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**Working Paper**

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AEI Economics Working Paper, No. 2019-06

**Provided in Cooperation with:**

American Enterprise Institute (AEI), Washington, DC

*Suggested Citation:* Mathur, Aparna; Munasib, Abdul; Roy, Devesh; Bhatnagar, Akshay (2019) : Sparking the #MeToo revolution in India: The "Nirbhaya" case in Delhi, AEI Economics Working Paper, No. 2019-06, American Enterprise Institute (AEI), Washington, DC

This Version is available at:

<https://hdl.handle.net/10419/280595>

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# Sparking the #MeToo Revolution in India: The “Nirbhaya” Case in Delhi

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AEI Economics Working Paper 2019-06

February 2019

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# Sparking the #MeToo Revolution in India: 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, the extent of the media coverage, and the intensity of the public’s opprobrium of the police and the administration of Delhi, was unprecedented. This paper argues that these events had a measurable impact on the reporting of crimes against women – rape and other sexual assaults – in Delhi. The sweeping public debates may have lessened the stigma typically associated with reporting such crimes. Further, an intense media focus on how the authorities in Delhi were handling these complaints, may have provided women of Delhi greater confidence to report these crimes. Using the synthetic control method, we estimate the impact of the 2012 incident on the reporting of crimes against women in Delhi. Our estimates show a significant increase in crime reporting in Delhi relative to a combination of other states and federally administered areas in India that are used to construct a counterfactual Delhi. We suggest that nearly all of this is a consequence of a greater willingness to report such crimes rather than the result of improvements in law and order and policing. While reported crimes increased, the convictions rate did not change significantly.

JEL Classification: J16, J28, K14, K32, R5

Key words: Rape reporting, India, crime against women, women’s empowerment

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<sup>f</sup> This research started when Abdul Munasib was a Research Scientist in the Department of Agricultural and Applied Economics, University of Georgia, Griffin, GA.

## I. Introduction

In December 2012, a 23-year-old female 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 on to the roadside, and thirteen days later, she succumbed to her injuries. Crimes against women are common in India. As per a 2018 poll by Thomson Reuters, India is the most dangerous country for women.<sup>1</sup> Yet this particular incident shocked the country, and not only because of the brutality of the crime.<sup>2</sup> The rape was covered widely not just in the national media but also in international newspapers, and was condemned across the world. People in Delhi took to the streets to protest the state and the federal government and demanded urgent steps to guarantee safety for women in Delhi and speedy justice for the brutalized and deceased victim. The rape victim is now remembered as “Nirbhaya”, meaning fearless, for her resistance against the perpetrators of the crime as well as her thirteen days of fight for life after the injuries inflicted on her.<sup>3</sup>

Given the enormity of this incident and the public outcry that followed in Delhi, did this incident lead to a significant change in reporting of crimes against women in Delhi vis-à-vis other jurisdictions? Did it create a more favorable environment for the women of Delhi to speak out against such incidents? This is the research question that we address in this paper.

The Nirbhaya case has analogies to the #MeToo movement we are witnessing in the developed world. #MeToo spread as a popular hashtag in the United States after several prominent women spoke out against the sexual abuse and harassment meted out to them by Harvey Weinstein, a famous Hollywood producer. The original use of the phrase was by a social

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<sup>1</sup> <http://poll2018.trust.org/country/?id=india> [last accessed: 15 December 2018].

<sup>2</sup> <https://www.ndtv.com/india-news/the-nirbhaya-rape-case-that-rocked-india-1880338> [last accessed: 15 December 2018].

<sup>3</sup> 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.

activist and community organizer, Tarana Burke, in 2006, who began using the phrase as part of a campaign to promote “empowerment through empathy” among women of color who have experienced sexual abuse. However, it caught on in October 2017 after the Weinstein scandal, and is now being used to demonstrate the widespread prevalence of sexual abuse in the workplace and elsewhere. We see a similar change in India, and specifically in Delhi, following the Nirbhaya rape case. As we document in this paper, reporting and recording of rape and molestation and sexual harassment cases in Delhi increased by 23-40 percent after 2012.

This is an important change because 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. A recent paper by Gupta (2014) comparing data from the National Crime Records Bureau (NCRB) and the National Family Health Survey (NFHS) in India finds that, as recently as 2005, only about 2 percent of the incidents of physical violence by the husbands towards their wives were officially reported. 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).

In India, the social and institutional elements that collude to suppress reporting of crimes against women are notably strong and resilient. Why are women less likely to report rape? According to Cahill (2001) “rape must be understood fundamentally ... as an affront to the embodied subject ... a sexually specific act that destroys the intersubjective, embodied agency and therefore personhood of a woman.” Anderson (2005) cites feelings of “dehumanization, objectification, and domination” in the accounts of both rapists and rape victims.

Rape reporting is particularly problematic in India due to its culture of apathy and victim blaming. 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). 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.”<sup>4</sup> In other cases, there have been attempts to marry off rape victims to their rapists, since the ultimate goal is for the victim to not remain unmarried.<sup>5</sup>

In a highly publicized investigation carried out by Tehelka, an Indian News Magazine known for its investigative journalism, members of the Delhi Police force 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.<sup>6</sup>

Destigmatization, women’s empowerment and greater ease of reporting are critical factors in reporting of crimes against women, particularly in cases of rape. Factors that reduce stigma and indicate reduction in apathy, can increase reporting. A small number of earlier papers, using India data, have documented increased reporting of women centric crimes in response to policies that lead to women empowerment. Iyer et al. (2012) show that increases in political reservations, such as a certain number of seats in local governments being reserved for women, lead to increased reporting of crimes against women.

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<sup>4</sup> <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].

<sup>5</sup> [https://www.washingtonpost.com/news/worldviews/wp/2012/12/29/india-rape-victim-dies-sexual-violence-proble/?utm\\_term=.b0342edf3edb](https://www.washingtonpost.com/news/worldviews/wp/2012/12/29/india-rape-victim-dies-sexual-violence-proble/?utm_term=.b0342edf3edb) [last accessed: 15 December 2018].

<sup>6</sup> 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.

Amaral (2014) finds that changes in inheritance law significantly reduced both documented crimes against women and reports of violence in India.<sup>7</sup> In a related paper, using nationally representative survey data, Mathur and Slavov (2017) suggest that improved representation increased the reported probability of domestic violence. Amaral et al. (2015) studied the impact of the National Rural Employment Guarantee Scheme in India and find that, with the employment opportunities that expanded to women there was an increase in reported domestic violence.

Wyatt (1992) shows that African-American women in her study 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,<sup>8</sup> the rise in reported rape may in part be attributed to the post-apartheid regime, under which black women feel safer reporting sexual crimes.

The Nirbhaya case and the events that followed constitute an exogenous shock. The unprecedented media coverage, the widespread sympathy the victim evoked, and the scale and intensity of public outcry witnessed in the aftermath of this gruesome crime, may have emboldened victims to come forward and demand justice. Our hypothesis is that, following the Nirbhaya case, at least in the short to medium term, victims of such abuse were more likely to

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<sup>7</sup> There are numerous studies on the determinants of domestic violence in India. Some find a lower risk of domestic violence among women who work (Bhattacharya, Bedi and Chhachhi, 2009), earn more income (Rao 1997), or have greater wealth (Panda and Agarwal 2005). Panda and Agarwal (2005) further find that women who own assets are also more likely to leave their homes if they experience violence. 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. Of these studies, Kishor and Johnson (2004), Kimuna et al. (2013), and Eswaran and Malhotra (2011) use the NFHS data.

