Conflict, Markets and Social Costs

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Motivation



BJP problem: As UP elections move eastward, so do herd of stray cattle

Background

Religious significance and state laws

- Cattle hold a special place in some cultures of India; many Hindus consider cows sacred
- Constitution allows states to enact discretionary laws on the prohibition of cow slaughter; laws vary across states
 - Most prohibit slaughter (except KL, WB, and parts of the NE)

Livestock economy

- 58% rural HHs own livestock (NSS, 2013); 192 million cattle (Census 2019)
- India ranks third in beef exports (held 1st place until 2015); hosted a thriving informal cattle market
 - HHs sell old and unproductive cattle (to buy productive ones)

Rise in conflict over the last decade

• Incidents of mob violence associated with cow-vigilante groups

This study

We empirically study the following channels:



Preview of results: Impact of cow-vigilante violence

Part 1: Market disruption

- $\bullet~$ Up to a 10% fall in cattle stock with a recovery in 2-3 years
 - Small farmers and minorities suffer more

Part 2: Social costs of market disruption

- Disruption in trade increases the number of stray cattle
 - 200% increase in road accidents in affected regions
- Document rural social costs of stray cattle
 - Conducted a primary survey in Rajasthan and Tamil Nadu
 - Large reported externalities (crop-loss & precautionary costs)

Related literature

- Economic impact of violence
 - Loss of 11.2% of global GDP (Global Peace Index 2019)
 - Effects of civil-war on **development** (Collier et al. 2003, Blattman & Miguel 2010)
 - Conflict affects **preferences**, **trust and market** participation (Voors et al. 2012; Cassar et al. 2013)
- Inter-group conflict
 - Inter-group competition on state, norms and markets (Tilly 1985; Grief 2006; Bellows & Miguel 2009)
 - Economic incentives and inter-ethnic conflicts (Jha 2013, Becker & Pascali 2019, Blattman 2022)
 - Hindu-Muslim conflicts (Mitra & Ray 2014, Iyer & Shrivastava 2018)

Documenting cow-vigilante violence

- **Cow-vigilante violence**: Attacks by vigilante groups (*Gau-Rakshaks*) on individuals or groups suspected of trading cows for slaughter or consuming beef.
- $\bullet\,$ Data source: IndiaSpend,a data journalism website
 - Recorded incidents of cow-vigilante violence as reported in English newspapers across India
 - Data period: 2012 to mid-2019
 - 133 incidents were documented; 44 fatalities, 39 were Muslims

Reported reason for the attack	Frequency	Reported perpetrator classification	Frequency
Suspected of			
Cattle trade	55	Cow vigilante groups with institutional affiliation	38
Cattle theft	12	Self-proclaimed organised Gau Rakshaks	35
Cattle slaughter	23	Local mob/ group (no affiliation)	30
Possession of beef	30	Mob of villagers (no affiliation)	26
Other	13	Other	4
Total	133	Total	133

Steep rise in cow-vigilante violence in India



Source: IndiaSpend data on cow-related violence

State-wise timing of exposure to violence



Part 1: Violence disrupts markets

Cow-vigilante violence decreases the cattle stock held by households

Dataset-1

Consumer Pyramid Household Data (CPHS) by CMIE

- Panel data of Indian households since January 2014
- Survey of approx. 150,000 households every 4 months ("wave")
- We used 18 waves spanning from January 2014 to December 2019
- Key variable for analysis: Number of cattle owned by households
 - Cattle includes cows, bulls, buffaloes, goats, horses, camels, and mules
- Narrow our analysis to rural households with at least one cattle in any of the 18 waves

Merging household data with violence data

Geographical unit of treatment (violence): State Homogeneous Regions (HR)

- First level of stratification; the smallest geographical area for statistical analysis
- Groups of neighboring districts similar in
 - Demographic characteristics such as urbanization, literacy, and agro-climatic conditions
- $\bullet~100~\mathrm{HRs}$ (out of 102 total) with rural coverage
- CPHS (household) data matched with violence data at HR level

Summary statistics

Summary statistics: CPHS dataset

Section A: frequency	Violence HR	No violence HR	All India
# of HR regions	51	49	100
# of rural households	38702	34336	73038
# of rural households (who ever had a cattle)	27256	24803	52059
Section B: Household Characteristics			
# of cattle per household	1.422	1.434	1.427
Share of Muslim	8.73	6.45	7.71
Share of SC/ST	33.54	33.38	33.47
Share of OBC	47.74	53.97	50.52
Share of Upper caste	18.73	12.65	16.01

