H i C N Households in Conflict Network

The Institute of Development Studies - at the University of Sussex - Falmer - Brighton - BN1 9RE
www.hicn.org

Naxalite Insurgency and the Economic Benefits of a Unique Robust Security Response[1]

Saurabh Singhal[2] and Rahul Nilakantan[3]

HiCN Working Paper 127

October 2012

Abstract: Using the synthetic control method of analysis, we provide the first measurements of the direct economic benefits of a unique robust security response to an insurgency. Of all the states affected by Naxalite violence in India, only one state i.e. Andhra Pradesh raised a specially trained and equipped police force in 1989 known as the Greyhounds, dedicated mainly to combating the Naxalite insurgency. Compared to a synthetic control region constructed from states affected by Naxalite violence that did not raise a specially trained anti-Naxalite police force, we find that Andhra Pradesh gained on average 16.11% of its per capita NSDP over the period 1989 to 2000. The effects on the various subsectors of the non-agricultural sector range from approximately 11% to 25%. Placebo tests indicate that all results are significant. Standard difference-in-difference specifications at the state and industry level further corroborate these findings.

Key words: Counterinsurgency, Conflict, Naxalite insurgency

JEL Classification: H56, D74, F52

---

[1] Address for correspondence: Department of Economics, University of Southern California, Los Angeles, CA 90089, email: <singhals@usc.edu>. We thank John Strauss, Jeffrey Nugent, Geert Ridder, Rohini Somanathan, Eli Berman, Juan Carrillo, Olga Shemyakina, Raja Kali, Arya Gaduh, Smriti Sharma and conference/seminar participants at University of Southern California, ISNIE 2012, Delhi School of Economics, Indian Statistical Institute (New Delhi), PACDEV 2011, MWIEDC 2011 and the Institute of Peace and Conflict Studies for helpful comments and suggestions. Singhal gratefully acknowledges financial support in the form of a travel grant and the Gold Family Graduate Fellowship from the University of Southern California. Results in this paper supersede those in an earlier working paper entitled "The Economic Costs of Naxalite Violence and the Economic Benefits of a Unique Robust Security Response" (Nilakantan & Singhal, 2011). We take sole responsibility for all errors.

[2] University of Southern California

[3] Indian Institute of Management Indore

1 Introduction

Since its independence in 1947, India has faced numerous insurgencies within its borders at various points in time. One of the longest running insurgencies in India is the Naxalite - also known as the Maoist - movement. Using the synthetic control method of analysis developed by Abadie and Gardeazabal (2003), we present the first estimates of the economic gains - in terms of income per capita - of a unique, robust security response to the Naxalite insurgency in one of the affected states i.e. Andhra Pradesh.

With the ultimate objective of overthrowing the state by force and establishing a communist regime (Ramana, 2009 and Gupta, 2007), the Naxalite movement started in a small village in West Bengal in 1967, and then spread steadily across the country. The rate of spread of the movement has become alarming in the recent past, from 76 districts in 9 states in 2005 (Government of India, 2006) to 182 districts in 16 states in 2007 (Ramana, 2009). By the Indian Government's own estimate it accounts for about 91% of the total violence in India and 89% of the resulting deaths (Government of India, 2005) prompting Prime Minister Manmohan Singh to observe that the Naxalite insurgency is the single biggest internal security threat facing the country.

While other countries have generally relied on soft counterinsurgency policies, India has frequently resorted to security based or "coercive" responses to its insurgencies. The usual strategy is to flood the affected area with security forces in order to stifle the insurgency and once some sort of order is restored, the State normally negotiates a political settlement within the framework of the constitution. This strategy has borne mixed results. While this has worked in Punjab, Tripura and Mizoram, it has been unsuccessful in Assam, Nagaland and Jammu & Kashmir.[1]

The Naxalite insurgency differs from the usual Indian insurgency experience on two important counts. Firstly, while most of the other insurgencies are restricted to a small region or a state, the Naxalite insurgency is spread over a large part of India, making it difficult to coordinate counterinsurgency efforts across states. Secondly, while all the other counterinsurgency efforts have seen the involvement of the Indian Army, the states' response to the Naxalite insurgency has been dependent on the state police forces. Of the several states in India that are affected by Naxalite violence, only one state raised a specially trained police force dedicated to combating the Naxalite insurgency. This explicit change in the government's counterinsurgency policy gives us a unique opportunity to measure the direct economic benefits of this robust localized security response to the Naxalite insurgency.

[1]See Chadha (2005) for a summary of these insurgencies and Mukherjee (2010), Rajagopalan (2008) and Ganguly and Fidler (2009) for a discussion on India's counterinsurgency experience.

Using the synthetic control methodology we find that the introduction of a specialized police force called Greyhounds in Andhra Pradesh in 1989, yielded a "security dividend" equal on average to 16.11% of its per capita net state domestic product (pcNSDP) over the period 1989 to 2000. We further find that this effect came through 11%-25% effects on various subsectors of the non-agricultural sector. Placebo tests indicate that our results are significant. Additionally, these results are robust to standard difference-in-difference specifications at the state and industry level. To the best of our knowledge, this is the first study that directly estimates the economic benefits of a security response undertaken by a state to counter an extremist threat.

The rest of the paper is organized as follows. Section 2 briefly summarizes the related literature. Section 3 provides a brief history of the Naxalite movement in India and the state response. Section 4 provides a brief overview of the synthetic control method of analysis and the data. Section 5 describes the results of the analysis, Section 6 discusses the findings and Section 7 concludes.

2 Related Literature

While understanding the linkages between conflict and socio-economic outcomes has long been considered important, the focus on the effects of counterinsurgency policies is recent and mainly due to the wars in Iraq and Afghanistan. Researchers and practioners of counterinsurgency broadly classify the policies as either "carrot" or "stick". The "carrot" or "soft" counterinsurgency approach is dominated by two major mechanisms. The first is the "hearts and minds" approach. This aims to win the over the population by providing them public services, with the expectation that once their grievances are addressed, the attitude of the population towards the government will improve. The civilians are then less likely to help or join the insurgents and more likely to share information with the counterinsurgents. The existing research provides mixed evidence. While Berman, Shapiro and Felter (2011) find that improved service provision through the Commanders Emergency Reconstruction Program (CERP) in Iraq reduced violence, Beath et al.(2011) find that even though the National Solidarity Program (NSP) in Afghanistan improved villagers' perception of the government, it had no effect on violence levels. Furthermore, Crost and Johnston (2010) find that the KALAHI-CIDSS development assistance program in the Philippines actually increased violence.

The second mechanism is the opportunity-cost approach that builds on Becker's theory of crime (Becker 1968). Improved economic environment, access to the market, labor market

conditions, etc. increase the costs of participating in the insurgency thereby reducing the supply of insurgents. While, Berman et al. (2011) find evidence against this mechanism, Iyengar et al. (2011) find that labor-intensive projects under CERP reduced violence levels in Iraq.

Overall, even though the current evidence on the different mechanisms underlying the soft counterinsurgency approach is mixed, given the U.S. army's focus on this approach (U.S. Army, 2007), the base of knowledge has been rapidly expanding over the last few years. Surprisingly, this has not been the case for the coercive or "stick" measures of counterinsurgency. Although coercive counterinsurgency measures have been employed frequently, there have been few systematic empirical evaluation of these policies. Security based state responses may deter civilian support and reduce violence (Lyall, 2009) or drive up support for the insurgents (Kocher et al., 2011).

Further, the evaluation of state response to insurgencies has been largely restricted to the effects on the production of violence. However, the efficacy of counterinsurgency may also be evaluated via their effect on economic outcomes (Kapstein, 2012 and Greenstone 2007). Existing research finds that markets, by efficiently aggregating information, can be a good indicator of civilians' security outlook and provide an unbiased evaluation of the state's security policy. This methodology is particularly useful when violence data is unreliable or unavailable, as is the case for the Naxalite insurgency over the duration of this study. For example, Zussman and Zussman (2006) find that the Israeli and Palestinian stock markets respond negatively to Israel's assassinations of senior political leaders of Palestinian terrorist organizations but positively to the assassination of senior military leaders. Similarly, some papers have used the price of Iraqi state bonds to measure the effectiveness of various counterinsurgency policies in Iraq. Greenstone (2007) finds a sharp decline in bond prices immediately after the "Surge" indicating worsening expectations about Iraq's future. Chaney (2008) finds evidence that the Iraqi bond market fell following the news of coalition troops withdrawal but responded positively to news of negotiations with Iran. This paper builds on this line of work that uses economic indicators to evaluate the effectiveness of security policies.

Finally, despite now running in its fifth decade, there exist few systematic quantitative studies on the Naxalite insurgency. Cross-sectional studies find high incidence of poverty, low levels of literacy, forest cover and population share of members of scheduled castes and tribes to be the main correlates of Naxalite activity at the district level (Borooah, 2008 and Hoelscher et al., 2011). Gawande, Kapur and Satyanath (2012) in a panel data study find that adverse natural resource shocks increase the intensity of Naxalite violence over the

period 2001-08. Eynde (2011) finds that negative rainfall shocks increase Naxalite violence against civilians in order to deter them from becoming police informers.

3 The Naxalite Movement

The Naxalite movement traces its roots to Naxalbari, a small village in West Bengal. In March 1967, a tribal farmer was attacked by local landlords over a land dispute. A peasant uprising followed, led by revolutionaries of the Communist Party of India (Marxist) i.e. CPI(M) in several states of India, namely Andhra Pradesh, Bihar, Jammu and Kashmir, Karnataka, Kerala, Orissa, Tamil Nadu, Uttar Pradesh, and West Bengal. The West Bengal government, despite being led by CPI(M), crushed the rebellion within West Bengal. However, the revolutionaries within the CPI(M) split to form the All India Coordination Committee of Communist Revolutionaries (AICCCR) in 1968. The AICCCR rejected parliamentary elections and called for an armed uprising against the state. Due to internal conflicts, the AICCCR split, and a new organization called the Communist Party of India (Marxist-Leninist) i.e. CPI(ML) was formed in 1969. At the same time, another organization, later known as the Maoist Communist Center (MCC) was formed in Bihar under the name Dakshin Desh. Response by the state security forces was swift and violent, suppressing the insurgency by 1972. Although, the CPI(ML) continued armed struggle against the Indian state throughout the 1970s, the movement was riven by internal conflicts, suffered from further splits, and soon disintegrated.

Of the various factions to emerge from the CPI(ML), the two most prominent ones were the Communist Party of India (Marxist-Leninist) Liberation i.e. CPI(ML) Liberation in 1974 and the Communist Party of India - Marxist Leninist (People's War), also known as the People's War Group (PWG) in 1980. While the CPI(ML) Liberation did not rule out the possibility of armed revolution against the state, it did participate in the electoral process, even winning an election in Bihar in 1989. The PWG and the MCC on the other hand, completely rejected the democratic system and continuously waged a "people's war for the people's government". Through the 1980s and 1990s the various factions rapidly consolidated their bases, actively engaged the state security forces but showed little intergroup coordination. Of late, however, there have been many mergers - the biggest being that of the MCC and the PWG to form the Communist Part of India - Maoist (CPI-Maoist) in 2004.[2]

[2]A more detailed description of the history of the movement can be found in Kujur (2008) and Gupta (2007).

The Naxalite violence has imposed economic costs on the affected states through various avenues. For example, the blog Naxal Terror Watch[3] documents incidents of Naxalites destroying pipelines transporting iron ore slurry in Chattisgarh, destroying road construction machinery in Bihar, forcing the closure of bank branches in Jharkhand, disrupting power supply by damaging hydroelectric power stations in Orissa, impeding interstate commerce by routinely preventing the repair of national highways and damaging railway infrastructure in Jharkhand and Orissa, and degrading telecom service by destroying mobile phone towers (Naxal Terror Watch, 2012).

The Naxalites also impede economic growth by administering a "kidnap and extortion empire" in their areas of operation. For example, in a dramatic show of force, the Naxalites held a prestigious high-speed train and its 700 passengers hostage for about five hours in 2009 (Hindustan Times, 2009). Extortion from small and large enterprises as well as the collection of 'taxes' is reportedly common in areas under Naxalite control (Singh and Diwan, 2010).[4] Joshi (2010) reports that investments of the order of Rs.130 bn. (approximately $2.83 bn. at 2012 exchange rates) were tied up in just the power and steel industries in projects that could not be completed in the state of Chattisgarh on account of Naxalite violence. Additionally, civilians caught between the insurgents and the government forces face reduced access to health care (Solberg, 2008) and educational services.

3.1 State Response and the Greyhounds

The state counterinsurgency response to the rapid growth of the Naxalite movement since the 1980s has been lacking and inconsistent. The affected states have primarily relied on the regular police force to maintain security. However, the state police forces being understaffed and inadequately trained for counterinsurgency operations, have failed to check the Naxalite insurgency. Further, since maintaining law and order in India is the responsibility of the states, until recently, there has been little coordination between the central and the state governments on the approach towards the insurgency. The role of the central government has been largely restricted to providing reinforcements from the central police organizations when requested to do so. The deployment of central police forces is usually for limited time periods and have done little to boost counterinsurgency efforts (Oetken, 2009 and Ramana, 2009).

[3]This blog, available at naxalwatch.blogspot.com aggregates reports of Naxalite activity from popular Indian newspapers.

[4]Singh and Diwan (2010) report that police investigations in 2007 revealed the revenue of CPI(Maoist) to be over Rs. 20 bn. ($ 400 m.). Another major source of revenue is reported to be poppy cultivation.

Of the affected states only Andhra Pradesh raised a separate police force, called the Greyhounds, whose main purpose was to combat the Naxalite insurgency in the state.[5] Established in 1989 as a separate administrative unit, the Greyhounds are an elite commando force specially trained in counterinsurgency methods, well-equipped and have their own intelligence network and other support units. The personnel are recruited from the regular police force and though exact numbers are not publicly available, the size of the Greyhounds is reported to have steadily increased from 886 in 1989 (Shatrugna, 1989) to around 2000 currently (Priyadershi, 2009).

It must be pointed out that, in addition to the creation of a highly trained anti-Naxalite police force, the establishment of the Greyhounds has resulted in the the transformation of the counterinsurgency capabilities of the regular state police force in Andhra Pradesh. All Greyhound personnel have a tenure of three years after which they return to their respective police units. Additionally, all newly recruited police officers are required to train with the Greyhounds before being absorbed into the district police establishment. These policies have resulted in a significant improvement in the counterinsurgency capabilities of the local police forces, close coordination between the Greyhounds and the district police and better intelligence gathering thereby increasing the efficiency of the operations of the Greyhounds (Sahni, 2007 & 2008 and Achuthan, 2010). Throughout this paper, the estimation of the effect of the establishment of the Greyhounds is effectively an estimation of this dramatic transformation of the police setup in Andhra Pradesh.

Anecdotal evidence suggests that the Greyhounds have been successful in bringing the Naxalite violence in Andhra Pradesh under control (Swami, 2010 and Tata, 2010), motivating policy makers to consider raising similar forces in other affected states. For example, in a speech on December 20, 2007 the Prime Minister noted:

> "...I believe that given the unique nature of this problem, it is time to have a dedicated force just to tackle naxalism. Affected states must set up Special Task Forces on the Andhra Pradesh pattern and the Centre will provide assistance for this purpose."[6]

Currently, several Naxalite affected states such as Chhattisgarh, Jharkhand, Orissa, Madhya Pradesh, Bihar and Maharashtra are reported to be in the process of creating dedicated security forces along the lines of the Greyhounds to tackle the insurgency (Tiwari, 2009).

[5] Other stated responsibilities of the Greyhounds include providing assistance during natural disasters and other grave law and order situations. For more details see the Greyhounds webpage at www.apstatepolice.org.

[6] PM's Closing Remarks at the Chief Ministers Conference on Internal Security, New Delhi 2007. Full text of this speech is available at http://pmindia.nic.in/speech-details.php?nodeid=613 (accessed June 1, 2012).

This is being done even though there exists no systematic study that establishes the efficacy of the Greyhounds. The rigorous findings of this paper should help policy makers make informed decisions.

Finally, we would like to point out some issues regarding the timing and the exogeneity of the policy intervention under consideration. Even though the Greyhounds were officially introduced in 1989, the decision to raise the Greyhounds was announced on June 6, 1988 (Balagopal, 1988). Although, as shown in the results later, this could have led to an announcement effect, we take 1989 as the treatment year because in addition to the introduction of the Greyhounds, there was an important transformation of the Andhra Police setup that occurred only after 1989. Secondly, the introduction of the Greyhounds is reported to be an idea of K. S. Vyas, an officer with Indian Police Service (IPS), posted in Andhra Pradesh (Raju, 2010). The allocation of an officer to a particular state is done by the central government on the basis of merit and other exogenous factors. Although, this is not definitive argument for the introduction of the Greyhounds being a clean natural experiment, it is possibly the closest that one can get to a natural experiment in the field of counterinsurgency.

4 Research Methodology and Data

In order to answer the research questions, we use the synthetic control method developed by Abadie and Gardeazabal (2003) and Abadie, Diamond and Hainmueller (2010) (AG and ADH hereafter, respectively) in a comparative case study approach. In simple terms, the methodology uses pre-treatment outcomes and their predictive characteristics to weight the unaffected (control) units in such a way that they provide an appropriate counterfactual for the exposed (treated) unit.

While some studies employ individual micro data to analyze macro policy interventions, it must be noted that disaggregated data using standard inference techniques assume all uncertainty enters through sampling error in estimating the means. ADH point out that in such cases analyzing the policy at the macro level is preferable as using aggregate data eliminates this uncertainty.[7] At the aggregate level, however, a regression approach is usually less appropriate due to the lack of a sufficient number of treated and control units for robust inference. The synthetic control methodology is useful in circumstances such as those of the present study where the the event of interest - the creation of the Greyhounds in 1989 - occurred at an aggregate level (state level) and affected aggregate entities (states of

[7]Other uncertainties such as the ability of the control units to replicate the treated units still remain. See Imbens and Wooldridge (2009) for a discussion of the literature.

India).[8] More importantly, as further elaborated below, the synthetic control approach can be motivated as a generalization of the linear panel difference-in-differences model where the unobserved individual specific confounders are allowed to vary with time. Although this approach does not allow for inference through traditional asymptotic methods, informative inference is still possible through falsification (placebo) tests.