<sup>8</sup> Assault was endemic during the apartheid era with Johannesburg's most popular daily *The Star* reporting twenty or thirty rapes every weekend in Soweto.

come forward and report these crimes. We employ a synthetic control approach to estimate the causal impact of the 2012 Nirbhaya case on reporting of crime against women in Delhi.

Based on the National Crime Records Bureau (NCRB) data, our synthetic control method estimates show that, in Delhi, the 2012 Nirbhaya case had a positive impact on the reporting of crimes against women such as rape, and 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. In a recent paper, McDougal et al. (2018) report that relative to the period 2005-2012, there was a 33 percent increase in rape reporting nationwide, over the period 2013-2016. The increases after 2012 were higher in regions closer to Delhi. The paper finds that for every additional 100 km farther from Delhi that a district was located, there was a significant decrease in rapes reported to the police relative to what may have been expected based on previous trends.

While we argue that the Nirbhaya case may have empowered women to speak up against rapes and sexual harassment, there were also administrative and legislative actions that were prompted by the Nirbhaya case, which we describe in detail later. However, we do not find any strong evidence of an impact on arrests and convictions for rape and molestation and sexual harassment in Delhi. To accommodate for the possibility that the increased reporting that we estimate is in fact due to an increase in crime, rather than simply reporting, we estimate the impact of the Nirbhaya case on murder and culpable homicide, a crime that is not subject to significant reporting bias; we 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. Our findings are robust to several other robustness tests discussed in section IV.



This paper contributes to the literature on the economics of violence against women. Papers that study the impact of policies empowering women on crime reporting (Wyatt 1992, Iyer et al. 2012, Amaral et al. 2015, Mathur and Slavov 2017) have been mentioned above. Several papers such as Aizer (2010), Andberg et al. (2016) and Bobonis et al. (2013) look at economic drivers such as income and employment as a factor in crime against women. Other papers like 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. The authors find that the increase led to a rise in reporting rates of domestic violence incidents and a decrease in female homicides committed by the intimate-partner.

In our paper, we find that while reporting increased after 2012, there has been little change in the conviction rates for crimes against women, suggesting that policing and other changes did not materially affect outcomes beyond reporting. In fact, the conviction rate for rape crimes has continued to decline since 2007 and has reached a historic low of 18.9 percent in 2016.

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: A Break from the Norm**

Discussions about rape in India have traditionally been minimal in the public arena (Nigam 2014). However, with the 2012 Nirbhaya case, it was noticeably different. Our analysis of Google News trends for India (Figure 1) over the period 2005-2015, shows that there was a marked

increase in the mention of the word “rape” in news stories starting in 2013. Between 2005 and 2012, the search results yielded a maximum of about 60,000 hits. After 2012, the number jumped initially to 112,000 in 2013, 407,000 in 2014 and 594,000 in 2015. In addition, the “India bus rape” search on google trends shows the reach of this news story, not just in India, but in other parts of the world as well.

These findings are confirmed in other analyses. According to Drache et al. (2013), rape reporting in media increased by 30 percent after the Delhi rape. Monitoring coverage across four major Indian newspapers between December 2012 and March 2013, the authors find a significant bump in media coverage of the issue, with more than 82 stories per week reported in December 2012, and an average of more than 40 stories per week in the first three weeks of January 2013. The authors 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.

Some of this was a consequence of the fact that people could empathize with the personal story of the victim. The media highlighted the educational background of the victim and her achievements, promise as a student and her aspirational story of a small-town girl striving to make it in a big city like Delhi. People came to know about the sacrifices made by her family for her education and her having a career (selling land and moonlighting in work). When The New York Times interviewed the victim’s father he talked about her childhood dream of becoming a doctor that later had to be dropped for a career in physiotherapy instead due to the exorbitant cost of a medical education.<sup>9</sup> These discussions in the media worked to create a feeling of connectedness as readers and viewers could relate with such stories of sacrifice in their own families (Drache et al. 2013).

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<sup>9</sup> <https://www.nytimes.com/2013/01/12/world/asia/for-india-rape-victims-family-layers-of-loss.html> [last accessed: 15 December 2018].

Public protests heightened after the case. There were demonstrations outside the Parliament of India as well as the official residence of the President of India in Delhi.<sup>10</sup> Even beyond Delhi, protests occurred in the city of Kolkata, Mumbai, Kochi and around the country at various locations. Protesters also took to social media, with users replacing their profile images with a black dot symbol. An online petition platform, Change.org, received more than 65,000 signatures appealing for the intervention of President Pranab Mukherjee and the Chief Justice of India. There were calls for an “Aurat Bandh”, a strike by women across the country to not do any work until the issue was resolved.

This was not the first case of gang rape in India; yet, this time, the government was compelled to take measures not taken before. A committee, under the leadership of Justice Verma was created to suggest changes in Criminal Law, which were soon implemented. The judicial committee recommended improvements in police and government procedures in incidents of rape. As part of the Criminal Law Ordinance of 2013, several new laws were passed and six new fast-track courts were created to hear rape cases. The government identified 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 as potential strategies to increase rape reporting were recommended.

### **III. Data Description**

The procedure for reporting a crime in India is as follows. When a person reports a crime to the police, the crime has to 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

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<sup>10</sup> <https://www.gadgetsnow.com/social-media/Delhi-gang-rape-case-FacebookTwitter-fuels-rally-at-India-Gate/articleshow/17741529.cms>

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. The “Crime in India” publications have been produced since 1953 and are the primary source of administrative and official data on crimes in India. The data are first collected by the respective state and union territory police at the police stations in each district. The data are then validated at the state level and then validated and checked again at the time of consolidation by the NCRB officers. The NCRB then aggregates the data to present national trends in crimes. 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; convictions 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 in order to create a counterfactual or synthetic Delhi. These variables include state/union territory economic and demographic characteristics. Variables such as total per capita GDP and per capita GDP in the secondary sector, population by

age, share of women in higher education enrollment, etc., were collected from the Economic and Political Weekly Research Foundation (EPWRF) time series data.<sup>11</sup> Election data used have been directly downloaded from the election commission website.<sup>12</sup>

Our treatment unit is Delhi, a union territory of India that contains New Delhi, the capital of India. The donor pool, the set of control units, consists of the remaining 31 states/union territories in India. A few very small union territories are dropped due to lack of data availability. 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 31 states and union territories. In addition, conviction rates for such crimes are higher in Delhi relative to the average. Figure 2 shows that, post-2012, reported rape and reported molestation and sexual harassment in Delhi saw a large spike compared to the average for other jurisdictions while reported murder and culpable homicide, as well as reported road accident deaths, do not exhibit such movements.

#### **IV. Estimation: Synthetic Control Method (SCM)**

The fact that Delhi is the sole location for the 2012 incident (a single treated unit), underscores the choice of SCM as our preferred method for assessing the impacts of the 2012 Nirbhaya case on crime reporting 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 of situations, and the method naturally renders itself to permutations or randomization tests for inference (Bertrand et

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<sup>11</sup> <http://www.epwrfits.in/>

<sup>12</sup> <https://eci.gov.in/>

al., 2004; Abadie, Diamond and Hainmueller, 2010; Buchmueller et al., 2011; Bohn et al., 2014). Appendix A discusses some of the advantages of using SCM.

As 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 in terms of its economic and demographic characteristics and the environment related to crime and law and order. It is also unlikely that we can find a single state/union territory in India that would be similar to Delhi across all these different categories of characteristics. SCM provides a systematic way to choose comparison units. In particular, 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 of time generates the weights.