Estimation Strategy

Staggered event study design

$$y_{ijt} = \alpha_i + \beta_t + \sum_{\tau = -K}^{L} \gamma_{\tau} D_{jt}^{\tau} + \epsilon_{ijt}$$

- y_{ijt} : number of cattle owned by the household i in HR j and wave t (in logs)
- $\tau = 0$ is the period of 1^{st} violence
- D_{jt}^{τ} is a dummy for τ waves from HR j's treatment (violent incident)
- α_i and β_t : HH and wave FE (unit and time)
- $\tau = -1$ is base category

Violence led to a fall in cattle stocks

Cattle stocks (log) held by rural households



Muslim HH exhibit larger fall in stocks

Cattle stocks (log) held by rural households



Effect on households vary

Heterogeneity by social groups

- Large and persistent effect on Muslim households
- SC, ST and OBC exhibit drop; upper caste unaffected Heterogeneity by caste

Heterogeneity by size

- Small cattle holding (≤ 2 in any wave):
 - Up to a 15% fall in cattle stocks; impact persisted for 3 years
- Medium to large cattle holding (≥ 3 cattle in any wave):
 - Less than 10% fall in cattle stocks; impact persisted for 2 years

Heterogeneity by size

DID robustness checks

Results are robust to other proposed estimators



Part 2: Violence and social costs

Cow-vigilante violence disrupts the unproductive cattle market, consequently imposing social costs

2a Increased households abandoning unproductive cattle

- 2b Stray cattle increased road accidents (loss of human lives)
- 2c Stray cattle increased rural externalities (crop loss, precautionary costs)

H2: Road accidents \uparrow due to stray cattle



- Dataset: Livestock census 2012 and 2019
 - Examine changes in stray cattle
 - **DID** estimates show an increase in stray cattle in regions experiencing cow-vigilante violence

Change in levels of stray cattle



Dataset-2b

- Examine road accidents due to stray animals
- Road accidents in India Reports (Min. of Transport, GOI)
- State-level panel data (2014 2018)
 - Number of road accidents, deaths, and injuries
- Categorizes accidents by cause
 - One of the categories: accidents due to collision with stray animals

Road accidents due to animals: steep increase



Rise in violence precedes rise in accidents



Empirical method: Two-way fixed effects

To study the impact of violence on road accidents, we estimate:

$$y_{s,t} = \alpha + \beta violence_{s,t-1} + \gamma_s + \tau_t + \epsilon_{s,t}$$

- y_{st} : # of accidents due to collision with stray animals, state s and year t
- γ_s and τ_t : State and Year FE
- violence_{s,t}: cow-vigilante violence in state s (key variable of interest)

Violence and road accidents

(1)	(2)	(3)	(4)
107.4**	61.49*		
(45.31)	(30.67)		
· · /	. ,	55.01*	43.35
		(30.17)	(28.91)
15.07	-19.28	17.00	-8.216
(130.5)	(134.0)	(117.9)	(114.0)
Yes	Yes	Yes	Yes
No	Yes	No	Yes
179	179	179	179
0.062	0.136	0.158	0.199
36	36	36	36
	(1) 107.4** (45.31) 15.07 (130.5) Yes No 179 0.062 36	$\begin{array}{c cccc} (1) & (2) \\ \hline 107.4^{**} & 61.49^{*} \\ (45.31) & (30.67) \\ \hline 15.07 & -19.28 \\ (130.5) & (134.0) \\ \hline Yes & Yes \\ No & Yes \\ 179 & 179 \\ 0.062 & 0.136 \\ 36 & 36 \end{array}$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$

Road accidents higher in states with violent incidents

Possible endogeneity issues

- 1 Omitted variable bias
 - For instance, economic downturns for states that change over time may possibly increase both conflict and cattle abandonment (effect overestimated)
- 2 Measurement error in the incidence of violence (X)
 - Incidence of violence is likely mismeasured (noise and bias), e.g., only those above a certain threshold reported or intensity varies (effect underestimated)

Instrumenting for violence

- Instrument cow-vigilante violence with historical conflict data
- Past Hindu-Muslim ethnic conflicts may drive current violence
- Dataset: Varshney and Wilkinson(2006) Hindu-Muslim violence data 1950-1995; extended by Ray and Mitra (2014) until 2000
 - Document Hindu-Muslim riots reported in The Times of India
- Instrumental variable for $violence_{s,t}$ (shift-share instrument):