We now summarize the synthetic control methodology of ADH (notation and equations are those of ADH). Suppose we have $J+1$ regions with the first region exposed to the treatment and the remaining J regions being the potential controls. There are T time periods and T_0 pre-intervention time periods such that $1 < T_0 < T$. Let Y_{it}^N be the outcome observed for region $i \in \{1, \ldots, J+1\}$ if it is not exposed to the treatment and Y_{it}^I be the outcome observed for the the i^{th} region if it is exposed to the treatment in time periods T_{0+1} to T. Let D_{it} be a dummy variable that takes the value of 1 if region i is exposed to the treatment at time period t and 0 otherwise, i.e.

$$D_{it} = \begin{cases} 1 & \text{if } i = 1 \text{ and } t > T_0 \\ 0 & \text{otherwise} \end{cases} \tag{1}$$

The observed outcome for region i at time t is then

$$Y_{it} = Y_{it}^N + \alpha_{it} D_{it} \tag{2}$$

where $\alpha_{it} = Y_{it}^I - Y_{it}^N$ is the effect of the treatment on region i at time t. We are interested in estimating $\left(\alpha_{1,T_{0+1}}, \ldots, \alpha_{1,T}\right)$. Since we observe Y_{it}^I, in order to estimate α_{it} we just need to estimate Y_{it}^N. Let Y_{it}^N be given by a generalized difference-in-difference (fixed effects) model, where the unobserved individual specific effect is allowed to vary with time

$$Y_{it}^N = \delta_t + \theta_t Z_i + \lambda_t \mu_i + \epsilon_{it} \tag{3}$$

Here, Z_i is a vector of observed covariates (which may contain time varying covariates), μ_i are individual specific unobserved confounders, λ_t is a vector of unobserved common factors and ϵ_{it} are mean 0 shocks. Let $W = \{w_j\}_{j=2}^{J+1}$ be a set of non-negative weights that sum up to one. Each such set of weights represents a particular weighted average of controls i.e., a particular synthetic control. Hence for a given W the outcome for the synthetic control will be

[8] For some recent applications of this methodology see Lee (2011), Montalvo (2011), Pinotti (2012) and Hinrichs (2012).

$$\sum_{j=2}^{J+1} w_j Y_{jt}^N = \delta_t + \theta_t \sum_{j=2}^{J+1} w_j Z_j + \lambda_t \sum_{j=2}^{J+1} w_j \mu_j + \sum_{j=2}^{J+1} w_j \epsilon_{jt} \tag{4}$$

Let there be weights $(w_2^*, \ldots, w_{J+1}^*)$ such that

$$Z_1 = \sum_{j=2}^{J+1} w_j^* Z_j \quad \text{and} \quad Y_{1t} = \sum_{j=2}^{J+1} w_j^* Y_{jt} \quad \forall t \in \{T_{0+1}, \ldots, T\} \tag{5}$$

i.e., (i) the weighted average of the covariates of the controls perfectly replicates the covariates of the treated unit, and (ii) the weighted average of the pre-treatment outcomes of the controls perfectly matches the pre-treatment outcomes of the treated unit. Then, ADH show that if $\sum_{t=1}^{T_0} \lambda_t' \lambda_t$ is non-singular, we have

$$Y_{1t}^N - \sum_{j=2}^{J+1} w_j^* Y_{jt} = \sum_{j=2}^{J+1} w_j^* \sum_{s=1}^{T_0} \lambda_t \left(\sum_{n+1}^{T_0} \lambda_n' \lambda_n \right)^{-1} \lambda_s' \left(\epsilon_{js} - \epsilon_{1s} \right) - \sum_{j=2}^{J+1} w_j^* \left(\epsilon_{jt} - \epsilon_{1t} \right) \tag{6}$$

Further, they show that the mean of the right hand side of equation (6) is close to zero "... if the number of pre-intervention periods is large relative to the scale of the transitory shocks" (pg. 495). We can therefore estimate the impact of the treatment as

$$\hat{\alpha}_{it} = Y_{it} - \sum_{j=2}^{J+1} w_j^* Y_{jt}^N \quad \forall t \in \{T_{0+1}, \ldots, T\} \tag{7}$$

Usually we are unable to get a perfect synthetic control because weights do not exist such that the equations in (5) hold exactly. The weights are then selected such that the equations in (5) hold approximately. Note that by not restricting λ_t to be constant over time, the synthetic control methodology extends the traditional difference-in-difference approach.

In order to implement the synthetic control methodology, let X_1 be the vector of Z_1 and pre-treatment outcomes for the treated state and X_0 be the matrix of Z_j and pre-treatment outcomes for the J control states. The vector of weights W^* is chosen to minimize $(X_1 - X_0 W)' V (X_1 - X_0 W)$ subject to the weights $\{w_j\}_{j=2}^{J+1}$ being non-negative and summing up to 1. The weighting matrix V can be any positive definite matrix but note that the choice of V affects W^*. Following the existing literature, we allow the choice of V to be data driven, by choosing V such that the mean square error of the outcome variable is minimized for the pre-treatment period. All calculations in this paper were performed using the software SYNTH for STATA, developed by ADH.[9]

[9]The software is available for download at http://www.mit.edu/ jhainm/software.htm

Given the small number of control units, asymptotic inferential techniques cannot be applied to comparative case studies. To estimate the "significance" of the results in this study, we conduct placebo tests similar to those in AG and ADH. A placebo test is one where the entire analysis is performed for a control state as if the control state was treated. Since the control state was not treated, we should not expect to find any treatment effect. If the placebo studies using control states iteratively assigned to treatment status create treatment effects of magnitude similar to the ones estimated for the actually treated state, then the conclusion is that the analysis does not provide significant evidence of a treatment effect for the actually treated state.

The primary economic indicator used to measure the effectiveness of the Greyhounds in real per capita net state domestic product (pcNSDP). We further investigate the channels through which the treatment affects pcNSDP using components of pcNSDP such as industrial pcNSDP, manufacturing pcNSDP, registered manufacturing pcNSDP, unregistered manufacturing pcNSDP, services pcNSDP and agricultural pcNSDP. All these outcome measures are measured in 1999 prices.

We use standard predictors of economic growth such as Human Development Index (HDI), population density, road density, percentage of households with access to safe drinking water, per capita electricity consumption, per capita development expenditure and percentage of population below the poverty line. We also use some observed covariates (Z_i) specifically for certain outcomes. For example, for the industrial sector and its various subsectors we use the Labor Reform Index constructed by Besley and Burgess (2004)[10] to proxy the industrial labor relations in the state. Similarly, for the agricultural sector we include variables such as foodgrain yields (to proxy for the extent of the spread of the green revolution) and average rainfall. The X_0 and X_1 matrices consist of a combination of observed covariates (averaged over the entire pre-intervention period) and some pre-treatment values of the outcome of interest.[11] The full list of the variables and details regarding their sources are provided in the appendix.

Finally, the period under consideration in this study is 1970-2000 which gives us 1970-1988 as the pre-treatment period and 1989-2000 as the treatment period. The treated unit is

[10]The states are allowed to amend the central government's Industrial Disputes Act of 1947. So even though all states had the same starting point, currently labor market regulations differ across states. Besley and Burgess (2004) code each state amendment as pro-worker (+1), neutral (0) and pro-employer(-1) and calculate the net direction of change for each year over the period 1947-1997. The index is arrived at by cumulating the scores over time. See Besley and Burgess (2004) for further details.

[11]While the existing literature does not specify a limit on number of pre-intervention covariates to use for matching (personal communication with Alberto Abadie), adding more variables can to lead to the standard problem of dimensionality. Although we have a fairly rich set of covariates, we restrict the total number of variables to eight and use the remaining covariates in other specifications as robustness checks.

Andhra Pradesh, and the potential control units are the other Naxalite affected states: Bihar, Madhya Pradesh, Maharashtra, Karnataka, Orissa, Uttar Pradesh and West Bengal.[12] Although we primarily use the synthetic control methodology, standard difference-in-difference estimations are also provided whenever possible.

5 Results

We begin our analysis with the effects of the creation of the Greyhounds on the pcNSDP of Andhra Pradesh. Figure 1 plots the trajectories of pcNSDP of Andhra Pradesh and a simple average of the pcNSDP of the control states (called Control States) over the period 1970-2000. Recall that the Control States are the other states that are affected by Naxalite violence but which did not set up a similar anti-Naxalite police force. The treatment year is 1989, in which the Greyhounds police force was introduced. Therefore, the pre-treatment period is 1970-1988, and the treatment period is 1989-2000. The equally weighted average pcNSDP for the control states lies above that of Andhra Pradesh for most of the pre-treatment period and well below that of Andhra Pradesh in the treatment period. This divergence in pcNSDP after 1989 however, is not the true treatment effect since before the formation of the Greyhounds force, Andhra Pradesh was a consistent underperformer relative to the rest of the Naxalite affected states. As an equally weighted average of the rest of the Naxalite affected states was significantly different from Andhra Pradesh in the pre-treatment period, using it as a comparison group for Andhra Pradesh would be inappropriate.

The synthetic Andhra Pradesh (i.e., the synthetic control unit) is constructed as a weighted average of the states in the potential control group that most closely resemble Andhra Pradesh in terms of (i) pre-treatment values of pcNSDP and (ii) pre-treatment values of pcNSDP growth predictors. Table 1 compares the pre-treatment characteristics of Andhra Pradesh to those of the synthetic control (appropriately weighted average of controls) and also to the simple average of controls. As can be seen from the table, the synthetic control matches actual Andhra Pradesh in terms of HDI, population density, road density, percentage of urban households with access to safe drinking water and per capita electricity consumption far more closely than the simple average of the control states. Similarly, the synthetic control is fairly close to actual Andhra Pradesh in terms of pre-treatment pcNSDP.

Table 2 shows the weights given to each state in the control group when constructing the synthetic Andhra Pradesh. The optimal weights are positive for Bihar, Karnataka, Madhya

[12]The states of Chhattisgarh, Uttaranchal and Jharkhand were carved out of Madhya Pradesh, Uttar Pradesh and Bihar respectively in Nov. 2000. Our analysis takes into account the undivided states of Madhya Pradesh, Uttar Pradesh and Bihar.

Pradesh and Orissa; and zero for the other states. Of the four states that border Andhra Pradesh (Karnataka, Madhya Pradesh, Orissa, and Maharashtra) three (Karnataka, Madhya Pradesh and Orissa) account for over 80% of the weight. This gives us further confidence in our estimates as these neighboring states are more like Andhra Pradesh in unobserved variables like geography and culture relative to the other controls.

Figure 2 plots the trajectory of pcNSDP of Andhra Pradesh and the synthetic control for the period 1970-2000. In the pre-treatment period 1970-1988, the pcNSDP of the synthetic control behaves very similarly to that of Andhra Pradesh till 1987. In the treatment period, the pcNSDP of the synthetic control diverges sharply from that of Andhra Pradesh, with the gap increasing rapidly over time.

What does this divergence mean for the actual and potential evolution of pcNSDP for Andhra Pradesh? Recall that the evolution of pcNSDP for the synthetic control is what the evolution of pcNSDP would have been for Andhra Pradesh if it had not raised the Greyhounds force. Hence, the gap between Andhra Pradesh and its synthetic control is an estimate of the treatment effect. The main implication of Figure 2 is that the establishment of the Greyhounds force paid immediate and rich dividends to Andhra Pradesh in terms of raising its pcNSDP to levels higher than could have been achieved in the absence of the dedicated anti-Naxalite force. The pcNSDP "dividend" seems to be increasing steadily from year to year all the way till the end of the study period. Lastly note that the divergence starts a year before in 1988, possibly indicating an announcement effect discussed in section 3.1.

We can quantify the gain in pcNSDP for Andhra Pradesh in two ways: (1) percentage average gain, and (2) average percentage gain. The former is the average yearly gap between pcNSDP of Andhra Pradesh and that of the synthetic control expressed as a percentage of the average yearly pcNSDP of Andhra Pradesh over the treatment period i.e. 1989-2000. The latter is the average of the yearly percentage gap between pcNSDP of Andhra Pradesh and that of the synthetic control over the treatment period. The average yearly gap between pcNSDP of Andhra Pradesh and that of the synthetic control was Rs.2,065.2 and the average yearly pcNSDP of Andhra Pradesh was Rs.12,820 during the treatment period. Andhra Pradesh consequently experienced a percentage average gain of 16.11% of its pcNSDP during this period.[13] The maximum gain observed was Rs.4,133.7 at the end of the treatment period.[14] The Greyhounds force has therefore had a large positive impact on the pcNSDP of Andhra Pradesh.

[13]The average percentage gain during this period was 15.37%.

[14]Yearly gains are available on request.

Next, the significance of our results is assessed by conducting a series of placebo tests that involve iteratively applying the synthetic control method to each of the seven control states. Figure 3 shows pcNSDP gap in Andhra Pradesh and the placebo gaps for all the control states. The estimated pcNSDP gap between each control state and its synthetic counterpart is represented by the grey lines. The black line represents the estimated pcNSDP gap between the Andhra Pradesh and its synthetic counterpart. It is clear from Figure 3 that the estimated pcNSDP gap for Andhra Pradesh States is large (positive) in comparison to the distribution of pcNSDP gaps for the control states, with the exception of one control state i.e. Maharashtra.

From Figure 3, it is clear that the synthetic control method provides a good fit for pcNSDP both in Andhra Pradesh and in control states prior to the treatment period, with the exception of Maharashtra. The pre-treatment root mean squared prediction error (RMSPE)[15] for Andhra Pradesh is just 273.48, while the median pre-treatment RMSPE for control states in the placebo runs is just 377.97, indicating relatively good pre-treatment fits. The pre-treatment RMSPE for the Maharashtra placebo run is largest at 1910.02, while that for Bihar is also relatively large at 1616.18.

The poor pre-treatment fits in the placebo runs for Maharashtra and Bihar cast doubt on the reliability of the post-treatment fits for Maharashtra and Bihar. Therefore, we also show Figure 4, where we drop placebo runs for states that give pre-treatment RMSPEs that are at least two times higher than the pre-treatment RMSPE for Andhra Pradesh i.e., we drop the placebo runs for Bihar and Maharashtra. The pcNSDP gap for Andhra Pradesh is now the largest (positive) of all the pcNSDP gaps.

Dropping controls with a poor pre-treatment fit involves some amount of subjectivity. We can also check the significance of the estimated treatment effect for Andhra Pradesh by comparing the post-treatment RMSPE to pre-treatment RMSPE ratios. Since controls with a poor pre-treatment fit are weighted down one no longer needs to drop them. Figure 5 shows that the ratio for Andhra Pradesh is clearly different from that of the controls.

Next, we assess the robustness of our results in two ways. Firstly, we test the sensitivity of the baseline model to the states in the control pool. For this purpose we iteratively drop one of the controls that receive positive weight in the base specification and re-estimate the baseline model.[16] The results of these iterations are shown in figure 6. The upper panel of

[15]The pre-treatment RMSPE is a measure of the lack of fit between Andhra Pradesh and its synthetic control and defined as: $\sqrt{\frac{1}{T_0}\sum_{t=1}^{T_0}\left(Y_{1t}-\sum_{j=2}^{J+1}w_j^*Y_{jt}\right)^2}$. The post-treatment RSMPE and the RMSPE for other states is similarly defined.

[16]Dropping states that receive zero weight does not change the results of the baseline model.

figure 6 depicts figure 2 superimposed with the synthetic controls estimated by iteratively leaving out one of the controls (dashed grey lines). The lower panel of figure 6 shows the difference in the estimated pcNSDP gap when using all the controls (solid black line) and leaving out one of the controls (dashed grey lines). Even though the pool of the control states is relatively small, figure 6 shows that the results are fairly robust to the exclusion of any given control state.

Secondly, we check the sensitivity of the results by using different combinations of predictors of pcNSDP when constructing the synthetic control. We find that instead of percentage of urban households with access to safe drinking water, our results remained robust to the use of other variables such as the percentage of rural population below the poverty line, per capita credit utilization, log per capita development expenditure, foodgrain yields, percentage of net sown area irrigated. Similarly, the results are robust to using adult literacy rate or life expectancy at birth instead of HDI or using percentage of villages electrified instead of per capita electricity consumption.

As mentioned earlier, the synthetic control methodology weakens the assumptions of the usual difference-in-difference estimator. As an additional robustness check, we present the estimated effect of the Greyhounds at the state level using the standard difference-in-difference methodology in table 3. Since all covariates are not available for the entire period we run two regressions: one for 1970-2000 (column 2) and the other for 1970-1997 (column 3). In column 2, in addition to controlling for state effects, year effects and state specific time trends, we also control for per capita electricity consumption. To this specification, in column 3 we add other covariates such as per capita development expenditure and the Besley and Burgess Labor Reform Index (to proxy the industrial labor relations in the state). However, since these data are only available till 1997 we lose the last three years of our treatment period.[17] As the results in table 3 show, the estimated effects of the Greyhounds is significant for both specifications. Further, we find that the treatment effect estimated by using the synthetic control methodology and the difference-in-difference methodology are quite similar: using the synthetic control methodology we find that the estimated treatment effect is Rs.2,065.2 over 1970-2000 and Rs.1686.9 over 1970-1997 while using the difference-in-difference methodology it is Rs.1251.9 and Rs.2029.6, respectively.

[17]In all the regressions reported in table 3 we can reject the null hypothesis that the state specific time trend is the same across all the states at the 1 percent level.

5.1 Industrial Sector

We begin our analysis of the channels through which the Greyhounds affected the economy by looking at the industrial sector. The industrial sector consists of mining, manufacturing, construction, gas, electricity and water supply. Within the industrial sector we also analyze the effects on the manufacturing sector and a further breakup of the manufacturing sector into registered and unregistered manufacturing.[18]

Figure 7(a) displays the trends in industrial outputs of Andhra Pradesh and the synthetic control. The synthetic Andhra Pradesh almost perfectly replicates the per capita industrial NSDP of Andhra Pradesh over the entire pre-treatment period, followed by an immediate divergence after the introduction of the Greyhounds. This marked divergence between Andhra Pradesh and its synthetic counterpart indicates a clear positive effect of the Greyhounds on the industrial output of Andhra Pradesh. This gap translates into an average of Rs. 437.95 over the period 1989-2000 or 16.41% of the average (observed) industrial output of Andhra Pradesh during this period.[19]

Similar effects are observed in the manufacturing sector. Figures 7(b)-7(d) present the effects of the Greyhounds on the manufacturing, registered manufacturing and unregistered manufacturing, respectively. Once again, for the manufacturing sector and the registered manufacturing sector the synthetic control closely replicates the observed output for Andhra Pradesh over the pre-treatment period. Unsurprisingly, the real output of the unregistered manufacturing sector fluctuates a lot given that it largely consists of small firms with little fixed capital investment. Still the synthetic control tracks the per capita unregistered manufacturing NSDP of Andhra Pradesh fairly well in the pre-treatment periods.

After the introduction of Greyhounds in 1989, the difference in the output of Andhra Pradesh and the respective synthetic controls in figures 7(b)-7(d) provide an estimate of the treatment effects. The average gaps (percentage average gaps) for the manufacturing, registered manufacturing and unregistered manufacturing sectors are Rs. 377.52 (25.73%), Rs. 202.89 (20.24%) and 112.91 (24.14%),respectively.[20]

The similarity of the synthetic control to Andhra Pradesh in terms of the pre-treatment characteristics is shown in table 5. The synthetic control is constructed by matching on variables such as HDI, population density, percentage of households with access to safe

[18]In India registered manufacturing sector consists of all manufacturing firms that employ more than 20 workers without using electricity or more than 10 workers and using electricity.

[19]The average per capita industrial NSDP of Andhra Pradesh is Rs. 2668.74 during 1989-2000. The average percentage gap over this period is 15.66%.

[20]The average percentage gaps for the manufacturing, registered manufacturing and unregistered manufacturing sectors are 24.80%, 19.87% and 22.63%, respectively.

drinking water, log per capita development expenditure, the Labor Reform Index constructed by Besley and Burgess (2004) and pre-treatment values of output. As comparisons with the simple average of the control units in table 5 indicate, the synthetic control approximates Andhra Pradesh far more closely.

The weights assigned to the various controls in constructing the synthetic control are shown in table 4. We infer the significance of the results by doing placebo tests as discussed earlier. These are shown in figures 8 - 11. The significance of the results can also be checked by comparing the ratio of post-treatment MSPE to the pre-treatment MSPE for Andhra Pradesh to those for the placebos as shown in figure 12.