As shown in Table 1, we use an extensive set of predictor variables to obtain pre-intervention matching between Delhi and the donor pool of 31 states/union territories. We use demographic characteristics such as share of population that is male of age 15-35, total and women's share of 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. For 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 Loksabha (parliamentary) 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 of the December 2012 Nirbhaya case 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 and reported 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, Diamond and Hainmueller, 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 and 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 on the left column of Figures 3, for instance, show the same close fit visually. The estimated impact is the post-intervention difference between the actual and the synthetic Delhi (Bohn et al. 2014, Munasib and Rickman 2015), which is estimated over the period 2013-2015. The annual average reporting of rape cases in Delhi increase by 2.2 per

100,000, or 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 permutations 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 (Bohn et al. 2014, Munasib and Rickman 2015). We then calculate the DID rank, which is the ranking of the absolute value of the magnitude of the DID of the treatment state against all the placebo 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. Therefore, if DID rank is 1 then 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 in case of both crimes against women, DID rank is 1 that is 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 and 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 towards making a synthetic Delhi for rape per 100,000, while Puducherry, Chandigarh, Goa, Andhra Pradesh and Sikkim contribute with the largest weights in making a synthetic Delhi for molestation and sexual harassment per 100,000.

#### *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 actually due to an increase in crime itself driven by an unobservable, we estimate the impact of the Nirbhaya case on murder and culpable homicide. Murder and culpable homicides, 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 is due to an increase in reporting rather than an increase in the actual incidence of these crimes. Mathur and Slavov (2017), in studying the impact of improved representation, consider two explanations: first, women may have experienced retaliation by men who feared the erosion of their power and opposed the policy change, and second, the policy change may have made women more willing to report the violence to interviewers. They find that it was the latter that was impacted.

In columns 1-4 of panel A of Table 4, we present the pre-intervention characteristics of the synthetic 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 total GDP), we find a good match between the actual and the synthetic.<sup>13</sup>

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<sup>13</sup> 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. Our inclusion of per capita GDP of the secondary sector, for which 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 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 of 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 2012 Nirbhaya case by excluding the states from the donor pool that are adjacent to Delhi. As noted earlier, McDougal et al. (2018) find that rape reporting increased more in districts closer to Delhi. It is possible that, due to proximity, some of the areas surrounding Delhi – belonging to two states, Haryana and Uttar Pradesh, that are adjacent to Delhi – 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. Again, the results remain qualitatively the same and quantitatively very close to those in columns 1-4 of Table 2.

### *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. If we find that this placebo intervention does not produce a statistically significant effect then we have greater confidence in our main estimates. Table 5

summarizes these SCM estimates. We find that, across all outcomes, the placebo intervention generates statistically non-significant impacts.

## **V. Law Enforcement Changes**

In response to the Nirbhaya case, the Justice J. S. Verma Committee was set up to review India's criminal laws and suggest amendments to them to address all sorts of sexual crimes, ensure speedy trials and mete out proper punishment. This report formed the basis of the Criminal Law Amendment Act of 2013. Some significant changes were made as a result of this report.

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 now needs 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 (if any police officer fails to register a case of rape reported to him, or attempts to abort it's investigation, they could face punishment for it). The report also suggested that police officers with "reputations of outstanding ability and character" should be placed at the higher levels of the police force. In addition, law enforcement agencies should not become "tools at the hands of political masters".

Several other recommendations related to ensuring that women can lead a life of dignity and security, that they not be humiliated in courts in order 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. In this section, we test whether these legislative and policing changes had any significant impacts on arrests and

convictions. Arrests happen after the FIR is registered (when the case is first reported) whereas conviction is 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 2012 Nirbhaya case on arrests (columns 5 and 6) and convictions (columns 7 and 8) under rape and molestation and sexual assault cases. 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 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 reporting of crimes against women in Delhi, particularly rape and molestation and sexual harassment. We ran a series of robustness and falsification tests that confirm our findings.

The Nirbhaya case led to a measurable change in attitudes towards rape, and increased pressure on the police to register such cases. This destigmatization 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 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. Choudhary et al. (2016) have studied the Black Lives Matter movement and similarly discuss the role of social media in enabling collective action and understanding perceptions on issues like race.

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 to be more prompt in recording crimes against women, there is no significant increase in conviction rates for the crimes against women. Hence, public and social pressures may have emboldened women to come forward and report the crime, which explains the large uptick in reporting, 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).

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, which consider a different sample that protects against spurious correlation. The non-significant result in time placebo tests reveal no special dynamics in reporting before this attack that differentiated Delhi in relation to other states and union territories. The question whether the incident coincided with other unrelated changes leading to greater reporting can also be addressed through a number of falsification tests. Further, the use of the synthetic control

method with good pre-intervention fits over a long-time period, accounts for both time varying observed and unobserved factors that could be related to reporting.<sup>14</sup>

## 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 have addressed this question exploiting a natural experiment. In December 2012, an incident of rape and murder that was the most publicized that India had seen occurred in Delhi, the nation's capital. What followed were mass protests and media outrage and brought about changes in law aimed at reducing the likelihood of such crimes recurring. To estimate the impact of this change, we collected data on different crimes across Indian states. We find a large, positive, and local effect of the incident on reporting. Delhi, where the crime took place, witnessed a significant increase in reporting relative to other regions around the country.

The results are robust to alternative specifications with different set of predictors, different subsamples for the donor pool, and different placebo tests. The empirical strategy employed in our paper suggests that the estimated effects correspond to changed incentives for reporting and recording. While the public pressure and outrage may have led more women to report crimes against them, it may also have led to increased recording of crimes by the police. However, the policing effect does not extend much beyond greater recording. Our data show that the rate of convictions or arrests did not 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

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<sup>14</sup> 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."

incidents, rather than a greater willingness of the police and legal system to convict criminals associated with these crimes.

## References

- Abadie, A., Diamond, A., 2015. "Comparative politics and the synthetic control method." *American Journal of Political Science*, 59, 495–510.
- Abadie, Alberto, Diamond, Alexis, and Hainmueller, Jens. 2010. "Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program," *Journal of the American Statistical Association* Vol. 105(490); 493-505. Retrieved from <https://doi.org/10.1198/jasa.2009.ap08746>
- Abadie, Alberto, Diamond, Alexis, and Hainmueller, Jens. 2014. "Comparative Politics and the Synthetic Control Method," *American Journal of Political Science* Vol. 59(2). Retrieved from <https://doi.org/10.1111/ajps.12116>
- Aizer, Anna. 2010. "The Gender Wage Gap and Domestic Violence," *American Economic Review* Vol. 100(4); 1847-1859. DOI: 10.1257/aer.100.4.1847
- Amaral, Sofia, Bandyopadhyay, Siddhartha, and Sensarma, Rudra. (2015). "Employment Programmes for the Poor and Female Empowerment: The Effect of NREGS on Gender-based Violence in India," *Journal of Interdisciplinary Economics* Vol. 27(2); 199-218. Retrieved from <https://doi.org/10.1177/0260107915582295>
- Amaral, Sofia, Bhalotra, Sonia, and Prakash, Nishith. (2018). "Gender, Crime, and Punishment: Evidence from Women Police Stations in India," Cornell University: NEUDC Retrieved from [http://barrett.dyson.cornell.edu/NEUDC/paper\\_32.pdf](http://barrett.dyson.cornell.edu/NEUDC/paper_32.pdf)
- Amaral, Sofia. (2014). "Do Improved Property Rights Decrease Violence Against Women in India?" Retrieved from <http://dx.doi.org/10.2139/ssrn.2504579>
- Anderson, Michelle J. (2005). "All American Rape," *St. John's Law Review*: Vol 79: No. 3, Article 2. Retrieved from: <https://scholarship.law.stjohns.edu/lawreview/vol79/iss3/2>
- Anderson, Michelle, J. (August 2003). "Marital Immunity, Intimate Relationships, and Improper References: A New Law on Sexual Offenses by Intimates," *Hastings Law Journal*, Vol. 54, July 2003. Retrieved from <http://dx.doi.org/10.2139/ssrn.439504>
- 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
- Banerjee, Neela. (2003). "Rape (and Silence About it) Haunts Baghdad," *The New York Times*.
- Bertrand, Marianne, Duflo, Esther, and Mullainathan, Sendhil. (2004). "How Much Should We Trust Differences-In-Differences Estimates?" *The Quarterly Journal of Economics* Vol. 119(1); 249-275. Retrieved from <https://doi.org/10.1162/003355304772839588>
- Bhalla, Abhishek and Vishnu, G. (April 14, 2012 and December 31, 2012). "Tehelka Investigation: The Rapes will Go On," *Moment of Truth*. Retrieved from <https://mallusviewpoint.blogspot.com/2012/12/tehelka-investigation-rapes-will-go-on.html>
- Bhattacharyya, Manasi, Bedi, Arjun S., and Chhachhi Amrita. (2009). "Marital Violence and Women's Employment and Property Status: Evidence from North Indian Villages," *World Development* Vol. 39(9); 1489-1690. Retrieved from <https://doi.org/10.1016/j.worlddev.2011.02.001>
- Black, M.C., Basile, K.C., Breiding, M.J., Smith, S.G., Walters, M.L., Merrick, M.T., Chen, J., and Stevens, M.R. (2011). "The National Intimate Partner and Sexual Violence Survey (NISVS): 2010 Summary Report," Atlanta,