(Share of state 's' in total number of Hindu-Muslim conflicts from 1950 to 2000)× total cow-vigilante violence across India in year 't'

• Exclusion restriction: Historical conflicts (exogenous) should not directly affect changes in stray cattle with TWFE

Results: IV estimation

	(1)	(2)	(3)	(4)
Panel A		2SLS	estimation	
Violence in t-1 (dummy)	560.8^{**} (246.5)	729.7^{**} (364.1)		
# of violence in t-1	()	(00000)	150.4^{***} (52.91)	177.3^{***} (67.26)
State Fixed effect	Yes	Yes	Yes	Yes
Year Fixed effect	No	Yes	No	Yes
Observations	179	179	179	179
Number of states	36	36	36	36
Panel B		IV First S	tage estimat	ions
Historical predictor	0.133277	0.093	0.497	0.384
(shift-share instrument)	(0.029)	(0.024)	(0.082)	(0.068)
F statistic	20.73	15.06	36.07	31.60
Robust standard errors in	parenthese	es. *** p<	0.01, ** p<	0.05, * p<0.1

Stray animals increase road accidents

Alternate IV: Only cow-related violence before 1970

Human lives cost of violence

	(1)	(2)	(3)	(4)
Panel A		2SLS	estimation	
Violence in t-1 (dummy)	689.1**	937.8*		
(),	(329.4)	(480.9)		
# of violence in t-1	· /	· /	184.9***	227.9**
			(71.66)	(88.54)
State Fixed effect	Yes	Yes	Yes	Yes
Year Fixed effect	No	Yes	No	Yes
Observations	179	179	179	179
Number of states	36	36	36	36
Panel B	Γ	V First St	age estimati	ons
Historical violent incidents	0.133277	0.093	0.497	0.384
(shift-share instrument)	(0.029)	(0.024)	(0.082)	(0.068)
F statistic	20.73	15.06	36.07	31.60

Deaths and injuries from road accidents due to stray cattle

Deaths only

Falsification Tests

- (1) No statistical relationship between cow-vigilante violence and other road accidents
 - Change in violence should not affect other road accidents (placebo outcome)
 - We run identical regressions with other road accidents as the dependent variable
- (2) No statistical relationship between road accidents and violence in the future
 - Stray cattle accidents should not precede the violence
 - Regress stray animal accidents in year 't' on violence in 't + 1'

Hypothesis 3: Rural social costs \uparrow due to violence



Documenting externalities on farmers

- Conducted a primary survey in Rajasthan (treated) and Tamil Nadu (control)
- Survey Details
 - Rajasthan: high proportion of cattle-related violence; Cross-sectional data (September - October 2018)
 - 5 Districts chosen based on intensity of cow-vigilante violence
 - 211 households in 23 villages
 - Farmers not primed
 - Compared to Tamil Nadu (75 households, 4 villages around Madurai)

Rajasthan and Tamil Nadu: Notable differences

Changes	R	ajasthan]	Tamilnadu
	N Percentage		Ν	Percentage
Increase	201	95.26%	2	2.67%
Decrease/no change	1	0.47%	70	93.34%
No response	9	4.27%	3	4%
Total	211	100%	75	100%

Table: Changes in the level of stray cattle in the past year

- $\bullet\,$ Reduction in cattle fairs in last two years: 62% in Rajasthan vs. 44% in TN
- $\bullet\,$ Precautionary measures to protect crops: 81% in Rajasthan vs. 52% in TN

Externalities on RJ farmers: descriptive results

- 50% higher reported risk of crop loss due to stray cattle in the violent district (Barmer) of Rajasthan
- Number of precautionary measures to protect the crop are twice in the violent district
 - Precautionary measures: fencing, barbed wiring, watching in the night, etc.,
- Farmers in affected regions incur higher cost for precautions to protect the crops
 - The neighboring (bordering) regions are also facing negative externalities
 - 15,880 INR in violent, 9826 INR in neighboring regions, vs. 782 in control (Baran)

WTP for cows: Rajasthan vs. Tamil Nadu (auction)

Second price-auction

Every participant in this survey is given a chance to bid on a healthy Jersey cow. The auction winner will get the cow and must only pay the second-highest bid. How much do you bid for the cow?