As before, we assess the robustness of our results by using different combinations of predictors of industrial output (and its components) when constructing the synthetic control. The results are robust to the use of adult literacy rate or life expectancy at birth instead of HDI. Instead of using the Besley and Burgess Labor Reform Index the results remain robust to the usage of other variables that capture the industrial relations environment in the state such as the number of mandays lost due to industrial disputes and the membership of labor unions that submit returns in the state. Similarly, instead of log per capita development expenditure, using other predictors of industrial activity such as the per capita consumption of industrial electricity, the percentage of population below the poverty line, road density or per capita credit utilization does not affect the significance of the results. Sensitivity of the results to the composition of the control pool is assessed by iteratively leaving out one of the controls that is assigned positive weight and re-estimating the baseline model. The results of this test are shown in figures 13 and 14.

Once again, as a further robustness check for the results, we present the estimates of the effect of the Greyhounds using the standard difference-in-difference methodology. Table 6 shows the estimated effects of the Greyhounds on industrial performance. In addition to controlling for the per capita consumption of industrial electricity, we also control for state effects, year effects and state specific time trends.[21] The effect of the Greyhounds is significant for the industrial sector and its components (manufacturing, registered manufacturing and unregistered manufacturing). Additionally, we can also control for other covariates of industrial production such as the Besley and Burgess Labor Reform Index and log per capita development expenditure. However, as mentioned earlier, as these data are only available till 1997 we lose the last three years of our treatment period. The results of adding more observed predictors are presented in table 7. Once again, the effect of Greyhounds is consis-

[21] In all the regressions reported in tables 6 - 7 we can reject the null hypothesis that the state specific time trend is the same across all the states at the 1 percent level.

tently significant on all measures of industrial performance. Our confidence in the estimated treatment effect if further boosted by comparing the results of the synthetic control and difference-in-difference methodologies. As the comparisons presented in table 8 show, the results using the two methodologies are quite similar.

Some disaggregated evidence

We can explore the effects of the Greyhounds on the industrial sector at a more disaggregated level. For this purpose we use the Aghion et al. (2008) state-industry panel data on the registered manufacturing sector collected under the Annual Survey of Industries. The period under consideration in 1980-1997 (nine years pre- and post-treatment) and industrial variables are measured at the two-digit level.[22] We estimate the following regression:

$$y_{ist} = \alpha_{is} + \beta(Grey_{st}) + \theta(X_{ist}) + \delta_{it} + \epsilon_{ist} \tag{8}$$

where y_{ist} is the outcome variable, $Grey_{st}$ is a dummy variable that takes the value of unity from 1989 onwards if the state is Andhra Pradesh, X_{ist} are observed covariates, α_{is} are state-industry interactions to control for unobserved time-invariant factors such as location, natural resources etc., δ_{it} are industry-year interactions that control for unobserved industry-year effects such as technological innovations. The outcome variables considered are logarithms of real output, real physical capital, and number of factories.

Industrial licensing was implemented by the central government in order to regulate the manufacturing sector. This policy was gradually reversed during the 1980s and 1990s. The variable delicensing reform indicates the fraction of existing three-digit industries within a two-digit industry that were delisenced. Another key deregulation policy was the removal of restrictions on foreign direct investment (FDI). The variable FDI reform measures the fraction of existing three-digit industries within a two-digit industry that had any product opened for automatic approval of FDI (up to 51%). Further following Aghion et al. (2008), we interact the state-level measure of labor regulation with the two deregulation measures (delicensing and FDI reform) to capture the differential effects of these policies across states. In addition to this, we also include other covariates such as log per capita development expenditure and the proportion of seats help by various political groups in the state legislature. Further details of these data are provided in appendix A.

The results of these regressions are in table 9. As the results clearly indicate, after controlling for a variety of covariates, the introduction of Greyhounds led to a significant

[22]The sampling unit in Aghion et al. (2008) is a state and three-digit industry pair. There are on average 64 three-digit industries in each state leading to a considerable amount of heterogeneity in the data. For this paper we aggregate the Aghion et al. (2008) data to the two-digit industry level.

increase in industrial activity in Andhra Pradesh relative to other Naxalite affected states.[23] Though the effects are slightly weak for fixed capital, they are particularly strong for the number of factories and output. Other results broadly confirm to the existing literature. Industrial performance improved following FDI reform, industries in relatively more pro-employer states benefited more from industrial deregulation (delicensing and FDI) while states with greater representation of Left-wing parties restricted the performance of the registered manufacturing sector.

5.2 Services Sector

We now look at the effect of Greyhounds on the services sector of Andhra Pradesh. Figure 15 shows the trajectory of per capita services output for Andhra Pradesh and the synthetic control. The synthetic control closely tracks the actual Andhra Pradesh from 1970 to 1987 after which there is a divergence that gradually increases over time. This gap in pc Services NSDP peaks in 2000 and is approximately equal to Rs. 1,310.7. The average yearly gap between Andhra Pradesh and the synthetic control in the treatment years is Rs. 652.80. As the average per capita services output in Andhra Pradesh over this period is Rs. 5,784.81 this gap translates into a percentage average gap of 11.29%.[24]

Tables 10 and 11 show the pre-treatment predictors of services NSDP and the resulting weights assigned to the controls. The treated and the controls are matched on observed covariates such as HDI, population density, road density, per capita electricity consumption, percentage of households with access to safe drinking water and log per capita development expenditure. Madhya Pradesh, Uttar Pradesh and Karnataka get assigned about a third of the weight each in constructing the synthetic control while the rest of the controls get zero weights.

Significance of the estimated treatment effect is again determined through placebo tests. The upper panel in figure 16 shows the estimated gaps in pc services NSDP for Andhra Pradesh and all the controls. Once again, Maharashtra has a poor fit before treatment. The lower panel in figure 16 shows the estimated gaps once we drop the controls that have an MSPE three times greater than that of Andhra Pradesh in the pre-treatment period. Alternatively, the significance of the result can be seen by comparing the ratios of post-treatment MSPE to pre-treatment MSPE in figure 17. Both tests indicate a significant effect of Greyhounds on the services sector of Andhra Pradesh.

[23] Similar results are found for a specification that includes year dummies instead of industry-year dummies.
[24] The average percentage gap is 10.74%.

Robustness of the results is further confirmed by (1) using other predictors of pc Services NSDP such as adult literacy rate or life expectancy at birth instead of HDI or the percentage of total population below the poverty line and per capita credit utilized instead of log of per capita development expenditure; and (2) iteratively dropping one of the controls that is assigned positive weight and re-estimating the baseline model (figure 18).

5.3 Agricultural Sector

Lastly, we look at the effect of the Greyhounds on the agricultural sector. The effect on per capita agricultural NSDP is not significant. Figure 19 shows the trends in per capita agricultural NSDP between Andhra Pradesh and its synthetic control. As the trajectory of pc agricultural NSDP indicates, the agricultural sector in India is still heavily dependent on rainfall. For example, the sharp dip in agricultural output in 1997 was caused due to El Niño Southern Oscillation related events. Still, the synthetic control does a fairly good job in tracking the treated unit till 1991 after which there is a steady divergence leading to a percentage average gain of 10.99% of its per capita agricultural NSDP.[25] Once again tables 12 and 13 show the pre-treatment predictors of agricultural NSDP and the resulting weights assigned to the controls. Apart from HDI and population density, other predictors of agricultual output used are percentage of rural population under the poverty line, standard deviation of average monthly rainfall and foodgrain yields (to proxy for the extent of the spread of the green revolution). Madhya Pradesh and Karnataka receive bulk of the weight in the construction of the synthetic control while the remaining weight is assigned to Bihar and Maharashtra.

The effect, however, is not significant as it fails the placebo tests. As figure 20 shows, the effect on the agricultural sector of Andhra Pradesh is indistinguishable from the effects on the control states. Similarly, comparing the ratio of post-treatment MSPE to the pre-treatment MSPE of Andhra Pradesh and the placebos indicates the insignificance of the result (figure 21). Figure 22 shows that this result is fairly insensitive to the composition of the control pool.

6 Discussion

Implicit in the calculation of the economic costs of Naxalite violence is the assumption of no spillover between units i.e., outcomes of control units are not affected by the treatment

[25] The gap reaches a maximum of Rs. 1269.23 in 2000 and the average percentage gap over the treatment period is 10.45%.

administered to the treated unit. This assumption may be violated in the following three ways in the present context. Firstly, there may be a spillover through the security forces. For example, the Greyhounds could offer support to the police forces of other states in the form of training, joint operations, material supply, deputing officers to other state police forces etc., to tackle the Naxalite insurgency. To the extent that the Greyhounds offered such support, the effect of the Greyhounds on pcNSDP would not have been confined to Andhra Pradesh, but would have extended to all other states whose police forces were supported by the Greyhounds. This would have artificially raised the output of the other Naxalite affected states and thus biased the estimate of the treatment effect downwards. As the Greyhounds started offering training to the police forces of other Naxalite affected states from 2000 onwards,[26] we terminate the analysis at the year 2000 to avoid this source of bias.

Secondly, anti-Naxalite operations by the Greyhounds in Andhra Pradesh could result in the movement of Naxalites from Andhra Pradesh to the surrounding Naxalite affected states, where the absence of specially trained and equipped security forces would have meant a less threatening security environment for Naxalites. An example of such an instance occurred in 2007 when Naxalites from North Telangana and Nallamala regions in Andhra Pradesh state retreated to Dantewada district (in Chattisgarh state) in response to the increased tempo of Greyhounds operations in Andhra Pradesh (Tata, 2010). Although this incident occurred after the study period ended, such instances may have occurred during the study period as well. To the extent that such displaced Naxalites indulged in insurgency activity in their temporary refuge across state borders, the per capita output of the other Naxalite affected states would have decreased (the decrease being a direct consequence of the activities of the Greyhounds force in Andhra Pradesh). This would result in an over estimate of the Greyhounds treatment effect. Unfortunately, there is no publicly available data to check the extent of such bias in the calculated treatment effect. In this case, the calculated treatment effect must therefore be interpreted as an upper bound on the true treatment effect.

Finally, spillover between the units may also happen through the migration of civilians from other Naxalite affected states to Andhra Pradesh. This migration may be selective in the sense that the civilians most likely to have the resources to migrate are more productive on average. This could then raise the per capita output in Andhra Pradesh and lower it other Naxalite affected states again leading to an upward bias in the estimated treatment effect. However, we find that migration in India is low and is mostly intra-state in nature. Lusome and Bhagat (2006) using Indian census data report that approximately 80% of the internal migration in India is in the form of intra-district and inter-district (but within the same

[26]This information is available on the Greyhounds webpage at www.apstatepolice.org

state) migration over the period 1971-2001. Further, in 2001 only 33.7% of the inter-state migration is for employment or business purposes.

7 Conclusion

Currently in its fifth decade, the Naxalite movement has largely escaped the attention of both policy makers and academics. We exploit an explicit change in the government's counterinsurgecy policy to estimate the economic benefits associated with a security based response. We find that the introduction of the Greyhounds results in large significant gains in pcNSDP for Andhra Pradesh. Additionally, we find that these gains come through the non-agricultural sector (industry, manufacturing, services) rather than the agricultural sector. Based on anecdotal evidence there have been numerous calls on other affected states to follow the "Andhra Pradesh model". The rigorous evaluation of the Greyhounds presented in this paper should help inform policy makers.

Since the synthetic control methodology is a case-study approach, we would like to stress that the findings do not imply that other Naxalite affected states raising security forces similar to the Greyhounds would experience effects of similar magnitude. Neither does it imply that a security response is more effective in terms of raising pcNSDP compared to non-security based responses. It is possible that a "carrot" counterinsurgency policy could have a similar effect.

The field of the microeconomic effects of counterinsurgency policies remains largely underexplored. As more data becomes available, future line of work could measure the effects of Naxalite insurgency and the state's counterinsurgency response at a more disaggregated level. The dynamics between insurgency, counterinsurgency and economic outcomes are only starting to be understood and though, this research is based on an example from India, we believe it sheds significant light on this issue.

References

[1] Abadie, A. and Gardeazabal, J., (2003), "The Economic Costs of Conflict: A case Study of the Basque Country", *American Economic Review*, 93(1), 113-132.

[2] Abadie, A., Diamond, A., and Hainmueller, J., (2010), "Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program", *Journal of the American Statistical Association*, 105(490), 493-505.

[3] Achuthan, J. K., (2010), "Tackling Maoists: The Andhra Paradigm", *Indian Defence Review*, 25(2).

[4] Aghion, P., Burgess R., Redding, S. J., and Zilibotti, F., (2008), "The Unequal Effects of Liberalization: Evidence from Dismantling the License Raj in India", *American Economic Review*, 98(4), 1397-1412.

[5] Balagopal, K., (1988), "Herald the Hunting Dogs that are Grey in Colour", *Economic and Political Weekly*, Vol. 23, No. 28, 1413-1414.

[6] Beath, A., Christia, F., and Enikolopov, R., (2011), "Winning Hearts and Minds through Development: Evidence from a Field Experiment in Afghanistan", MIT Political Science Department Research Paper No. 2011-14.

[7] Becker, G. S., (1968), "Crime and Punishment: An Economic Approach", *Journal of Political Economy*, 76(2), 169-217.

[8] Berman, E., Callen, M., Shapiro, J. N., and Felter, J. H., (2011), "Do Working Men Rebel? Insurgency and Unemployment in Afghanistan, Iraq, and the Philippines", *Journal of Conflict Resolution*, 55(4), 496-528.

[9] Berman, E., Shapiro, J. N., and Felter, J. H., (2011), "Can Hearts and Minds Be Bought? The Economics of Counterinsurgency in Iraq", *Journal of Political Economy*, 119(4), 766-819.

[10] Besely, T. and Burgess, R. (2004), "Can Labor Regulation Hinder Economic Performance? Evidence from India", *Quarterly Journal of Economics*, 19(1), 91-134.

[11] Borooah, V. K. (2008), "Deprivation, Violence, and Conflict: An Analysis of Naxalite Activity in the Districts of India", *International Journal of Conflict and Violence*, 2(2), 317-333.

[12] Chadha, V. (2005). *Low intensity conflicts in India: an analysis*. New Delhi: Sage Publications.

[13] Chaney, E. (2008), "Assessing Pacification Policy in Iraq: Evidence from Iraqi Financial Markets", *Journal of Comparative Economics*, 36(1), 116.

[14] Crost, B., and Johnston, P. B., (2010), "Aid Under Fire: Development Projects and Civil Confict", Working Paper.

[15] Eynde, O. V., (2011), "Targets of Violence: Evidence from India's Naxalite Conflict", Working Paper.

[16] Ganguly, S., and Fidler, D. P. (*eds.*) (2009). *India and counterinsurgency: lessons learned*. London: Routledge.

[17] Gawande, K., Kapur, D. and Satyanath, S. (2012), "Natural Resource Shocks and Conflict in India's Red Belt", Working Paper.

[18] Greenstone, M., (2007), "Is the "Surge" Working? Some New Facts", NBER Working Paper 13458.

[19] Government of India (2005), Ministry of Home Affairs Annual Report 2004-05.

[20] Government of India (2006), Ministry of Home Affairs Annual Report 2005-06.

[21] Gupta, D. K. (2007), "The Naxalites and the Maoist Movement in India: Birth, Demise, and Reincarnation", *Democracy and Security*, 3, 157-188.

[22] Hindustan Times (2009), "Rajdhani held hostage in Naxal land; secured after five hours", retrieved from http://www.hindustantimes.com/Rajdhani-held-hostage-in-Naxal-land-secured-after-five-hours/Article1-469941.aspx as on June 14, 2011.

[23] Hinrichs, P. (2012), "The Effects of Affirmative Action Bans on College Enrollment, Educational Attainment, and the Demographic Composition of Universities", *Review of Economics and Statistics*, 94(3), 712-722.

[24] Hoelscher, K., Miklian, J., and Vadlamannati, K.C., (2011), "Hearts and Mines: A District-Level Analysis of the Maoist Conflict in India", Working Paper.

[25] Imbens, G. W., and Wooldridge, J. M., (2009), "Recent Developments in the Econometrics of Program Evaluation", *Journal of Economic Literature*, 47(1), 5-86.

[26] Iyengar, R., Monten, J., and Hanson, M., (2011), "Building Peace: The Impact of Aid on the Labor Market for Insurgents", NBER Working Paper Series No. 17297.

[27] Joshi, S. (2010), "How Naxal Violence hits India Inc. Hard", IBN Live News Report available at http://ibnlive.in.com/news/how-naxal-violence-hits-india-inc-hard/112950-7.html?from=tn as on June 14, 2011.

[28] Kapstein, E. B., (2012), "Measuring Progress in Modern Warfare", *Survival: Global Politics and Strategy*, 54(1), 137-158.

[29] Kocher, M. A., Pepinsky, T. and Kalyvas, S., (2011), "Aerial Bombing and Counterinsurgency in Vietnam War", *American Journal of Political Science*, 55(2), 201-218.

[30] Kujur, R. (2008) "The Naxal Movement in India: A Profile", Institute of Peace and Conflict Studies Research Papers.

[31] Lee, W. (2011) "Comparative case studies of the effects of inflation targeting in emerging economies", *Oxford Economic Papers*, 63(2), 375-397.

[32] Lusome, R., and Bhagat, R. B., (2006), "Trends and Patterns of Internal Migration in India, 1971-2001", Working Paper.

[33] Lyall, J., (2009), "Does Indiscriminate Violence Incite Insurgent Attacks? Evidence from Chechnya", *Journal of Conflict Resolution*, 53(3), 331-362.

[34] Mukherjee, A. (2010) "India's experience with insurgency and counterinsurgency", in S. Ganguly, A. Scobell and J. C. Liow (eds.), *The Routledge Handbook of Asian Security Studies*, London: Routledge, 139-157.

[35] Montalvo, J. G., (2011) "Voting after the Bombings: A Natural Experiment on the Effect of Terrorist Attacks on Democratic Elections", *Review of Economics and Statistics*, 93(4), 1146-1154.

[36] Naxal Terror Watch (2010), blog available at http://naxalwatch.blogspot.com/ as on June 14, 2011.

[37] Oetken, J. L. (2009), "Counterinsurgency against the Naxalites", in S. Ganguly and D. P. Fidler (eds.), *India and counterinsurgency: lessons learned*, London: Routledge, 127-151.

[38] Pinotti, P. (2012), "The Economic Consequences of Organized Crime: Evidence from Southern Italy", Working Paper.

[39] Planning Commission, Government of India, "Tenth Five-Year Plan: 2002-07, Vol. III, State Plans, Trends, Concerns and Strategies".

[40] Priyadershi, V. (2009), "Fighting Left-Wing-Extremism through Special Task Forces", Centre for Land Warfare Studies, Article 1362.

[41] Rajagopalan, R. (2008), *Fighting like a Guerrilla: The Indian Army and Counterinsurgency*. New Delhi: Routledge.

[42] Raju, R. V. (2010), "Countering the Naxal Threat - I: An Analysis of Earlier Efforts", Institute of Peace and Conflict Studies, Article 3149.

[43] Ramana, P.V. (2009), "A Critical Evaluation of the Union Governments Response to the Maoist Challenge", *Strategic Analysis*, 33(5), 745-759.