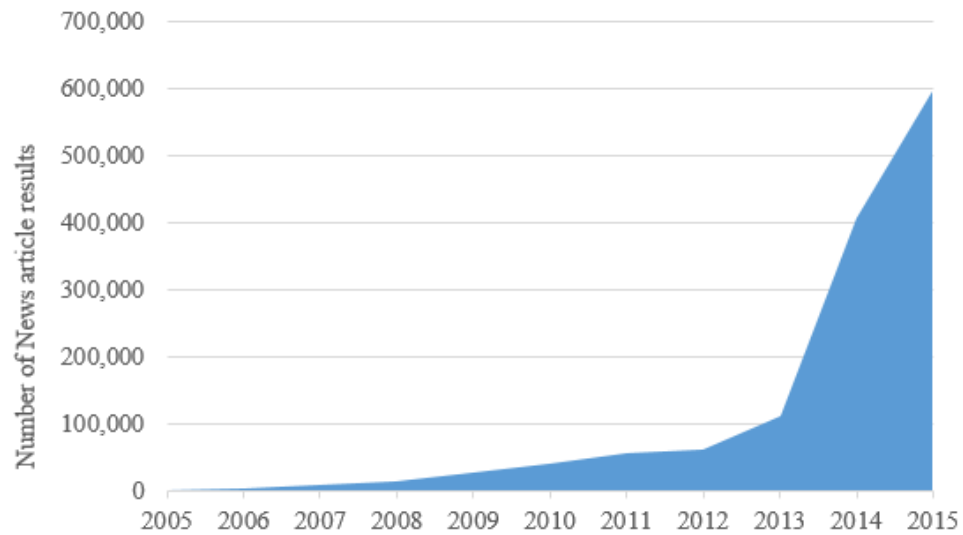
- Bobonis, Gustavo J., González-Brenes, Melissa, and Castro, Roberto. (2013). "Public Transfers and Domestic Violence: The Roles of Private Information and Spousal Control," *American Economic Journal: Economic Policy* Vol. 5(1); 179-205. DOI: 10.1257/pol.5.1.179
- Bohn, Sarah, Lofstrom, Magnus, and Raphael, Steven. (2014). "Did the 2007 Legal Arizona Workers Act Reduce the State's Unauthorized Immigrant Population?" *Review of Economics and Statistics* Vol. 96(2); 258-269. Retrieved from [https://doi.org/10.1162/REST\\_a\\_00429](https://doi.org/10.1162/REST_a_00429)
- Buchmueller, T. C., DiNardo, J., & Valletta, R. G. (2011). The effect of an employer health insurance mandate on health insurance coverage and the demand for labor: Evidence from hawaii. *American Economic Journal: Economic Policy*, 3(4), 25-51
- Cahill, Ann J. (2001). "Rethinking Rape. Ithaca," New York: Cornell University Press.
- Choudhury M De, Jhaver S, Sugar B, Weber I. 2016. "Social Media Participation in an Activist Movement for Racial Equality," *Proc Int AAAI Conf Weblogs Soc Media*. 2016;2016:92-101.
- Donald, Stephen, G. and Lang, Kevin. (2007). "Inference with Difference-in-Differences and Other Panel Data," *Review of Economics and Statistics* Vol. 89(2); 221-233. Retrieved from <https://doi.org/10.1162/rest.89.2.221>
- Drache, Daniel and Velagic, Jennifer. (June 10, 2013). "A Report on Sexual Violence Journalism in Four Leading Indian English Language Publications Before and After the Delhi Bus Rape," *Materials Science Research Network*. Retrieved from SSRN: <http://dx.doi.org/10.2139/ssrn.2277310>
- Eswaran, Mukesh and Nisha Malhotra. (2011). "Domestic violence and women's autonomy in developing countries: theory and evidence," *Canadian Journal of Economics* Vol. 44(4). Retrieved from <https://doi.org/10.1111/j.1540-5982.2011.01673.x>
- France-Presse, A. (2018). "The Nirbhaya Rape Case that Rocked India," NDTV. Retrieved from <https://www.ndtv.com/india-news/the-nirbhaya-rape-case-that-rocked-india-1880338>
- Gomillion, Sarah C. & Traci A. Giuliano (2011). "The Influence of Media Role Models on Gay, Lesbian, and Bisexual Identity," *Journal of Homosexuality*, 58:3, 330-354, DOI: 10.1080/00918369.2011.546729
- GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention. Retrieved from [https://www.cdc.gov/violenceprevention/pdf/nisvs\\_report2010-a.pdf](https://www.cdc.gov/violenceprevention/pdf/nisvs_report2010-a.pdf)
- Gupta, Aashish. (2014). "Reporting and incidence of violence against women in India." Working paper, Rice University, Retrieved from: <http://riceinstitute.org/wordpress/wpcontent/uploads/downloads/2014/10/Reporting-and-incidence-of-violence-againstwomen-in-India-working-paper-final.pdf>
- Iyer, Lakshmi, Anandi Mani, Prachi Mishra, and Petia Topalova. 2012. "The Power of Political Voice: Women's Political Representation and Crime in India." *American Economic Journal: Applied Economics*, 4 (4): 165-93. DOI: 10.1257/app.4.4.165
- Jejeebhoy, S.J. (1998). "Wife-Beating in Rural India: A Husband's Right? Evidence From Survey Data," *Economic and Political Weekly* 33:855-62. Retrieved from <https://www.jstor.org/stable/4406642>
- Khazan, Olga and Lakshmi, Rama. (2012, December 29). "10 reasons why India has a sexual violence problem," *The Washington Post*. Retrieved from [https://www.washingtonpost.com/news/worldviews/wp/2012/12/29/india-rape-victim-dies-sexual-violence-proble/?utm\\_term=.b0342edf3edb](https://www.washingtonpost.com/news/worldviews/wp/2012/12/29/india-rape-victim-dies-sexual-violence-proble/?utm_term=.b0342edf3edb)
- Kimuna, Sitawa, R., Djamba, Yanyi K., Ciciurkaite, Gabriele, and Cherukuri, Suvarna. (2012). "Domestic Violence in India: Insights From the 2005-2006 National Family Health