Table: WTP differences for a Jersey (milk) cow

	Rajasthan	Tamilnadu
% participating in the auction	21%	100%
Average bid amount	1962.30	46980

- Reported WTP for purchasing cows varies widely between violent districts and other districts
 - Zero in the violent district, about 26% in other

Summary

Sharp increase in cow-related violence over the last decade

2 Increase in violence \Rightarrow breakdown of cattle trade

- Fall in cattle stocks up to 10%
- Increase in stray cattle \Rightarrow large societal costs
- Increase in road accidents by 200%
- Externality to farmers (crop-loss, precautionary cost); accidents
- **③** Violence can disrupt long-sustained informal trade

Policy: complex issue; the rule of law, sustain inter-ethnic trust

Thank you for your attention

Background: Cattle trade markets in India

Two types of cattle markets in India

(1) Trading of calf or productive cattle

- $\bullet\,$ U sually operated at local Mandi or through household's network
- Usually limited to local geography
- Legal and mostly informal
- Not primary targets of cow-vigilante groups
- (2) Reselling of unproductive and aged cattle for slaughter
 - Traders purchase unproductive cattle or lifting of stray cattle
 - Illegal in most states
 - Usually inter-districts and inter-states trade
 - Primary target of cow-vigilante groups

	(1)	(2)	(3)
Wave number	No. of treated HR	No of 1^{st} time treated HR	No of 1^{st} time treated households
Panel A			
1 (Jan-Apr 14)	0	0	0
2 (May-Aug 14)	2	2	563
3 (Sep-Dec 14)	1	1	495
4 (Jan-Apr 15)	0	0	0
5 (May-Aug 15)	4	3	2193
6 (Sep-Dec 15)	8	5	2593
7 (Jan-Apr 16)	5	4	2328
8 (May-Aug 16)	12	7	3423
9 (Sep-Dec 16)	7	4	2016
10 (Jan-Apr 17)	9	6	2685
11 (May-Aug 17)	22	9	5392
12 (Sep-Dec 17)	5	1	762
13 (Jan-Apr 18)	2	0	0
14 (May-Aug 18)	18	6	2657
15 (Sep-Dec 18)	7	0	0
16 (Jan-Apr 19)	2	0	0
17 (May-Aug 19)	7	3	1847
18 (Sep-Dec 19)	1	0	0
Total treated units	112	51	26954
Panel B			
Total clean control units	49	49	24476

Wave-wise Treatment Assignment

Results



Impact of each violence on HH cattle stocks

Heterogeneous impact: by social group

Figure: Impact of violence on the stock of cattle



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Heterogeneous impact: by size of holding

Figure: Impact of violence on the stock of cattle





Placebo outcomes: no impact on other HH assets





Changes in stray cattle (and a placebo outcome)

VARIABLES	Stray cattle	Stray dog
2019 \times violence district	1.490^{**}	0.254
	(0.634)	(0.186)
2019	-1.400**	-0.374**
	(0.630)	(0.167)
violence district	-1.103***	-0.0585
	(0.384)	(0.151)
Constant	11.00***	10.80***
	(0.415)	(0.112)
Observations	1,152	1,152
R-squared	0.435	0.462

Number of stray animals

Note: Data: Livestock census 2012 and 2019.

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Results: IV estimation

variables	(1)	(2)	(3)	(4)	
		2SL	S estimation		
violence in t-1 (dummy)	641.7**	840.9^{*}			
	(316.4)	(486.2)			
no. of violence in t-1			171.1***	205.1^{**}	
			(63.53)	(83.25)	
	v	V	V	V	
State Fixed effect	Yes	Yes	Yes	Yes	
Year Fixed effect	No	Yes	No	Yes	
Observations	179	179	179	179	
Number of states	36	36	36	36	
Nata II		an hofene	1070 f IV	- t : t :	

Impact on road accidents due to stray animals

Note: Using only cow-related violence before 1970 for IV estimation Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

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Human cost: Deaths

variables	(1)	(2)	(3)	(4)		
Panel A	2SLS estimation					
violence in t-1 (dummy)	261.5^{**}	359.2^{**}				
	(123.2)	(181.7)				
no. of violence in t-1	. ,	. ,	70.14^{***}	87.29**		
			(27.05)	(34.03)		
State Fixed effect	Yes	Yes	Yes	Ves		
Year Fixed effect	No	Ves	No	Ves		
Observations	179	179	179	179		
Number of states	36	36	36	36		
Panel B	IV	V First Sta	age estimati	ons		
Historical violent incidents	0.133277	0.093	0.497	0.384		
(shift-share instrument)	(0.029)	(0.024)	(0.082)	(0.068)		
F statistic	20.73	15.06	36.07	31.60		
Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1						

Deaths from road accidents due to stray cattle