[44] Sahni, A., (2007), "Andhra Pradesh: The State Advances, the Maoists Retreat", *South Asia Intelligence Review Weekly Assessments & Briefings*, 6(10), available at http://www.satp.org/satporgtp/sair/Archives/6_10.htm .

[45] Sahni, A., (2008), "Fighting the Maoists with *Mantras*", *South Asia Intelligence Review Weekly Assessments & Briefings*, 7(2), available at http://www.satp.org/satporgtp/sair/Archives/7_2.htm .

[46] Shatrugna, M. (1989), "NTR and the Naxalites", *Economic and Political Weekly*, Vol.24, No.28, p. 1570.

[47] Singh, A. K. and Diwan, S. B. (2010), "Red Money", *South Asia Intelligence Review Weekly Assessments & Briefings*, 8(39), available at http://www.satp.org/satporgtp/sair/Archives/sair8/8_39.htm .

[48] Solberg, K. E. (2008), "Health Crisis Amid the Maoist Insurgency in India", *The Lancet*, 371(9621), 1323-1324.

[49] Swami, P. (2010, April 13), "For a review of counter-insurgency doctrine", *The Hindu*. Retrieved May 7, 2012, from http://beta.thehindu.com/opinion/lead/article395529.ece.

[50] Tata, M. (2010, April 19), "Lessons from Andhra", *Outlook India*. Retrieved May 7, 2012, from http://www.outlookindia.com/article.aspx?265014.

[51] Tiwari, A. (2009, February 7), "Naxal-hit states to form Greyhound-like force", *The Times of India*. Retrieved May 7, 2012, from http://articles.timesofindia.indiatimes.com/2009-02-07/india.

[52] U.S. Army (2007), *The U.S. Army/Marine Corps Counterinsurgency Field Manual* (Field Manual No. 3-24), University of Chicago Press.

[53] Zussman, A. and Zussman, N. (2006), "Assassinations: Evaluating the Effectiveness of an Israeli Counterterrorism Policy Using Stock Market Data", *The Journal of Economic Perspectives*, 20(2), 193-206.

Appendix A: Data Description

Data on pcNSDP (and its various components) at current prices were downloaded from EPWRFITS,[27] based on data from the Central Statistical Office of the Ministry of Statistics and Programme Implementation, Government of India. The data were available in four separate series, each corresponding to a different base year i.e. 1970-71, 1980-81, 1993-94, and 1999-00. The data was first deflated using the Nationmaster[28] GDP deflator series for India using 1999 as the base year, thus converting the data into pcNSDP at constant 1999 prices, although corresponding to different base years. The pcNSDP data for each base year series were calculated using slightly different methodologies, thus rendering them non-comparable across base years unless suitably linked. The Directorates of Economics and Statistics of the respective state governments are responsible for transforming back series of pcNSDP data so that they are compatible with the latest base year series. However, in the absence of data from the Directorates, we were compelled to link the various base year series using the following ad hoc method.

Data on overlapping years for the different base year series were used to link the series, using different "linking coefficients" for each state. For example, if data on a number of years for a state was available for both the 1993-94 series and the 1999-00 series, then the linking coefficient for that state was calculated as the ratio of the average value of pcNSDP at constant 1999 prices for that state for the overlapping years in the 1999-00 series to that of the 1993-94 series. Then, data for the 1993-94 series was converted into data for the 1999-00 series by multiplying all observations for that state for the 1993-94 series by the linking coefficient. This procedure was performed for each state, thus converting all 1993-94 series data into 1999-00 data. A similar procedure was then performed for each state in order to convert 1980-81 series data into 1999-00 data by linking with the converted 1993-94 series. In this manner, all data were suitably linked so that they were expressed in terms of their 1999-00 equivalents both for deflation as well as for linking purposes.

The following varibales were used as predictors of pcNSDP and its various components.

Demographic- Population density in 1971 and 1981 was obtained from the Census of India 1991. The 1981 values of the Human Development Index (HDI) were obtained from the third volume of the 10th Five-Year Plan, published by the Planning Commission, Government of India.[29] Data on the percentage of rural/urban/total population under the poverty line in

[27]Economic and Political Weekly Research Foundation India Time Series (EPWRFITS) is an online statistical information portal aimed at aiding and promoting research on Indian economy. It is partly funded by the University Grants Commission and is available at http://www.epwrfits.in

[28]Nationmaster is a statistics information portal, available at www.nationmaster.com

[29]Planning Commission hereafter.

1973, 1977 and 1983 were also obtained from the Planning Commission. Adult literacy rate (literacy of population aged 15 and over) for the years 1971 and 1981 was obtained from the Ministry of Human Resource Development. Life expectancy at birth over five year spans 1971-75, 1976-80, 1981-85 and 1986-90 are based on data collected by the Ministry of Rural Development and were obtained from INDIASTAT.[30]

Infrastructure- Road density, measured in kilometers of road per 1000 square kilometers of area, in 1971 and 1981 was obtained from the Planning Commission. Similarly, the percentage of urban/rural/total households with access to safe drinking water in 1981 was obtained from the Planning Commission. Yearly data on per capita total/industrial/agricultural electricity consumption (measured in kilowatt hours) and the percentage of villages electrified for the period 1970-2000, based on various publications of the Central Electricity Authority, were obtained from EPWRFITS.

Credit- The yearly amount of credit utilized and sanctioned for the period 1972-1988 were published in various reports of the Reserve Bank of India (RBI). These were then deflated and converted to per capita terms.

Other variables- The data on total area under irrigation, net area sown and foodgrain yields (kilograms per hectare) in 1970 and 1980 were obtained from the website of the Central Statistical Office of the Ministry of Statistics and Programme Implementation, Government of India. From the EOPP data[31] we obtained the following variables - Labor Reform Index constructed by Besley and Burgess (2004); the number of mandays lost due to industrial disputes; the membership of labor unions submitting returns, log per capita development expenditure and average monthly rainfall.

For the industry level regressions reported in section 5.1 we use the data set constructed by Aghion et al. (2008). The data from the Annual Survey of Industries is used to construct a state-industry panel on the registered manufacturing sector for the period 1980-1997. Industries are observed at the three-digit level and they only consider industries that are in the data for at least ten years and active in at least five of the 16 major states over this period. This was then combined with their measures of delicense and FDI reform. For the purpose of this paper we aggregate their data to the two-digit industry level. Political parties are grouped into the following categories and expressed as a share of the total number of seats in the state legislature: Congress parties (Indian National Congress,Indian National Congress Urs, Indian National Congress Socialist); Janta parties (Janata Dal, Janta Party, Lok Pal); Left parties (Communist Party of India, Communist Party of India Marxist);

[30]INDIASTAT is another online statistical information portal, available at http://www.indiastat.com.

[31]These data and further details are available at the EOPP website http://sticerd.lse.ac.uk/eopp/

Hindu party (Bharatiya Janata Party); Regional parties (Telugu Desam Party, Shiv Sena, Utkal Congress, Progressive Democratic Front). All the other parties and independents form the base category. Further details are available in Aghion et al. (2008).

Figures and Tables

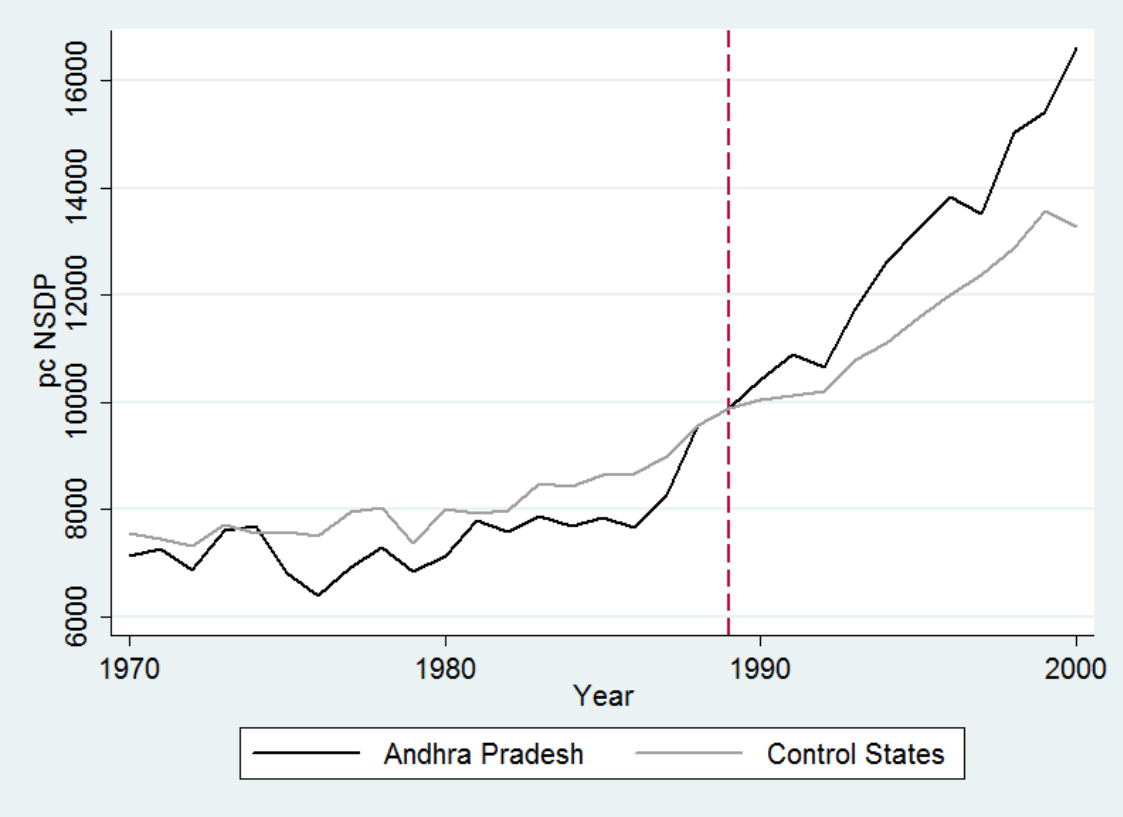


Figure 1: Trends in pcNSDP: Andhra Pradesh vs. Control States

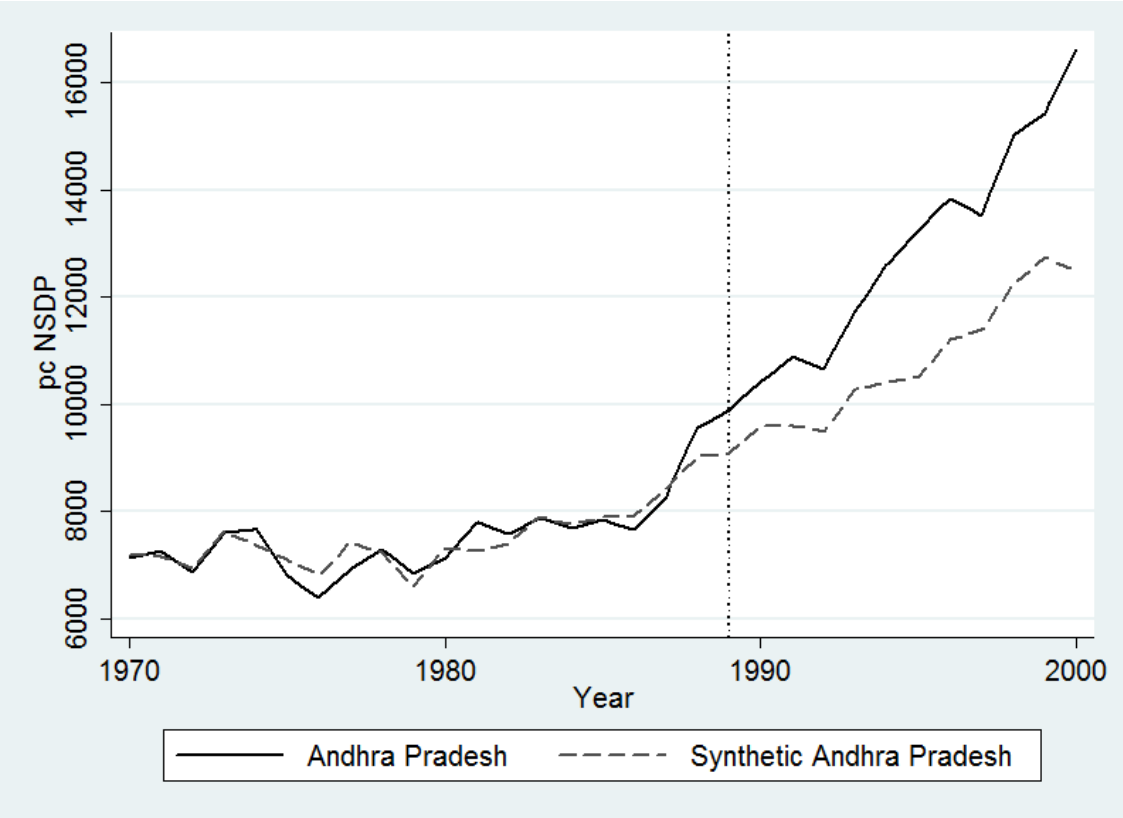


Figure 2: Trends in pc NSDP: Andhra Pradesh vs. Synthetic Control

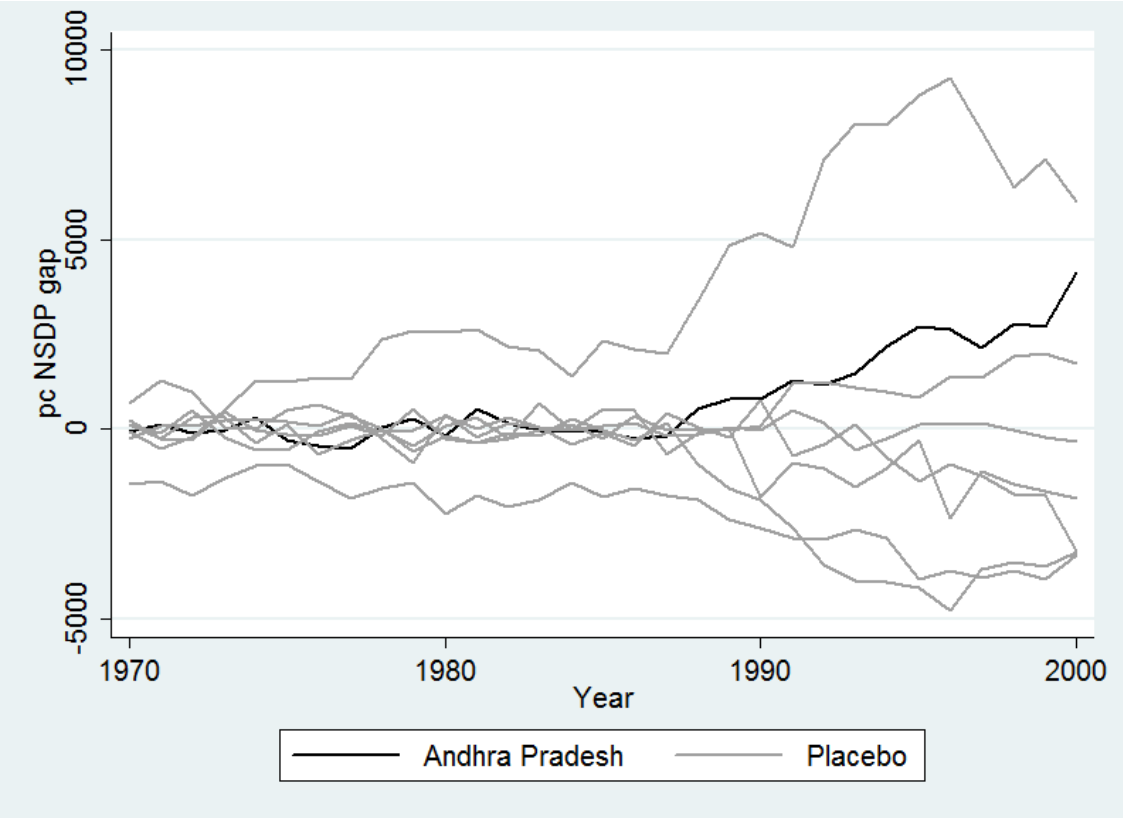


Figure 3: pc NSDP Gap in Andhra Pradesh and all Control States

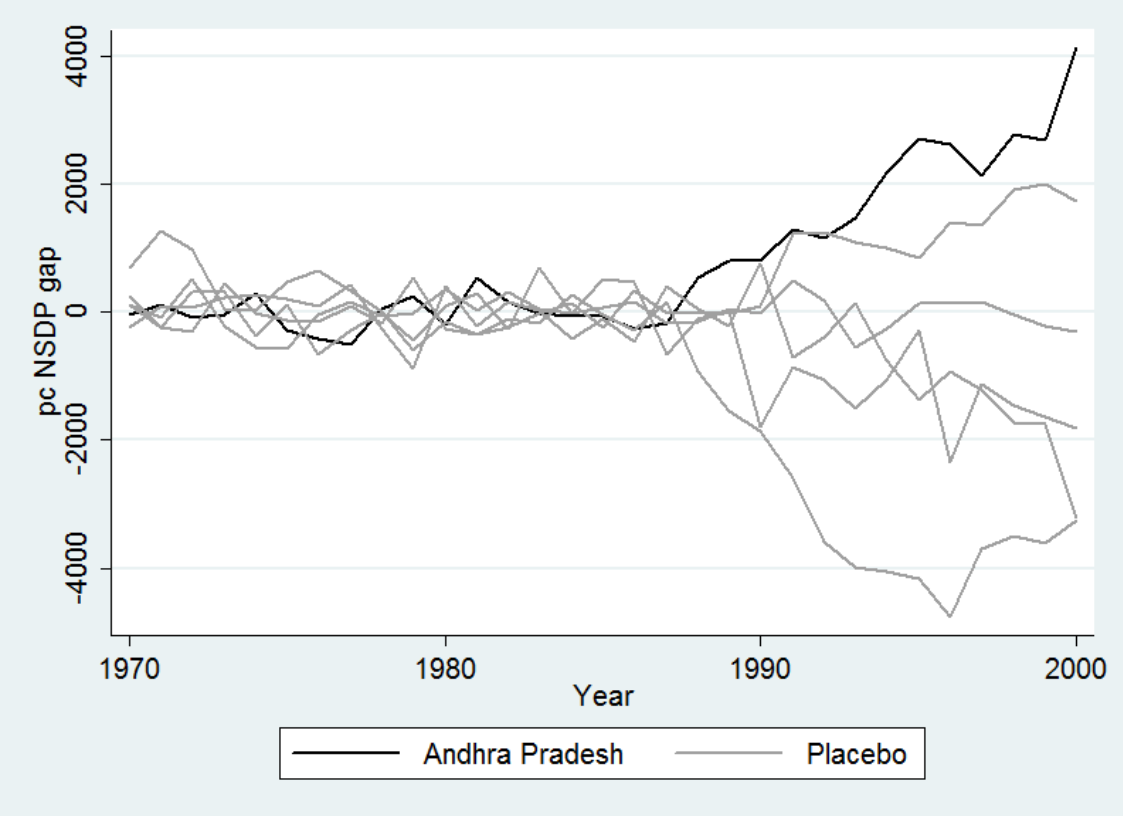


Figure 4: pc NSDP Gap in Andhra Pradesh and all Control States (Discards States with Pre-Treatment MSPE Two Times Higher than Andhra Pradesh)