- Survey," *Journal of Interpersonal Violence* Vol. 28(4): 773-807.  
<https://doi.org/10.1177/0886260512455867>
- Kishor, Sunita and Johnson, Kiersten (2005). "Profiling domestic violence: a multi-country study," *Studies in Family Planning* Vol. 36(3); 259+
- Krishnan, Suneeta, Rocca, Corinne H., Hubbard, Alan E., Subbiah, Kalyani, Edmeades, Jeffrey, and Padian, Nancy S. (2010). "Do changes in spousal employment status lead to domestic violence? Insights from a prospective study in Bangalore, India," *Social Science and Medicine* Vol. 70(1); 136-143. Retrieved from <https://doi.org/10.1016/j.socscimed.2009.09.026>
- Mathur, Aparna and Slavov, Sita. (2017). "The impact of legislative change on reported domestic violence against women in India," *Economics Bulletin* Vol. 37(4); 2655-2664.
- Marcus, NC. 2016. "From Edward to Eric Garner and beyond: The importance of constitutional limitations on lethal use of force in police reform," *Duke J. Const. L. & Pub. Policy*, 2016.
- McDougal, Lotus, Krumholz, Samuel, Bhan, Nandita, Bharadwaj, Prashant, and Raj, Anita. (2018). "Releasing the Tide: How Has a Shock to the Acceptability of Gender-Based Sexual Violence Affected Rape Reporting to Police in India?" *Journal of Interpersonal Violence* <https://doi.org/10.1177/0886260518811421>
- Miller, Amalia R. and Segal, Carmit. (2014). "Do Female Officers Improve Law Enforcement Quality? Effects on Crime Reporting and Domestic Violence Escalation," University of Zurich, UBS International Center of Economics in Society, Working Paper No. 9. Retrieved from <http://dx.doi.org/10.2139/ssrn.2519470>
- National Crime Records Bureau, "Crimes in India" publications, 2005-2015. Accessed at: <http://ncrb.gov.in/>
- Neumark, David, Salas, J.M. Ian, and Wascher, William. (2014). "Revising the Minimum Wage-Employment Debate: Throwing Out the Baby with the Bathwater?" IZA Discussion Papers, No. 7166, Institute for the Study of Labor (IZA), Bonn. Retrieved from <http://hdl.handle.net/10419/69384>
- Nigam, Shalu. (2014). "Violence, Protest and Change: A Socio-Legal Analysis of Extraordinary Mobilization after the 2012 Delhi Gang Rape Case," Materials Science Research Network. Retrieved from SSRN: <https://ssrn.com/abstract=2447411>
- Panda, Pradeep and Agarwal, Bina. (2005). "Marital violence, human development and women's property status in India," *World Development* Vol. 33(5); 681-850. Retrieved from <https://doi.org/10.1016/j.worlddev.2005.01.009>
- Pratiksha Baxi, Shirin M Rai and Shaheen Sardar Ali. (2006) "Legacies of common law: 'crimes of honour' in India and Pakistan," *Third World Quarterly*, 27:7, 1239-1253. DOI: 10.1080/01436590600933404
- Rao, Vijayendra. (1997). "Wife-beating in rural South India: A qualitative and econometric analysis," *Social Science and Medicine* Vol. 44(8); 1169-1180. Retrieved from [https://doi.org/10.1016/S0277-9536\(96\)00252-3](https://doi.org/10.1016/S0277-9536(96)00252-3)
- Rubin, Donald B. (2001). "Using Propensity Scores to Help Design Observational Studies: Application to the Tobacco Litigation" *Health Services and Outcomes Research Methodology* Vol. 2(3-4); 169-188. Retrieved from <https://doi.org/10.1023/A:1020363010465>
- Ruggi, Suzanne. (Spring 1998). "Commodifying Honor in Female Sexuality: Honor Killings in Palestine," *Middle East Report* No. 206. Retrieved from <https://www.jstor.org/stable/3012473>

- Timmons, Heather and Kumar Hari (January 11, 2013). "For India's Rape Victim's Family, Many Layers of Loss," The New York Times. Retrieved from <https://www.nytimes.com/2013/01/12/world/asia/for-india-rape-victims-family-layers-of-loss.html>
- Tjaden, Patricia and Thoennes, Nancy. (November 2000). "Full Report of the Prevalence, Incidence, and Consequences of Violence Against Women," National Institute of Justice and Center for Disease Control. Retrieved from <https://www.ncjrs.gov/pdffiles1/nij/183781.pdf>
- Verma, Anurag. (2017, August, 3). "10 Bizarre Statements Made by Indian Politicians that will make you Facepalm Hard," CNN-News 18. Retrieved from <https://www.news18.com/news/politics/10-bizarre-statements-made-by-indian-politicians-that-will-make-you-facepalm-hard-1481489.html>
- Wyatt, Gail, E. (1992). "The Sociocultural Context of African American and White American Women's Rape," Journal of Social Issues, Vol. 48(1): 77-91. Retrieved from <https://doi.org/10.1111/j.1540-4560.1992.tb01158.x>