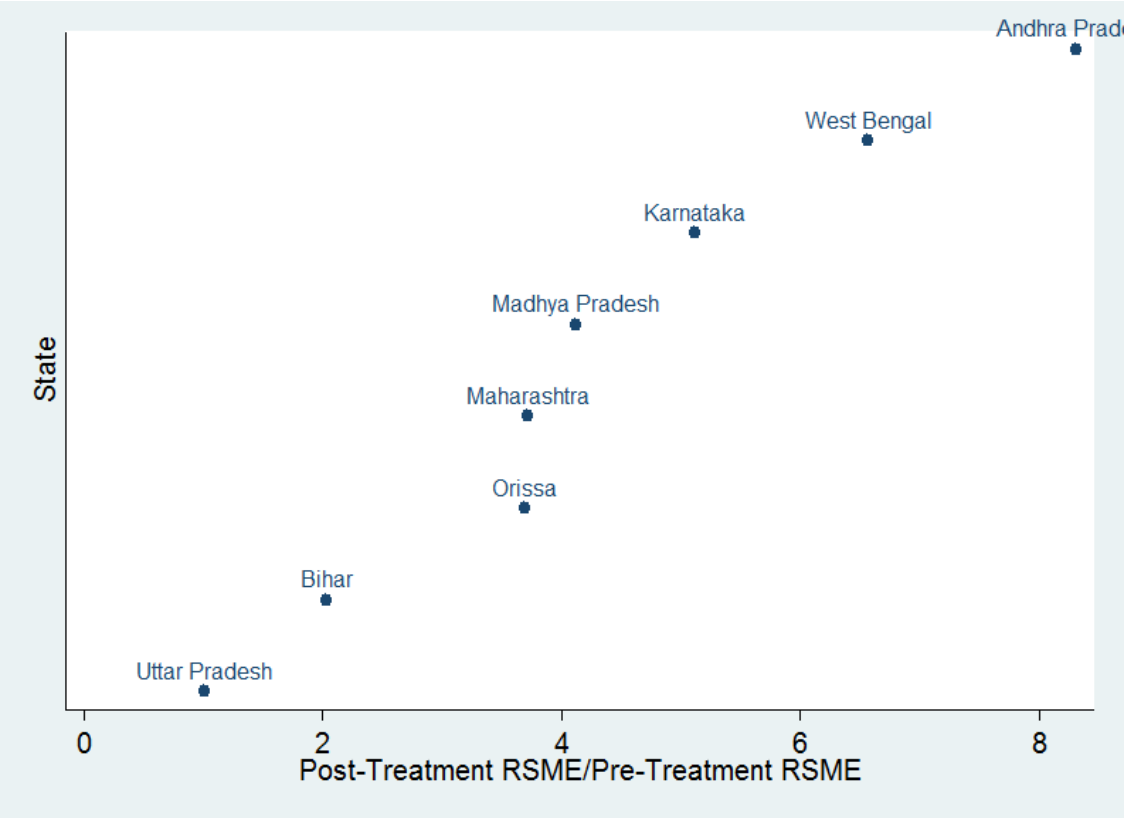


Figure 5: Ratio of post-treatment RMSPE to pre-treatment RMSPE: pcNSDP

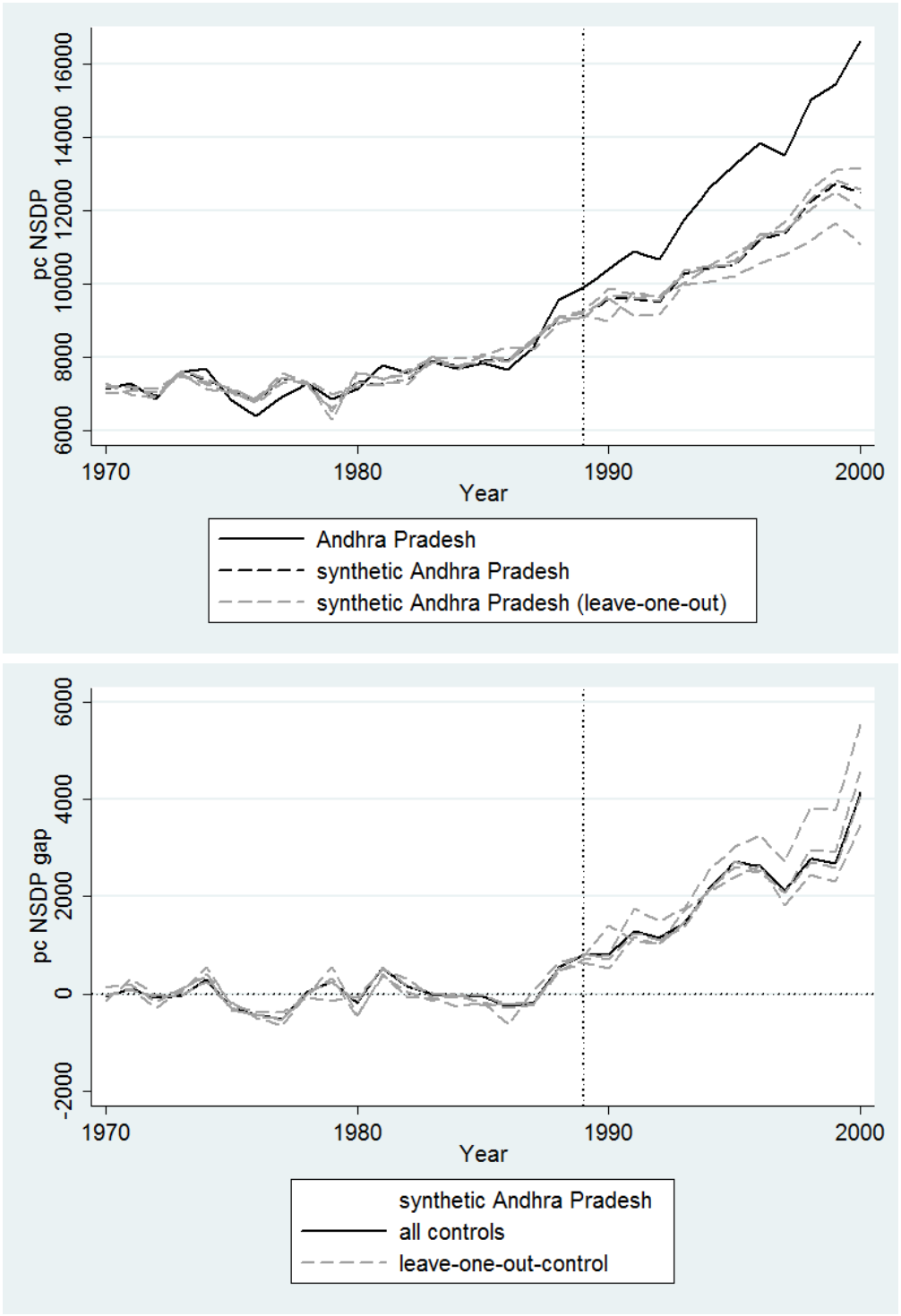
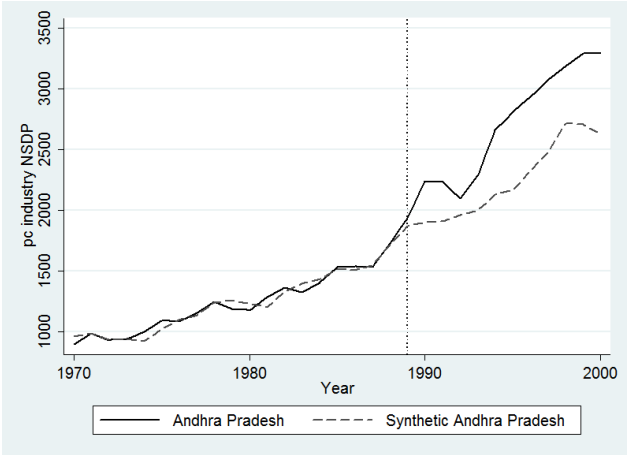
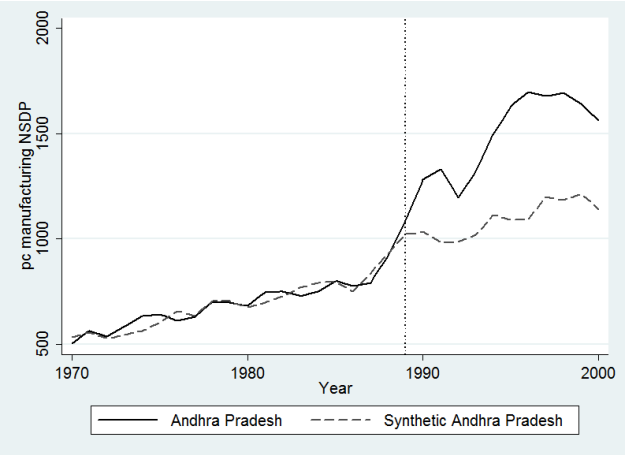


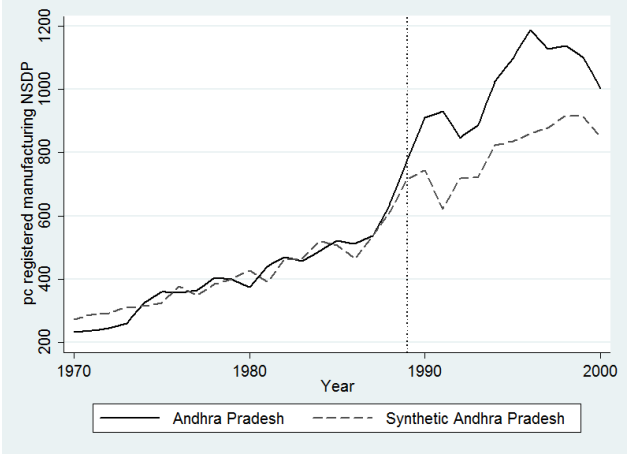
Figure 6: Leave-one-out Checks: The upper panel shows the trends in pcNSDP while the lower panel shows the gaps in pcNSDP



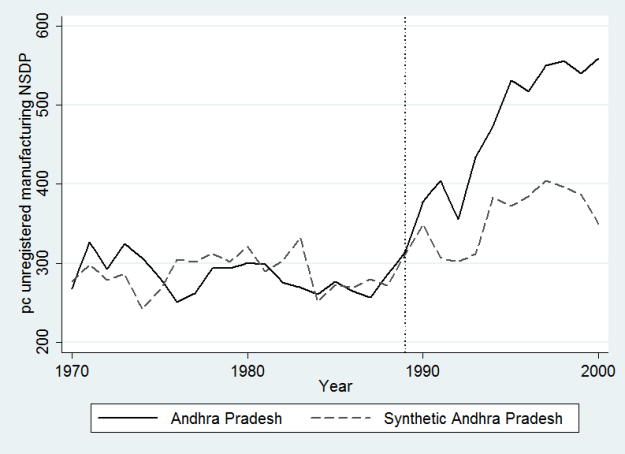
(a) Industry



(b) Manufacturing



(c) Reg. Manufacturing



(d) Unreg. Manufacturing

Figure 7: Trends in per capita industry output: Andhra Pradesh vs. Synthetic Control.

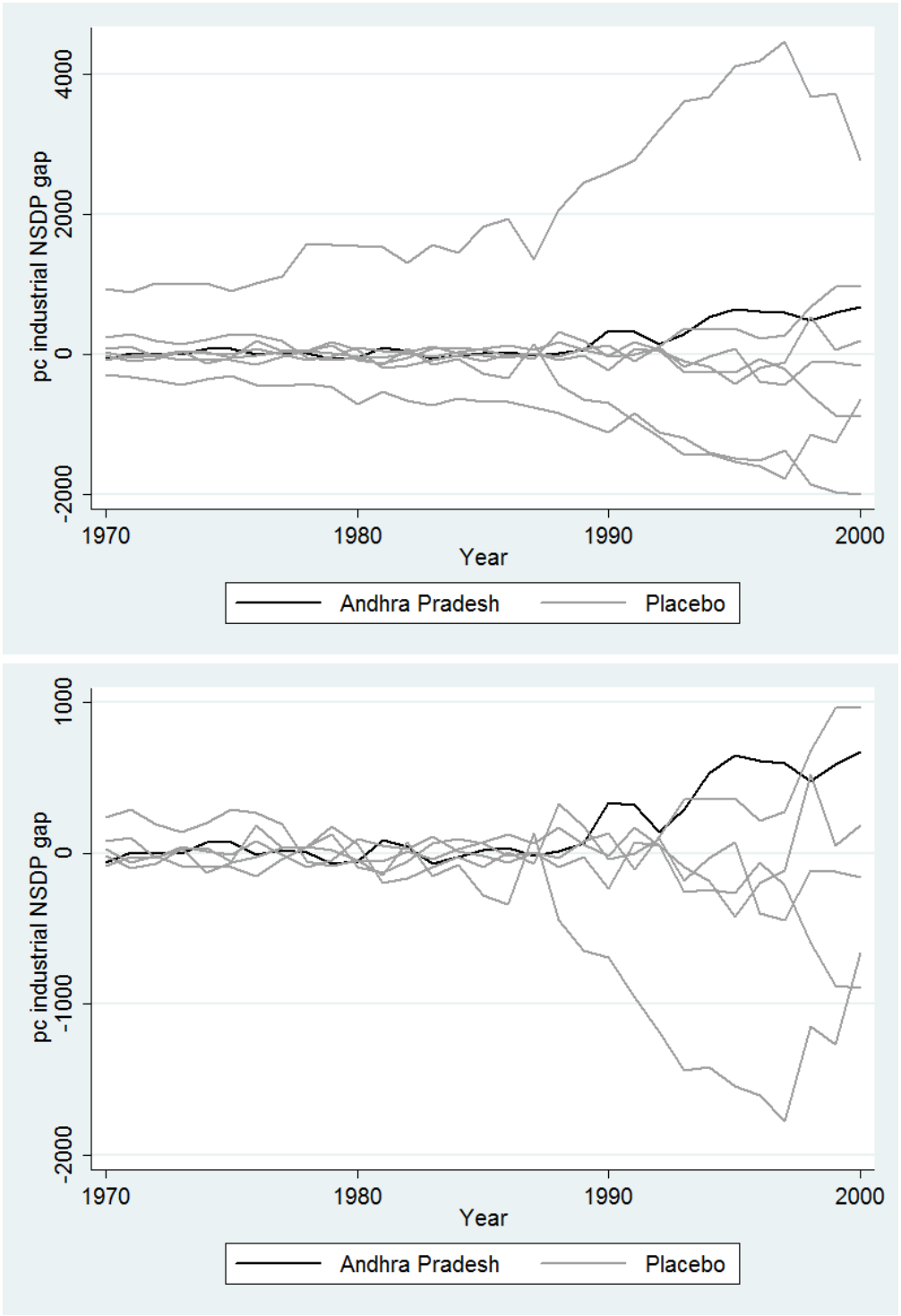


Figure 8: pc Industrial NSDP Gap in Andhra Pradesh and placebo gaps of Control States (Upper panel has all controls, lower panel discards states with pre-treatment MSPE five times higher than Andhra Pradesh)

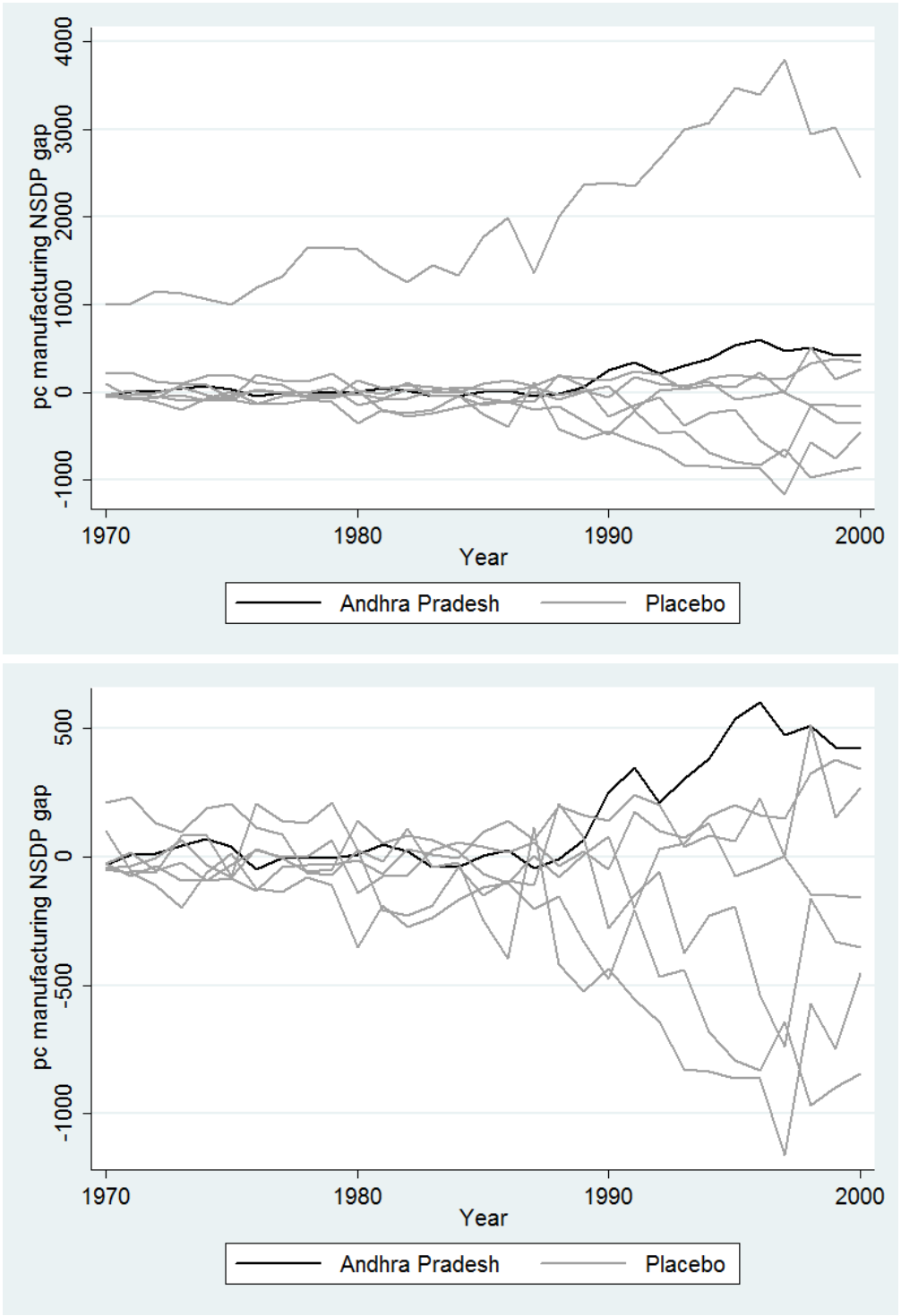


Figure 9: pc Manufacturing NSDP Gap in Andhra Pradesh and placebo gaps of Control States (Upper panel has all controls, lower panel discards states with pre-treatment MSPE six times higher than Andhra Pradesh)