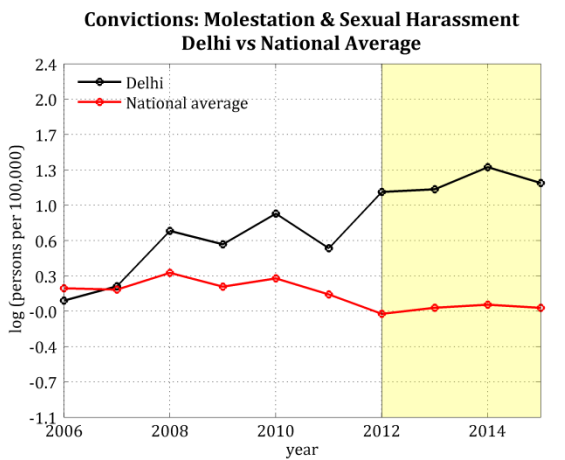
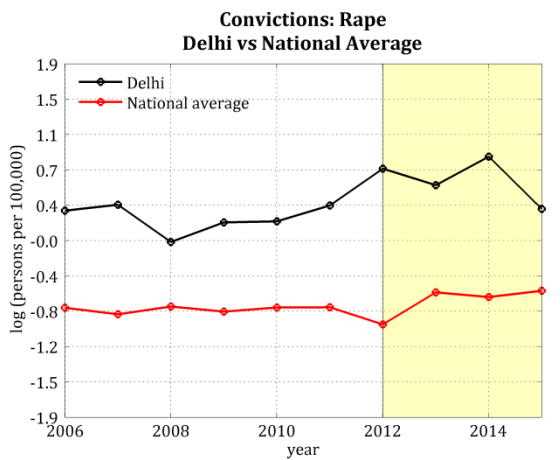
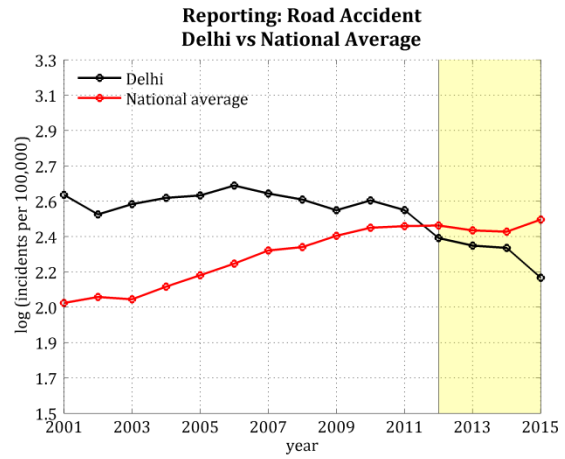
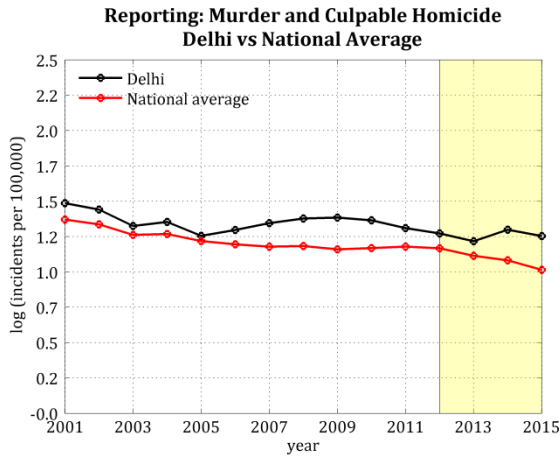
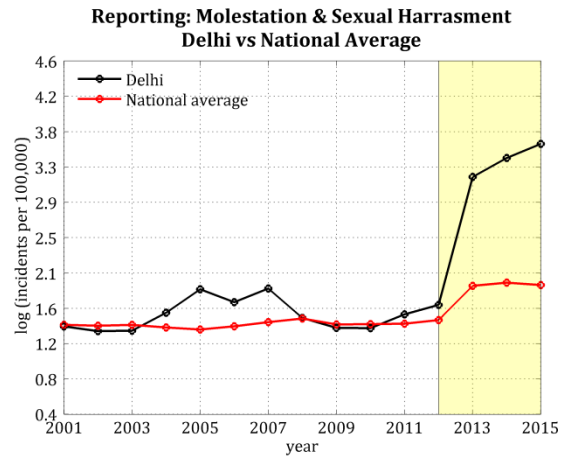
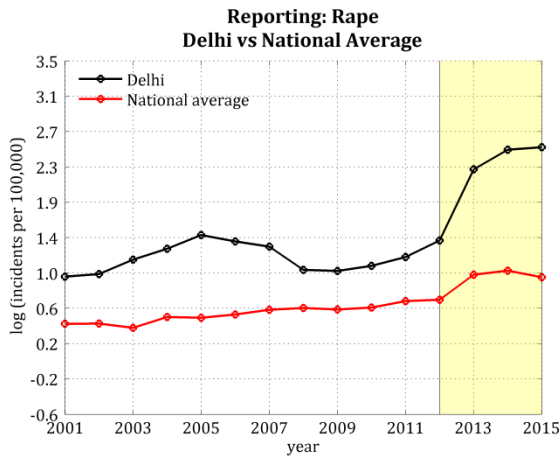
## Figures

Figure 1: Media Coverage – Number of Google News Results in India for Search Term “Rape”



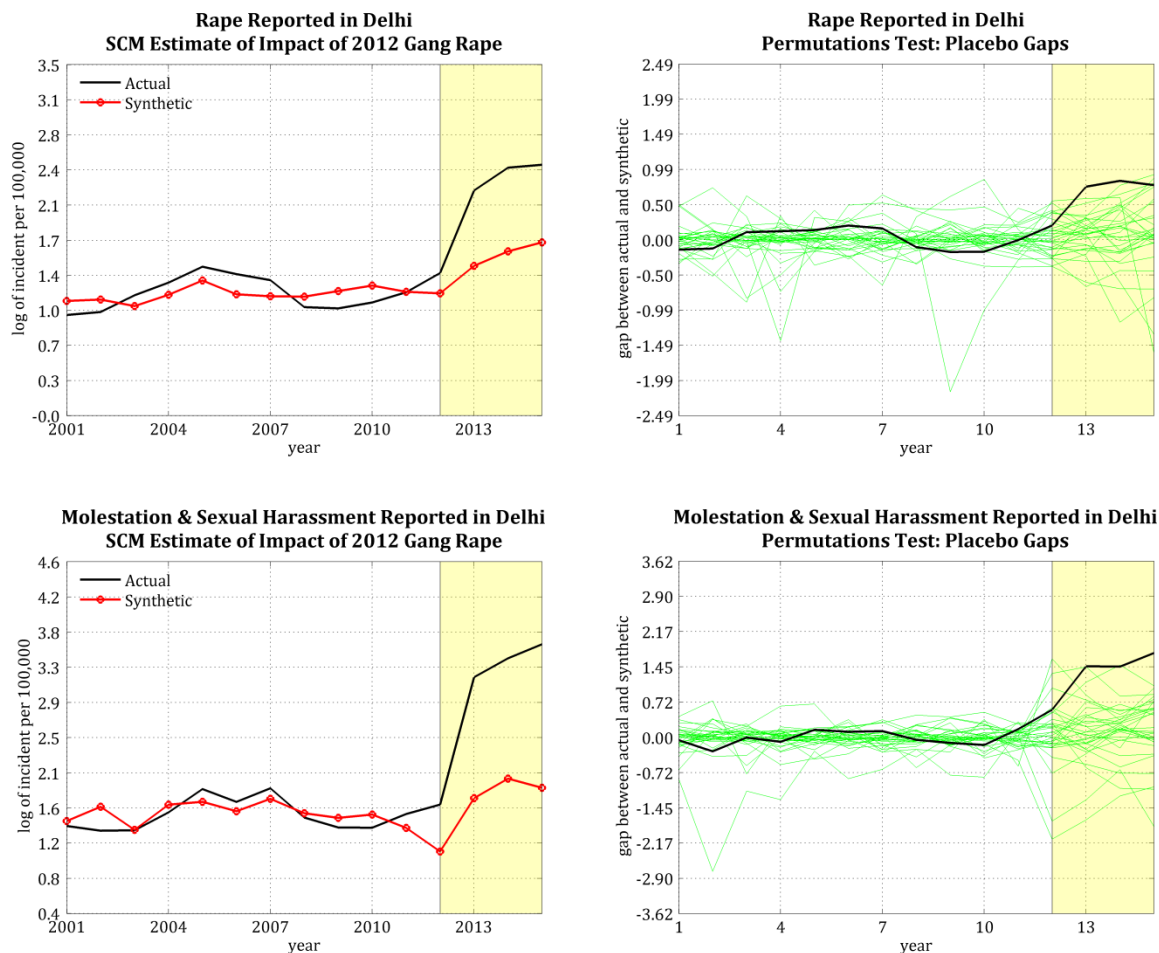
Source: [https://www.google.com/search?q=rape&biw=1875&bih=964&source=ln&tbs=cd:3A1%2Ccd\\_min:3A1%2F1%2F2005%2Ccd\\_max:3A12%2F31%2F2005&tbm=nws](https://www.google.com/search?q=rape&biw=1875&bih=964&source=ln&tbs=cd:3A1%2Ccd_min:3A1%2F1%2F2005%2Ccd_max:3A12%2F31%2F2005&tbm=nws) Note: The number on the vertical axis represents the (approximate) number of Google News results when the word “rape” is entered in the query bar. A “result” is represented as an article in a news publication, as qualified by the “News” toggle in the Google search engine. Results are refined to the region of India and the date range from January 1 through December 31 of the indicated year.