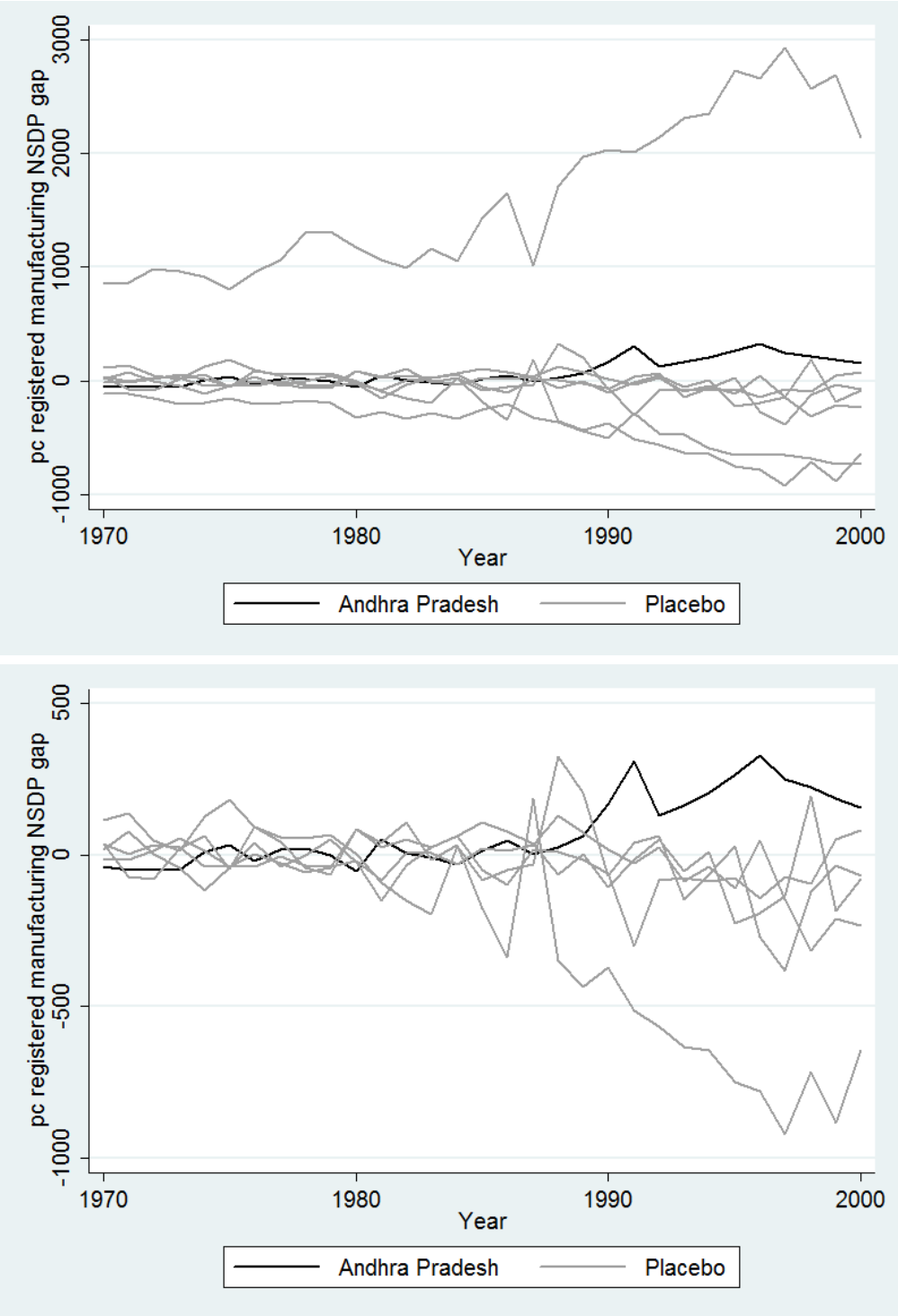


Figure 10: pc Regristered Manufacturing NSDP Gap in Andhra Pradesh and placebo gaps of Control States (Upper panel has all controls, lower panel discards states with pre-treatment MSPE five times higher than Andhra Pradesh)

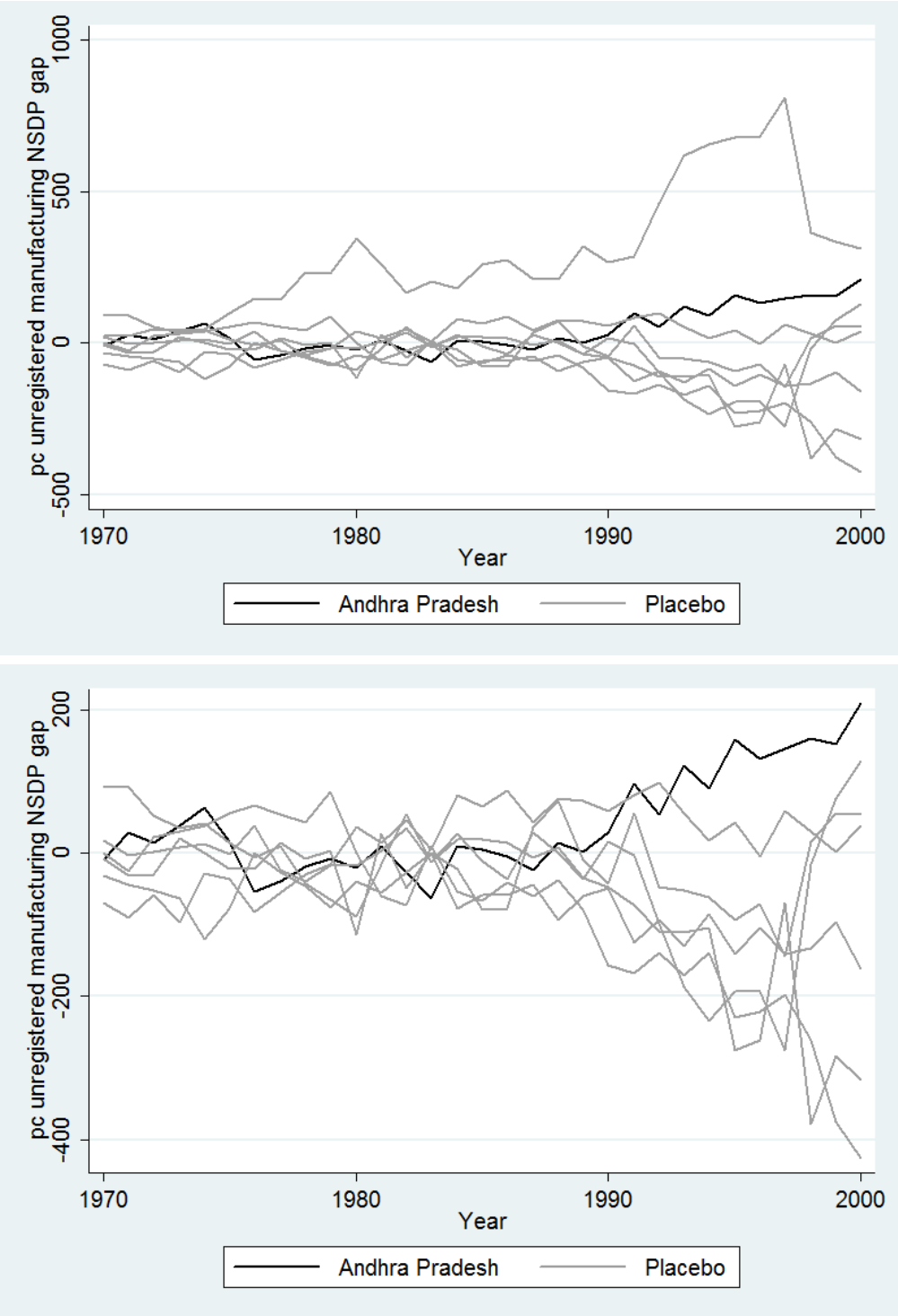
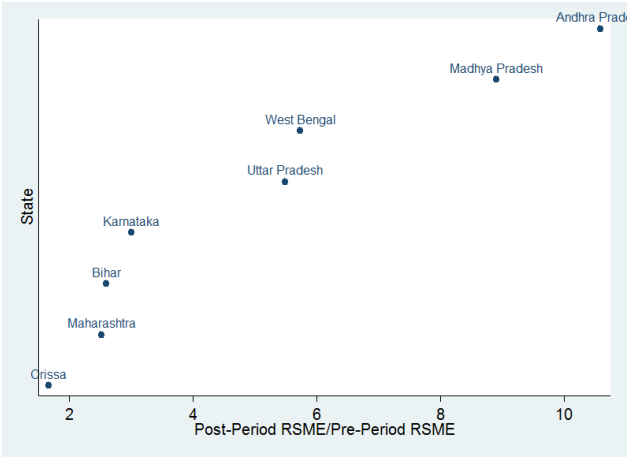
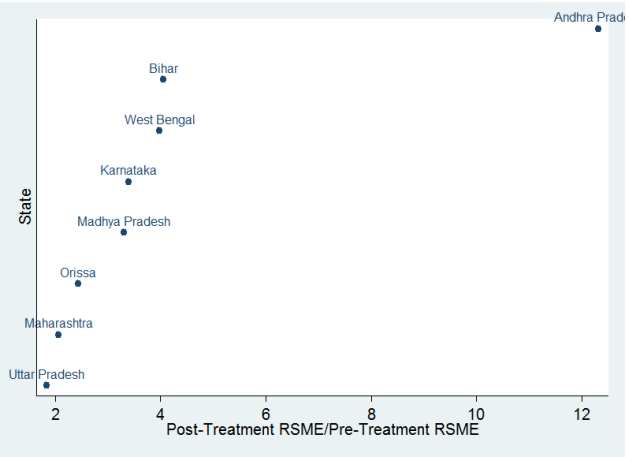


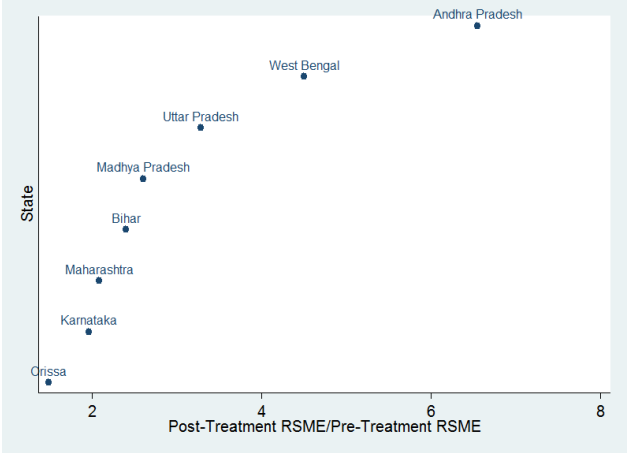
Figure 11: pc Unregristered Manufacturing NSDP Gap in Andhra Pradesh and placebo gaps of Control States (Upper panel has all controls, lower panel discards states with pre-treatment MSPE two times higher than Andhra Pradesh)



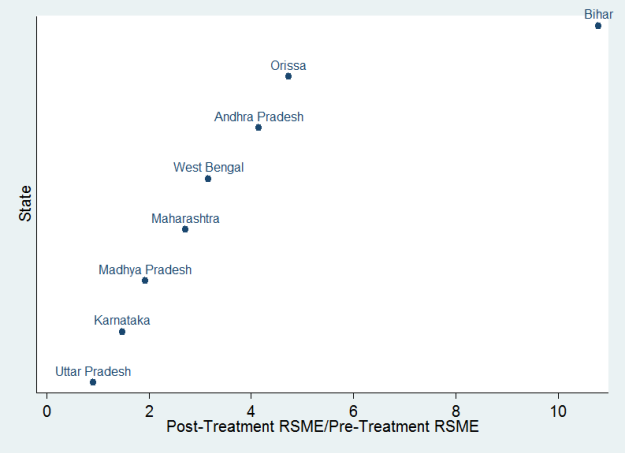
(a) Industry



(b) Manufacturing

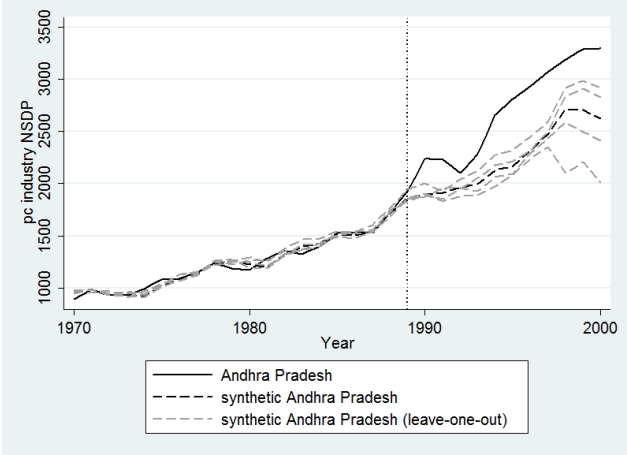


(c) Reg. Manufacturing

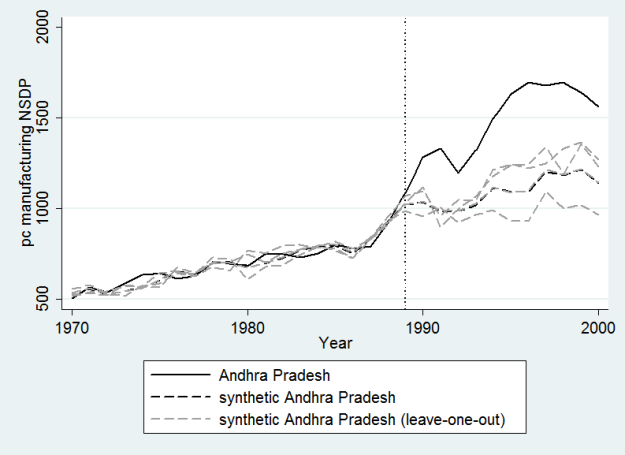


(d) Unreg. Manufacturing

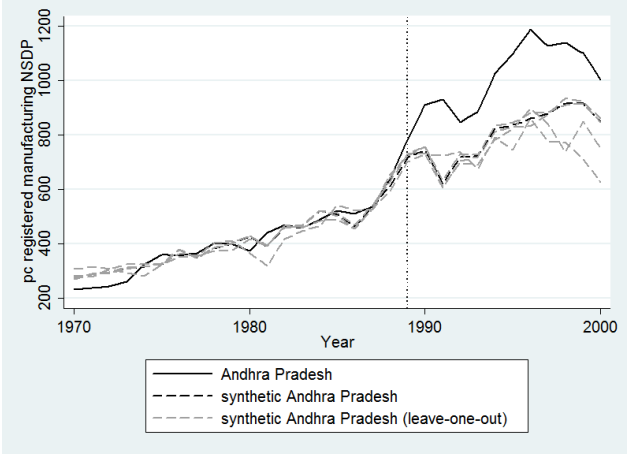
Figure 12: Ratio of post-treatment MSPE to pre-treatment MSPE: Industrial pcNSDP



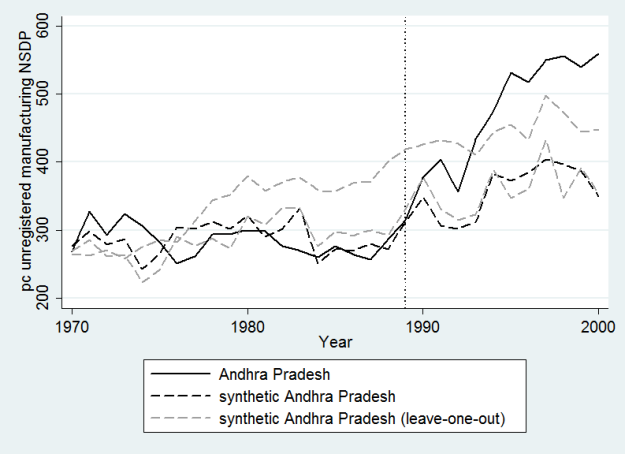
(a) Industry



(b) Manufacturing

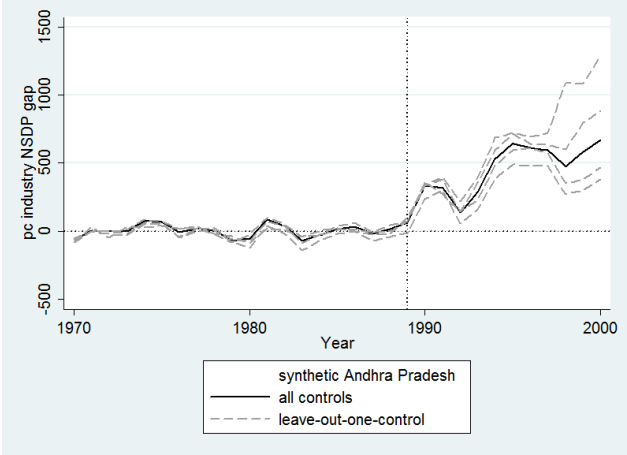


(c) Reg. Manufacturing

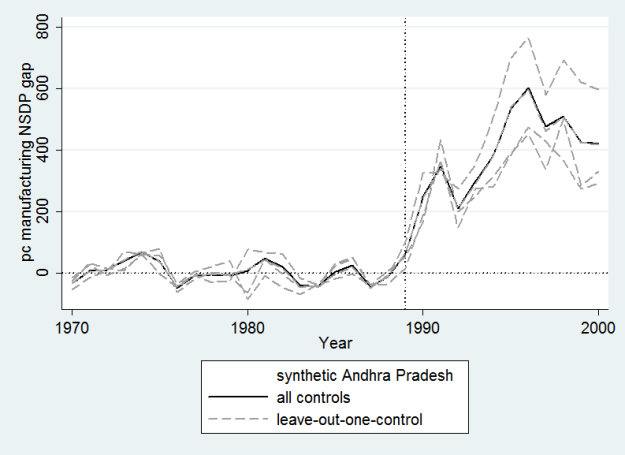


(d) Unreg. Manufacturing

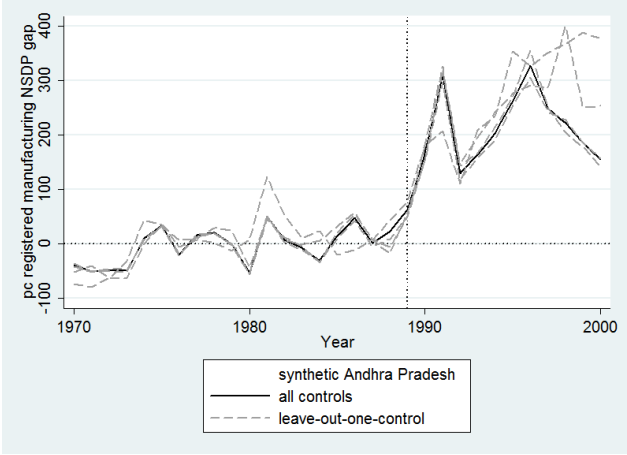
Figure 13: Leave one out: Trends in Industrial pcNSDP



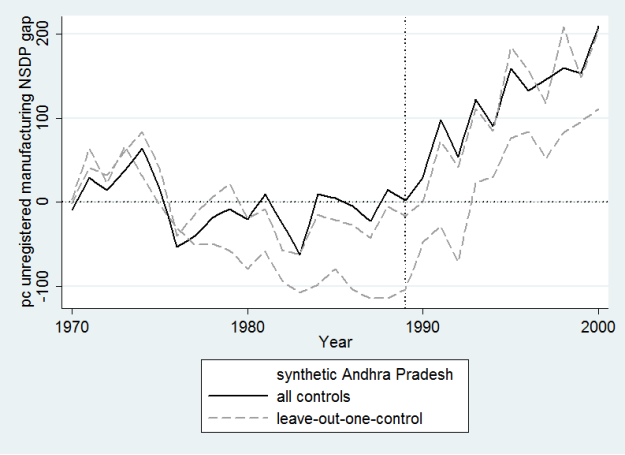
(a) Industry



(b) Manufacturing



(c) Reg. Manufacturing



(d) Unreg. Manufacturing

Figure 14: Leave one out: Gaps in Industrial pcNSDP

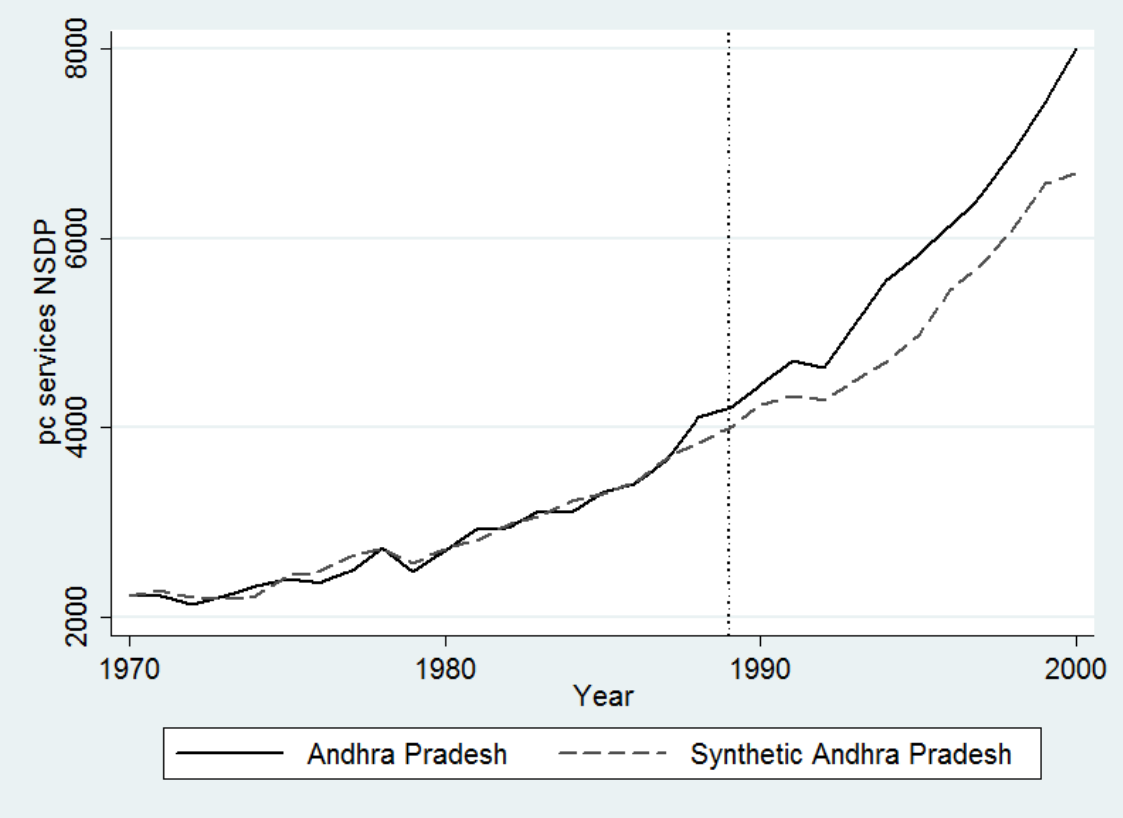


Figure 15: Trends in pc Services NSDP: Andhra Pradesh vs. Synthetic Control

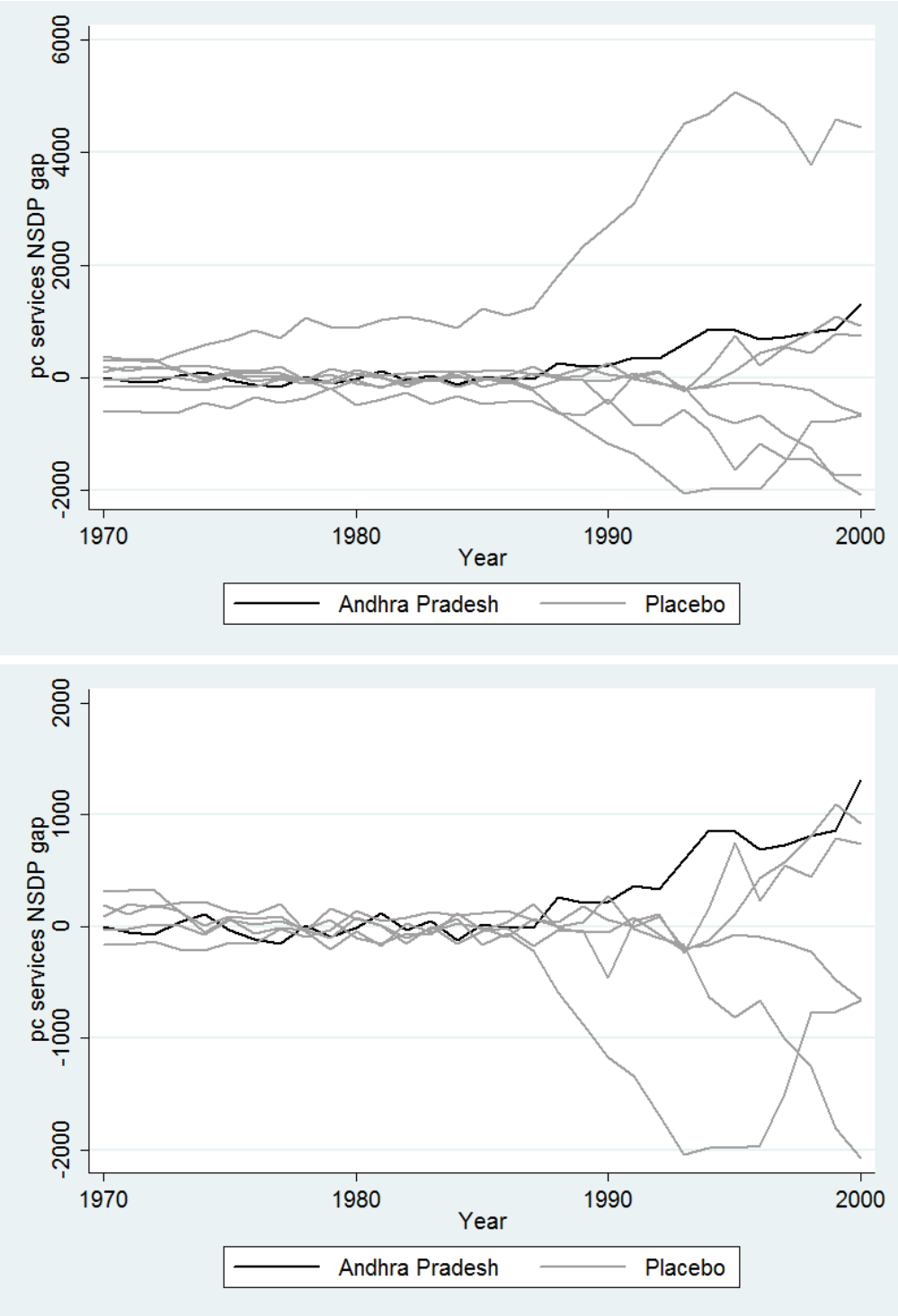


Figure 16: pc Services NSDP Gap in Andhra Pradesh and placebo gaps of Control States (Upper panel has all controls, lower panel discards states with pre-treatment MSPE Three times higher than Andhra Pradesh)

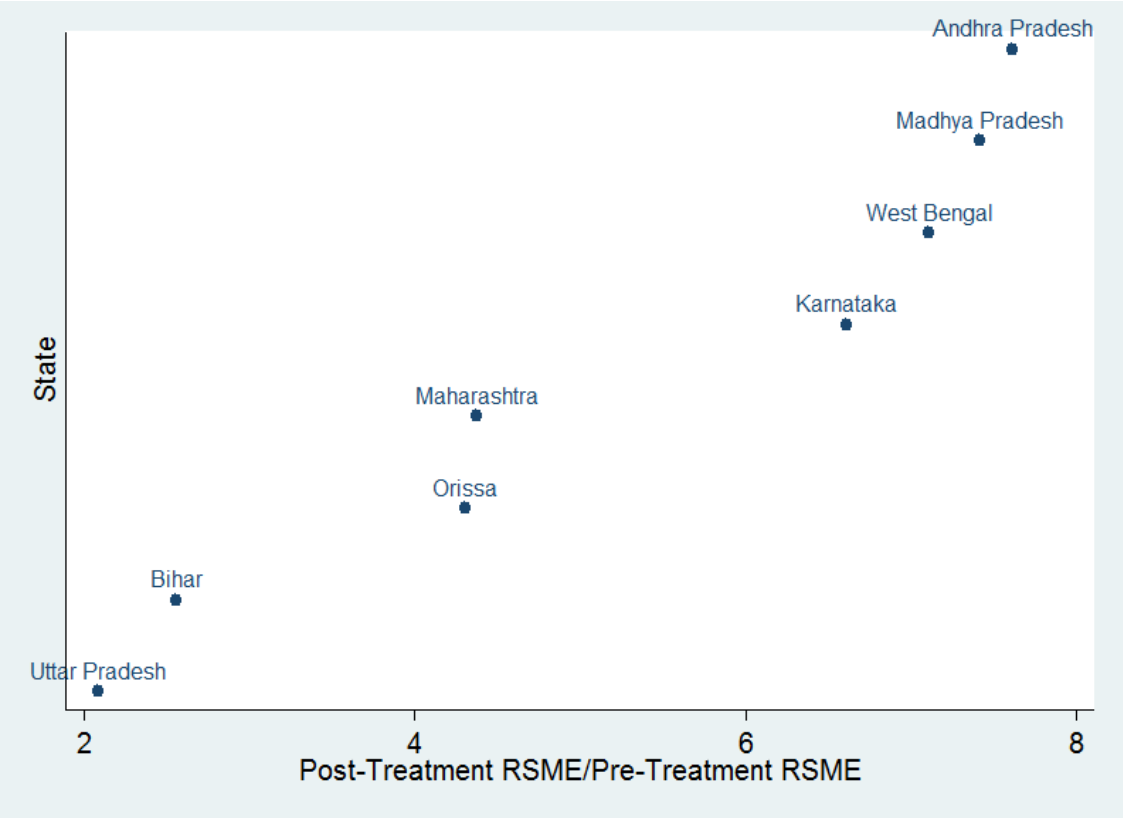


Figure 17: Ratio of post-treatment RMSPE to pre-treatment RMSPE: pc Services NSDP

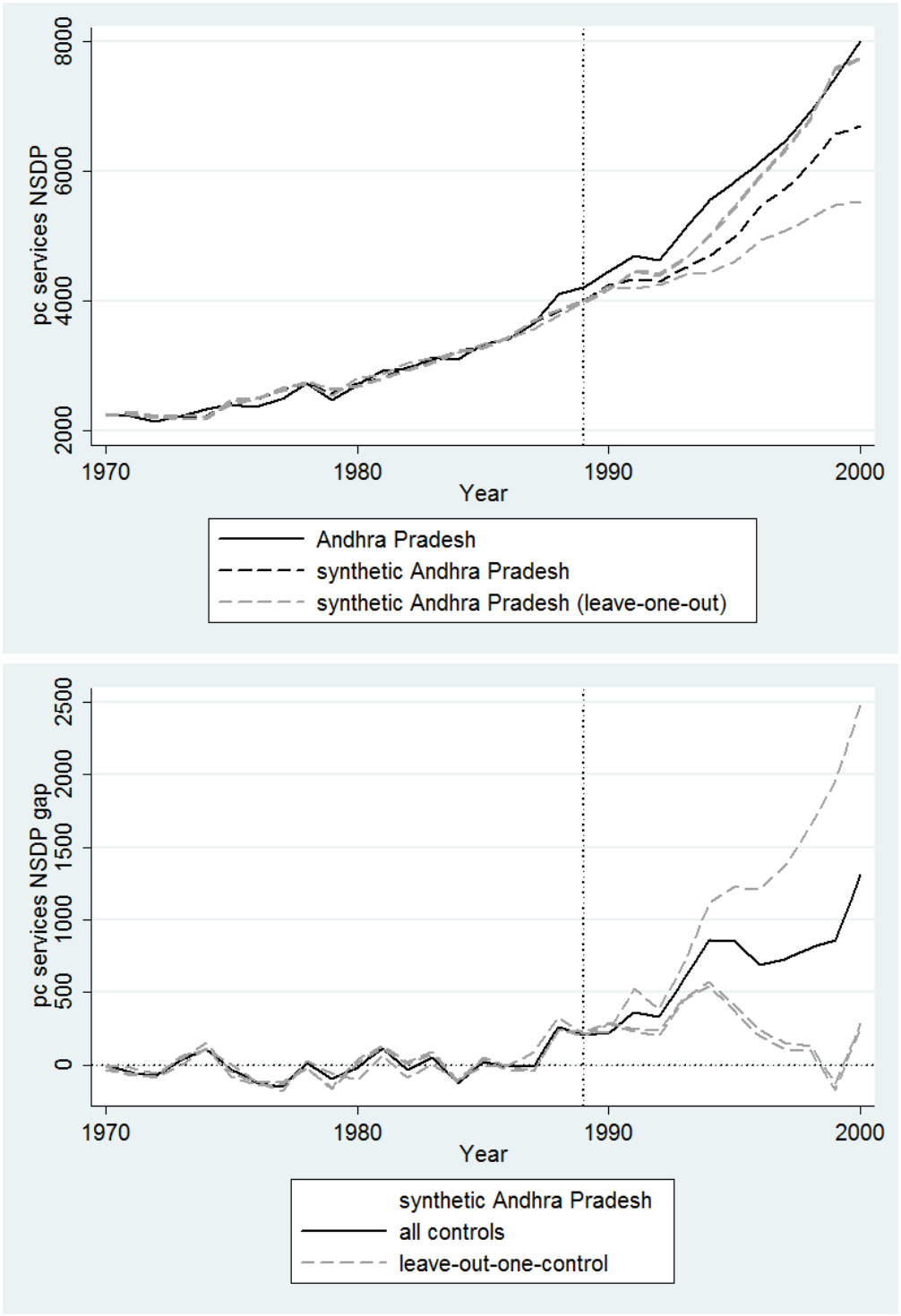


Figure 18: Leave-one-out Checks: The upper panel shows the trends in pc Services NSDP while the lower panel shows the gaps pc Services NSDP

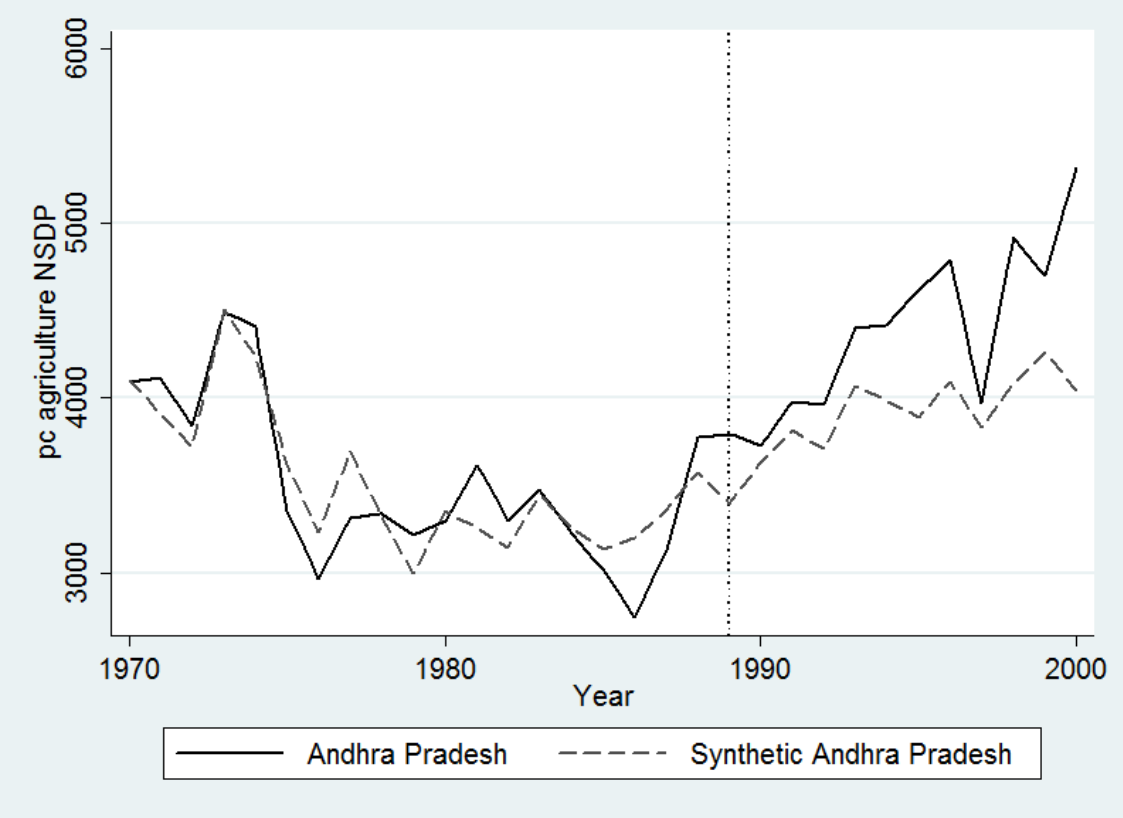


Figure 19: Trends in pc Agricultural NSDP: Andhra Pradesh vs. Synthetic Control

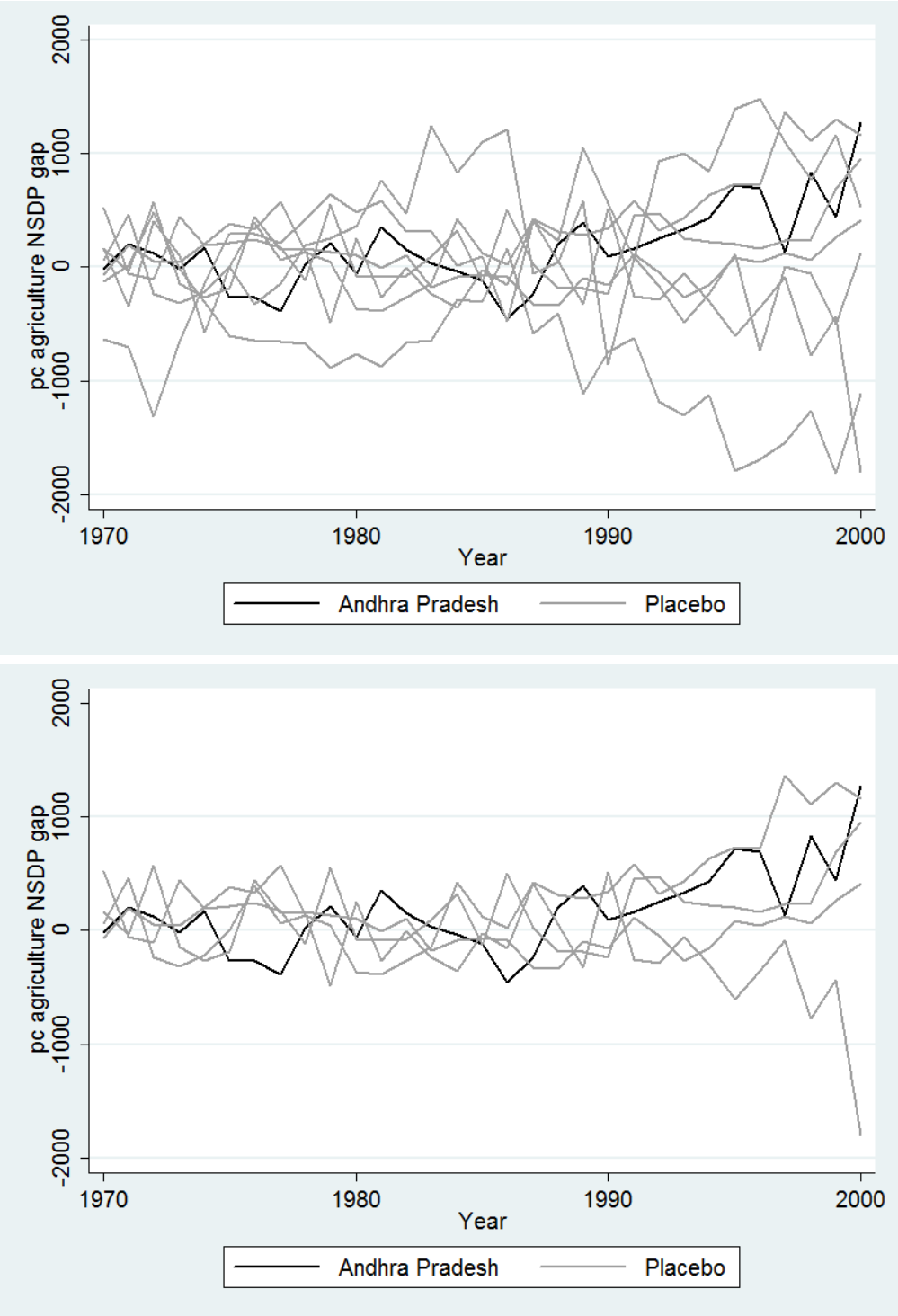


Figure 20: pc Agriculture NSDP Gap in Andhra Pradesh and placebo gaps of Control States (Upper panel has all controls, lower panel discards states with pre-treatment MSPE Two times higher than Andhra Pradesh)