Figure 2: Descriptive Pictures of Selected Outcome Variables



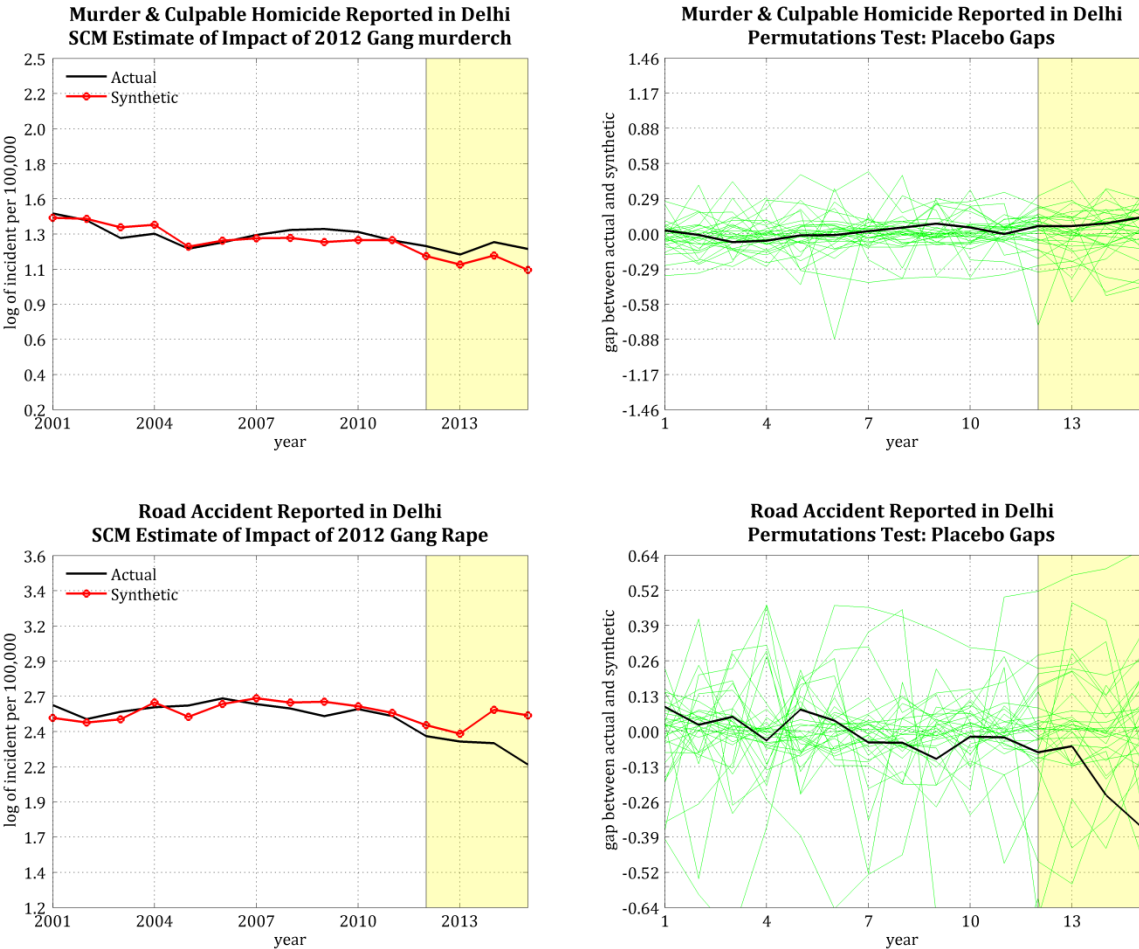
Note: Outcome variables are in logs of 'outcome per 100,000'; for example, Rape = log of rape reported per 100,000. MSH = Molestation & sexual harassment, MCH = Murder & culpable homicide, Accident = Road accident death.

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.

## Tables

Table 1: Summary Statistics

	Donor Pool (31 states/territories)				Delhi
	Mean	Std dev	Min	Max	Mean
<i>Outcomes: Reporting &amp; arrests per 100,000 (2001-2015)</i>					
Rape per 100,000: reporting	2.54	1.74	0.09	10.14	4.93
Molestation & sexual harassment per 100,000: reporting	5.18	3.90	0.05	23.01	10.21
Murder & culpable homicide per 100,000: reporting	3.59	1.54	1.12	10.77	3.71
Road accidents per 100,000	10.31	5.53	1.61	31.09	12.27
Arrests per 100,000: rape	3.03	2.13	0.09	16.90	5.70
Arrests per 100,000: molestation & sexual harassment (MSH)	6.41	5.16	0.00	27.28	11.04
<i>Outcomes: Convictions per 100,000 (2006-2015)</i>					
Convictions per 100,000: rape	0.50	1.08	0.00	10.86	1.02
Convictions per 100,000: MSH	0.78	1.28	0.00	10.94	1.59
<i>Predictors: Characteristics (2001-2011)</i>					
Female police per 100,000	10.49	11.72	0.00	77.69	20.59
Police per 100,000 people	281.90	223.68	37.83	991.67	388.60
Women's share of higher education enrollment	0.43	0.08	0.18	0.69	0.46
Higher education enrollment (% of population)	1.53	0.98	0.47	7.49	2.87
Per capita GDP (current Rs lakh)	0.46	0.32	0.07	2.40	0.96
Per capita GDP secondary sector (current Rs lakh)	0.13	0.13	0.01	0.96	0.16
All crimes against women: arrests per 100,000	22.39	13.32	1.33	78.18	27.32
Male age 15-35 (% of population)	17.94	3.65	1.77	30.92	20.99
Annual population growth rate	1.08	0.11	0.61	1.61	1.10
Growth in urban population 2001-2011	1.20	0.28	1.00	2.57	1.13
Annual per capita GDP growth rate	1.99	0.93	0.95	7.01	2.09
All crimes per 100,000: reporting	184.17	89.72	43.20	513.81	340.52
All crimes: arrests per 100,000	237.91	125.52	36.02	670.82	287.51
Loksabha election: ratio of votes for female to male candidate (%)	8.40	10.74	0.00	58.01	12.04

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) Domestic violence is defined as "cruelty to women by husband and/or his relative". (d) 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 and Convictions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Reporting				Arrests		Convictions	
	Rape	MSH	MCH	Accident	Rape	MSH	Rape	MSH
RMSPE to mean ratio	0.02	0.01	0.00	0.00	0.02	0.00	0.07	0.03
Estimated impact	0.79	1.55	0.10	-0.21	0.69	1.56	0.21	0.68
DID rank	1	1	17	9	3	2	25	16
P-value: DID	0.00	0.00	0.50	0.25	0.06	0.03	0.75	0.47
Donor probability	0.03	0.03	0.53	0.28	0.09	0.06	0.78	0.50
<i>Donor pool weight</i>								
Andaman & Nicobar Islands	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	0.00
Arunachal Pradesh	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00
Chandigarh	0.27	0.20	0.10	0.26	0.17	0.03	0.27	0.00
Chhattisgarh	0.50	0.00	0.00	0.00	0.22	0.00	0.00	0.00
Goa	0.00	0.19	0.06	0.23	0.00	0.24	0.00	0.00
Haryana	0.00	0.00	0.30	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
Kerala	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00
Madhya Pradesh	0.00	0.00	0.00	0.00	0.38	0.00	0.25	0.24
Maharashtra	0.00	0.00	0.00	0.49	0.00	0.25	0.00	0.00
Mizoram	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00
Orissa	0.00	0.13	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
Sikkim	0.01	0.03	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	0.00	0.22
Uttarakhand	0.00	0.00	0.12	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 and Convictions, with Alternative Set of Predictors and Alternative Set of Donor Pool