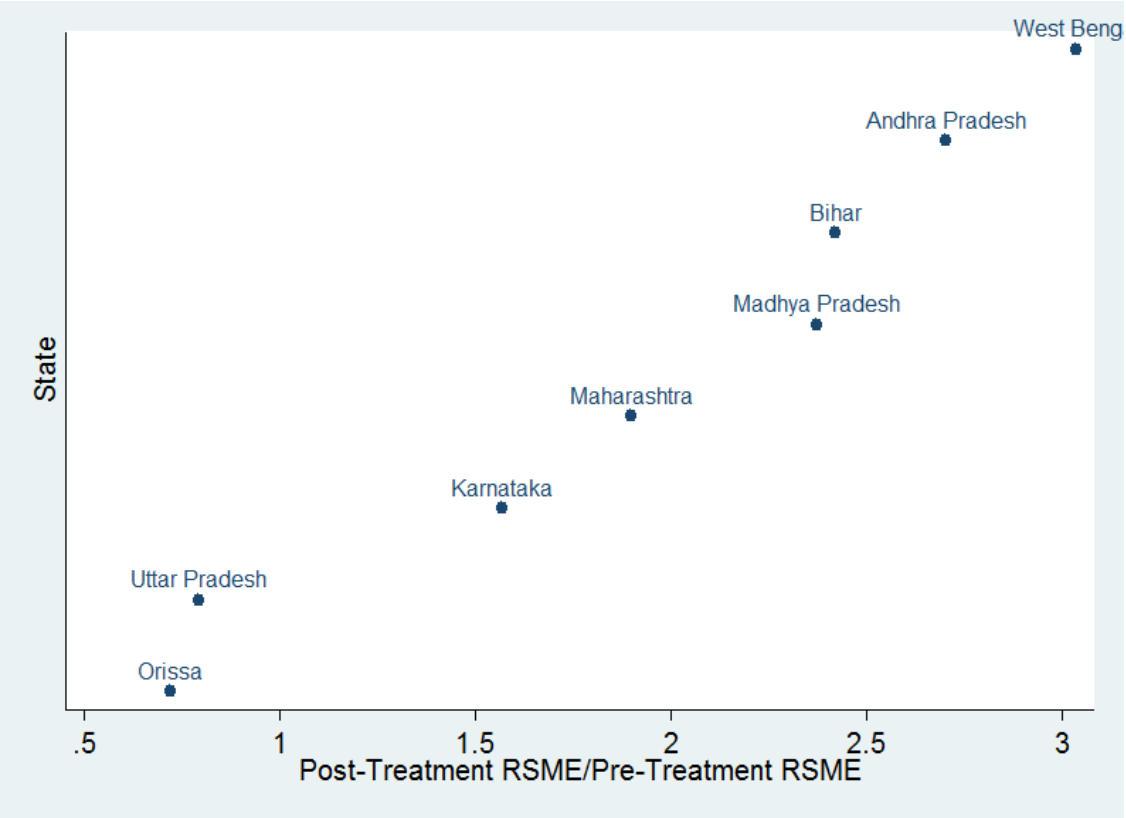


Figure 21: Ratio of post-treatment RMSPE to pre-treatment RMSPE: Agriculture

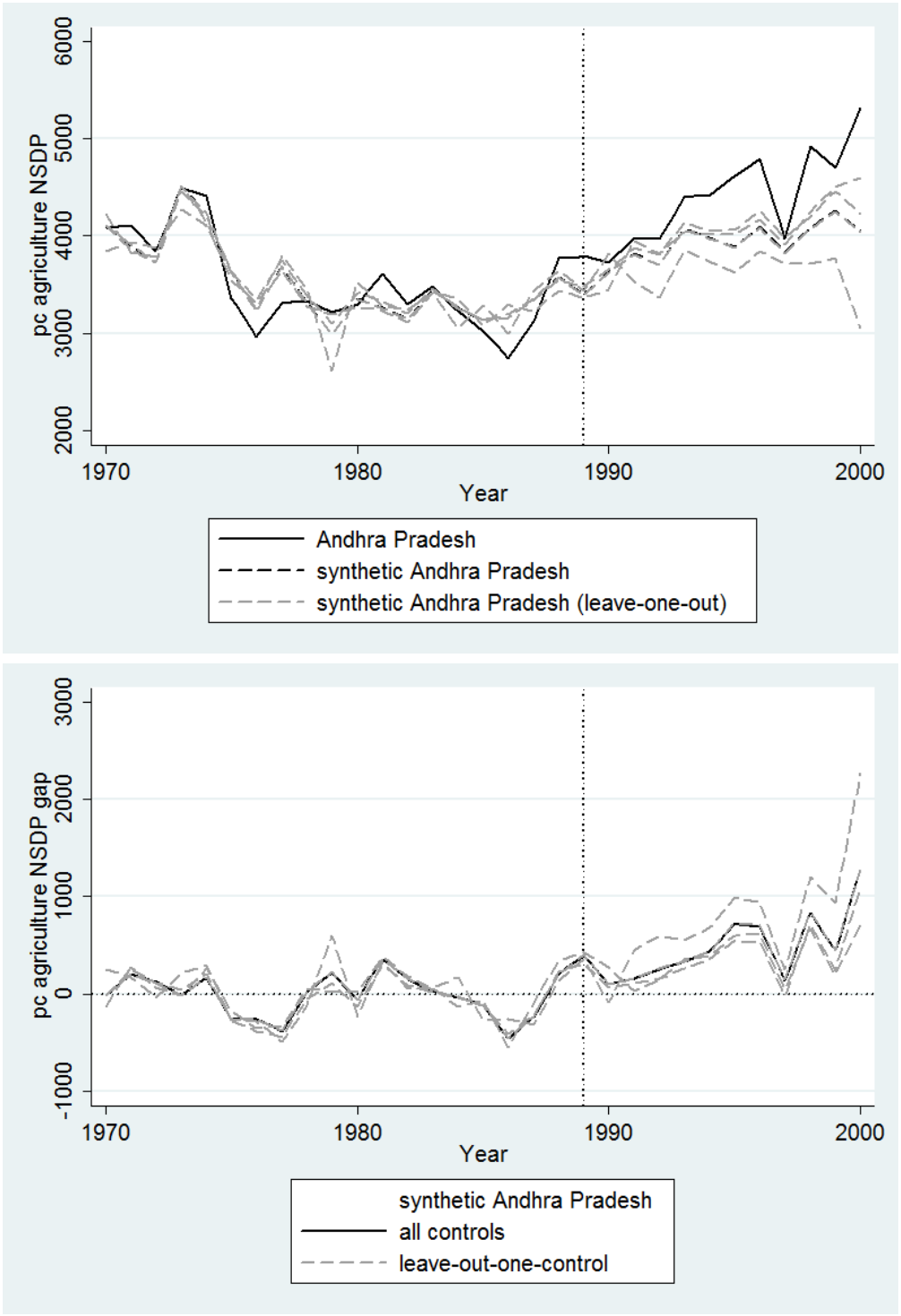


Figure 22: Leave-one-out Checks: The upper panel shows the trends in pc Agricultural NSDP while the lower panel shows the gaps pc Agricultural NSDP

Table 1: pcNSDP Predictor Means

Variables	Andhra Pradesh	Synthetic Control	Average of Control States
HDI	0.30	0.28	0.29
Population Density (persons/sq. km.)	176.50	180.46	303.86
Urban HH with safe drinking water (%)	63.27	68.21	70.90
Per capita Electricity Consumption (KwH)	114.35	122.86	132.44
Road Density (km./1000 sq. km. area)	366.00	405.99	487.14
1973 pcNSDP (1999 prices)	7605.60	7634.94	7728.50
1983 pcNSDP (1999 prices)	7891.15	7899.00	8478.88
1984 pcNSDP (1999 prices)	7703.05	7759.85	8424.71

Table 2: State Weights: pcNSDP

State	Weight
Bihar	0.19
Karnataka	0.34
Madhya Pradesh	0.42
Maharashtra	0.00
Orissa	0.05
Uttar Pradesh	0.00
West Bengal	0.00

Table 3: Greyhounds and pcNSDP

	1970-2000	1970-1997
Greyhounds	1251.9**	2029.6***
	(492.8)	(407.9)
pc Electricity Consumption	15.22*	9.400
	(6.633)	(7.627)
log pc Dev Expenditure		389.9
		(1041.5)
Lag Labor Regulation		-592.1
		(462.7)
Constant	-81868.4	51288.9
	(143453.1)	(384201.1)
State effects	Yes	Yes
Year effects	Yes	Yes
State-time trends	Yes	Yes
Observations	248	224
R^2	0.968	0.968

Standard errors calculated using robust standard errors clustered at the state level are reported in parentheses. The details of the variables are provided in the appendix. * significant at 10%,** significant at 5%,*** significant at 1%.

Table 4: State Weights: Industry

	Synthetic Control Weights			
State	Industry	Manufacturing	Registered Manufacturing	Unregistered Manufacturing
Bihar	0.13	0.32	0.04	0.00
Karnataka	0.39	0.31	0.26	0.00
Madhya Pradesh	0.26	0.34	0.59	0.72
Maharashtra	0.00	0.00	0.00	0.00
Orissa	0.00	0.03	0.00	0.28
Uttar Pradesh	0.22	0.00	0.11	0.00
West Bengal	0.00	0.00	0.00	0.00

Table 5: pc Industry NSDP Predictor Means

Variables	Andhra Pradesh	Synthetic Control				Control States		
		Industry	Manufacturing	Registered Manufacturing	Unregistered Manufacturing	Mean	Min	Max
HDI	0.30	0.29	0.27	0.27	0.25	0.29	0.24	0.36
Population Density (persons/sq. km.)	176.50	271.31	211.43	185.08	119.57	303.86	106	588.5
Total HH with safe drinking water (%)	25.89	30.78	29.89	25.88	18.62	36.00	14.58	69.65
Log pc Development Expenditure	4.95	4.76	4.71	4.79	4.78	4.79	4.34	5.20
Labor Reform Index	-2.26	-0.03	-0.03	-0.05	0.05	0.34	-0.05	1.42
1976 pc Ind. NSDP	1085.13	1093.30				1501.7	441.79	3302.11
1984 pc Ind. NSDP	1401.76	1430.66				1704.61	539.37	3603.37
1986 pc Ind. NSDP	1538.37	1504.56				1820.22	513.69	4072.35
1977 pc Mgf. NSDP	629.43		635.47			1081.07	332.35	2801.98
1983 pc Mgf. NSDP	730.15		768.02			1148.61	429.06	2905.30
1986 pc Mgf. NSDP	777.15		751.98			1183.81	420.94	3222.24
1979 pc Reg. Mgf. NSDP	400.31			400.70		732.54	62.90	2269.17
1982 pc Reg. Mgf. NSDP	469.91			462.67		681.04	65.86	2009.76
1986 pc Reg. Mgf. NSDP	511.44			463.84		755.40	79.04	2400.58
1974 pc Unreg. Mgf. NSDP	306.34				242.42	409.35	153.66	646.36
1983 pc Unreg. Mgf. NSDP	269.53				332.34	487.06	295.76	806.30
1988 pc Unreg. Mgf. NSDP	286.72				272.05	494.79	228.61	809.03

Table 6: Greyhounds and Industrial Performance in Naxalite Violence Affected States 1970-2000

	Industrial NSDP	Manufacturing NSDP	Registered Manufacturing NSDP	Unregistered Manufacturing NSDP
Greyhounds	294.4**	238.6**	137.4*	101.6***
	(124.4)	(92.33)	(72.03)	(20.57)
Industrial electricity	-2.31	-0.89	-0.53	-0.61
consumption per capita	(3.03)	(2.42)	(1.94)	(1.05)
State effects	YES	YES	YES	YES
Year effects	YES	YES	YES	YES
State time trends	YES	YES	YES	YES
R^2	0.93	0.87	0.84	0.78
N	248	248	248	248

Standard errors calculated using robust standard errors clustered at the state level are reported in parentheses
* significant at 10%,** significant at 5%,*** significant at 1%.

Table 7: Greyhounds and Industrial Performance in Naxalite Violence Affected States 1970-1997

	Industrial NSDP	Manufacturing NSDP	Registered Manufacturing NSDP	Unregistered Manufacturing NSDP
Greyhounds	557.0***	409.5***	241.2***	162.0***
	(105.3)	(82.91)	(54.70)	(40.03)
Industrial electricity	-0.33	0.58	1.11	-0.63
consumption per capita	(3.84)	(3.25)	(2.48)	(0.93)
Log development	341.7*	195.3	186.5	0.75
expenditure per capita	(147.4)	(111.5)	(107.9)	(42.5)
Lagged labor regulation	-165.5	-111.1	-49.94	-53.91
	(99.68)	(98.51)	(64.00)	(37.33)
State effects	YES	YES	YES	YES
Year effects	YES	YES	YES	YES
State time trends	YES	YES	YES	YES
R^2	0.93	0.88	0.87	0.82
N	224	224	224	224

Standard errors calculated using robust standard errors clustered at the state level are reported in parentheses
* significant at 10%,** significant at 5%,*** significant at 1%.

Table 8: Results Summary: Greyhounds and Industrial Performance

	1970-2000		1970-1997	
	SCM	D-i-D	SCM	D-i-D
Industry	437.95	294.4	391.86	557.0
Manufacturing	377.52	238.6	352.54	409.5
Registered Manufacturing	202.89	137.4	208.16	241.2
Unregistered Manufacturing	112.91	101.6	92.50	162.0

Table 9: Greyhounds and Registered Manufacturing Performance: 1980-1997

	Log no. factories	Log real output	Log real capital
Greyhounds	0.304***	0.174**	0.176*
	(0.0499)	(0.0774)	(0.0981)
Labor Regulation	0.0348	0.00374	0.109**
	(0.0301)	(0.0462)	(0.0549)
Delicense	-0.143	-0.540*	-0.142
	(0.129)	(0.282)	(0.390)
FDI reform	0.379*	0.942***	1.157***
	(0.200)	(0.259)	(0.401)
Delicense * Labor Regulation	-0.0382***	-0.0651***	0.0102
	(0.0141)	(0.0232)	(0.0308)
FDI Reform * Labor Regulation	-0.000692	-0.0802***	-0.108***
	(0.0136)	(0.0215)	(0.0305)
Congress seats	0.00277	-0.0619	-0.166
	(0.159)	(0.227)	(0.356)
Left parties seats	-1.557***	-1.726**	-2.455**
	(0.492)	(0.704)	(1.020)
Janta Dal parties seats	-0.0463	0.0414	-0.0908
	(0.174)	(0.259)	(0.380)
Hindu parties seats	0.543**	0.459	0.770
	(0.208)	(0.294)	(0.502)
Regional parties seats	0.202	0.405*	0.423
	(0.179)	(0.242)	(0.351)
Log Development Expenditure	0.290	0.360	0.479
	(0.195)	(0.298)	(0.447)
Constant	6.652***	13.40***	11.32***
	(0.884)	(1.348)	(2.019)
State-Industry effects	Yes	Yes	Yes
Industry-Year effects	Yes	Yes	Yes
Observations	2639	2639	2639
Adjusted R^2	0.967	0.939	0.912

Standard errors calculated using robust standard errors clustered at the state-year level are reported in parentheses. The details of the variables are provided in the appendix. * significant at 10%,** significant at 5%,*** significant at 1%.

Table 10: pc Services NSDP Predictor Means

Variables	Andhra Pradesh	Synthetic Control
HDI	0.30	0.29
Population Density (persons/sq. km.)	176.50	281.73
Road Density (km./1000 sq. km. area)	366.00	432.30
Per capita electricity consumption (KwH)	114.35	126.13
Total HH with safe drinking water (%)	25.89	30.54
Log per capita Development Expenditure	4.95	4.82
1971 pc Services NSDP (1999 prices)	2226.45	2277.91
1984 pc Services NSDP (1999 prices)	3102.50	3224.33

Table 11: State Weights: Services

State	Weight
Bihar	0.00
Karnataka	0.46
Madhya Pradesh	0.24
Maharashtra	0.00
Orissa	0.00
Uttar Pradesh	0.30
West Bengal	0.00

Table 12: pc Agricultural NSDP Predictor Means

Variables	Andhra Pradesh	Synthetic Control
HDI	0.30	0.30
Population Density (persons/sq. km.)	176.50	178.54
Rural population under poverty line (%)	37.68	52.99
Foodgrain Yield	960.06	798.94
Average monthly Rainfall (s.d.)	43.52	54.41
1974 pc Agricultural NSDP (1999 prices)	4409.73	4238.96
1978 pc Agricultural NSDP (1999 prices)	3338.53	3312.59
1987 pc Agricultural NSDP (1999 prices)	3129.55	3361.12

Table 13: State Weights: Agriculture

State	Weight
Bihar	0.15
Karnataka	0.51
Madhya Pradesh	0.34
Maharashtra	0.01
Orissa	0.00
Uttar Pradesh	0.00
West Bengal	0.00