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Reporting				Arrests		Convictions	
	Rape	MSH	MCH	Accident	Rape	MSH	Rape	MSH
<i>Panel A: Alternative Set of Predictors</i>								
RMSPE to mean ratio	0.02	0.01	0.00	0.00	0.02	0.01	0.07	0.12
Estimated impact	0.86	1.54	0.16	-0.14	0.70	1.16	0.21	0.60
DID rank	1	1	10	10	2	2	20	15
P-value: DID	0.00	0.00	0.28	0.28	0.03	0.03	0.59	0.44
Donor probability	0.03	0.03	0.31	0.31	0.06	0.06	0.63	0.47
<i>Panel B: Alternative Donor Pool - Excluding Adjacent States</i>								
RMSPE to mean ratio	0.02	0.01	0.00	0.00	0.02	0.01	0.06	0.09
Estimated impact	0.76	1.71	0.09	-0.21	0.73	1.35	0.21	0.69
DID rank	1	1	14	8	2	2	21	14
P-value: DID	0.00	0.00	0.43	0.23	0.03	0.03	0.67	0.43
Donor probability	0.03	0.03	0.47	0.27	0.07	0.07	0.70	0.47

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 and Convictions - Pre-intervention Characteristics Match

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Synthetic Delhi								Actual Delhi
	Reporting			Arrests		Convictions			
	Rape	MSH	MCH	Accident	Rape	MSH	Rape	MSH	
<i>Panel A: Main Estimates</i>									
Female police per 100,000	2.06	2.38	2.14	2.43	1.21	2.34	0.88	1.79	2.98
Police per 100,000	5.33	5.38	5.54	5.36	4.99	5.31	5.55	5.37	5.96
Women share higher education	0.44	0.47	0.45	0.47	0.41	0.48	0.48	0.44	0.46
Higher education	1.97	2.65	2.04	2.46	2.03	2.38	2.05	1.60	2.87
Per capita GDP	-0.89	-0.39	-0.64	-0.31	-1.07	-0.32	-0.80	-1.08	-0.14
PC GDP secondary sector	-2.31	-1.56	-1.93	-1.64	-2.56	-1.30	-2.43	-2.40	-1.91
Crimes against women: arrests	3.25	2.99	3.24	3.13	3.53	3.03	3.16	3.21	3.26
Male age 15-35	18.38	17.69	18.67	18.64	19.32	17.70	19.41	17.91	20.99
Population growth rate	1.12	1.09	1.09	1.13	1.04	1.09	1.14	1.08	1.10
Urban population growth	1.22	1.17	1.23	1.14	1.16	1.15	1.21	1.27	1.13
PC GDP growth rate	1.99	2.03	2.01	2.08	1.88	2.03	1.81	2.19	2.09
<i>Panel B: Estimates with Alternative Set of Predictors</i>									
Female police per 100,000	1.92	2.15	2.67	2.72	1.22	1.90	0.92	1.46	2.98
Police per 100,000	5.31	5.60	5.77	5.69	4.96	5.40	5.59	5.61	5.96
Women share higher education	0.44	0.45	0.46	0.50	0.41	0.45	0.49	0.43	0.46
Higher education	1.46	2.54	2.45	3.03	1.94	2.85	2.14	2.36	2.87
Per capita GDP	-1.07	-0.66	-0.59	-0.33	-1.09	-0.59	-0.76	-0.85	-0.14
PC GDP secondary sector	-2.38	-2.01	-1.74	-1.59	-2.54	-2.07	-2.40	-2.29	-1.91
Crimes against women: arrests	3.16	3.00	2.82	3.08	3.51	3.35	3.14	3.23	3.26
Male age 15-35	17.57	20.48	18.09	18.16	19.23	20.93	19.52	20.98	20.99
All crimes: reporting	5.24	5.33	5.57	5.66	5.57	5.54	5.65	5.27	5.83
All crimes: arrests	5.44	5.47	5.69	5.78	5.84	5.71	5.78	5.46	5.64
Election female to male candidate	12.01	12.00	12.03	12.03	11.44	12.02	5.18	5.57	12.04

Notes: (a) The table reports the characteristics matches 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. (c) MSH = Molestation & sexual harassment, MCH = Murder & culpable homicide, Accident = Road accident death. (d) Detailed descriptions and names of the variables are in Table 1. (e) The election refers to the Lok Sabha (parliamentary) election. (f) The monetary variables are in logarithm.

Table 5: Time Placebo Test: SCM Estimate of the Impact of 2012 Nirbhaya Gang Rape on Reporting, Arrests and Convictions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Reporting				Arrests		Convictions	
	Rape	MSH	MCH	Accident	Rape	MSH	Rape	MSH
RMSPE to mean ratio	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.00
Estimated impact	-0.42	-0.05	0.17	-0.13	-0.27	-0.34	0.17	0.93
DID rank	5	29	15	15	22	11	21	7
P-value: DID	0.13	0.88	0.44	0.44	0.66	0.31	0.63	0.19
Donor probability	0.16	0.91	0.47	0.47	0.69	0.34	0.66	0.22

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.

## Appendix: Advantages of Using Synthetic Control Method (SCM)

This Appendix is based on Ehrlich, Munasib and Roy (2017). There are a number of advantages to using SCM for this study. Neither every state/union territory nor a single state/union territory in the control group would likely approximate the most relevant characteristics of Delhi, the treatment unit. SCM provides a comparison unit (or synthetic control) that is a combination of the control units – a data-driven procedure that calculates ‘optimal’ weights to be assigned to each state/union territory in the control group based on pre-intervention characteristics – thus making explicit the relative contribution of each control unit to the counterfactual of interest (Abadie and Gardeazabal 2003; Abadie et al. 2010). In SCM, the researcher is forced to demonstrate the affinities between the affected and unaffected units using observed characteristics (Abadie et al. 2010; Abadie and Diamond 2015).<sup>15</sup>

Secondly, when aggregate data are employed (as is the case here) the uncertainty remains about the ability of the control group to reproduce the counterfactual outcome that the affected unit would have exhibited in the absence of the intervention (Abadie et al. 2010). This type of uncertainty is not reflected by the standard errors constructed with traditional inferential techniques for comparative case studies. As Buchmueller et al (2011) explain, in a ‘clustering’ framework, inference is based on asymptotic assumptions that do not apply in our case as the focus is on one state, Delhi, where the crime took place.

The comparison of a single state against all other states/union territory in the control group collapses the degrees of freedom and results in much larger sample variance compared to the one typically obtained under conventional asymptotic framework. The latter can seriously overstate significance of the treatment (Donald and Lang 2007; Buchmueller et al. 2011). We, therefore, apply the permutations or randomization test (Bertrand et al. 2004; Abadie et al. 2010; Buchmueller et al. 2011; Bohn et al. 2014) that SCM readily provides.

Additionally, Abadie et al (2010) argue that unlike the traditional regression-based difference-in-difference model that restricts the effects of the unobservable confounders to be time-invariant so that they can be eliminated by taking time differences, SCM allows the effects of such unobservables to vary with time. In particular, 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.<sup>16</sup>

Finally, because the construction of a synthetic control does not require access to post-intervention outcomes, SCM allows us to decide on a study design without knowing its bearing on the findings (Abadie et al. 2010). The ability to make decisions on research design while remaining agnostic about how each particular decision affects the conclusions of the study is a safeguard against actions motivated by a ‘desired’ finding (Rubin 2001).

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<sup>15</sup> Neumark et al (2014), in the context of the impact of minimum wage legislations, point out that in several studies that adopted regression-based models, there were underlying assumptions of similarities across states (for example, categorization by region). Unlike the *ad hoc* strategies with a presumption of affinity, SCM demonstrates affinities of the donor pool states with the exposed state.

<sup>16</sup> 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.”