Unmarried Men and Violence against Women: long-term effects of sex-selection in India

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Motivation

Can high sex ratios increase gender-based violence?
If so, why?

I. Presence of two striking trends:

1. India's sex ratio (i.e. the ratio of males to females) is high:
   - Since at least 1980's sex ratios have been increasing
   - In the latest Census there were 107 males per 100 females
   - The infant sex ratio was 109.4 which is well-above the normal of 105

2. Violence against women is the fastest growing crime category:
   - IPV in DHS-1998 was 21% and in 2005 was 33.5%
   - Police reported violence grew at average annual rate of 18%
   - Unnatural deaths are also increasing

Motivation

II. Ambiguous theoretical predictions on the consequences of changes in the sex ratio at birth:

- Becker (1973): high relative demand for women should improve their position within marriage as women "marry-up"
- Edlund (1999) with son preference there is a risk of a "propagation of a female underclass"
  - Low marriage rates for wome as low classes choose to have daughters in order to increase their return from marrying upper-class sons
- Bhaskar (2011,2015): with parental sex selection, son preference and marriage rates for men remain low in the equilibrium
  - The relative position of women depends on the growth of cohort sizes
  - In India cohort sizes are shrinking → d'Albis and De La Croix(2012) estimate of excess of males is of 1.4 grooms to every potential bride

We test these theories by looking at gender-based violence (GBV)

What we do and what we find

1. *What we do:*
   - A surplus of males can increase gender-based violence (GBV) if:
     - Raises the number of unmarried men at crime-prone ages
     - Men exhibit more traits that are correlated with crime (Bertrand & Pan, 2011)
     - Marriage has a sobering effect (Cameron et al., 2016)
   - Explore the variation within districts in sex ratios across age-groups that are more/less crime prone (Edlund et al, 2013)
     - Using a detailed district-level spanning 40 years we are able to address the main identification challenge of omitted variable bias
2. *What we find:*
   - A surplus of males at the 20-24 age-group increases GBV by 8%
   - A surplus of males in non-crime prone ages does not affect GBV or acquisitive crime

Contribution

1. The consequences of sex ratios on matching quality and labour market outcomes
   - Lafortune, 2013; Abramitzky et al, 2011; La Mattina, 2016 and Angrist, 2002; Autor, 2016
   - Our context is one with son preference culture and an endogamous marriage market → theoretically relevant

2. Our work is also related to:
   - Edlund et al., (2013) who finds that the rise sex ratios accounts for 16% of the rise in non-gender based crime in China
   - Cameron et al., (2016) find that men from areas with high sex ratios exhibit more risk-taking and impatience behaviour
     - GBV is decreasing in China but not in India ▸ CH

3. Institutional causes of GBV:
   - Marital payments (Block and Rao,1999; Bhalotra et al, 2016); pre-colonial customs (Tur-Prats, 2015; Alesina et al., 2016)

4. Overcome previous issues with the use of panel data and address omitted variable bias

Data: Age-specific sex ratio

- District-level population data from 5 census waves between 1971-2011
- Age-specific male to female ratios grouped into 4 year bins
- Focus on the age-groups 0-4 (infants), 10-19 (youth), 20-24 (marriageable ages), 25-34 (older group)
- Create time variation in sex ratios to join with yearly crime variation by linear interpolation
- Data collected from Maryland Indian Districts database and Census of India
- Other socio-demographic controls collected from the Census publications

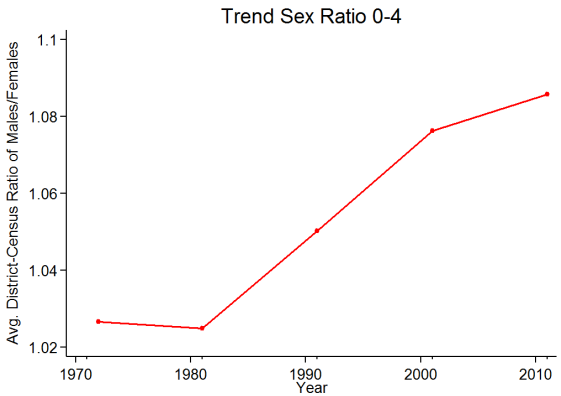
▸ SumStats

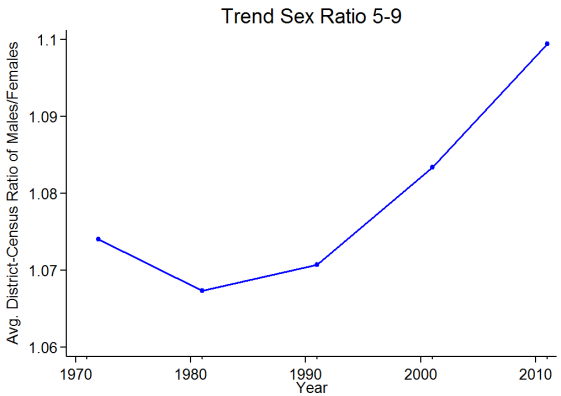
Data: Overview of sex ratio in India over time

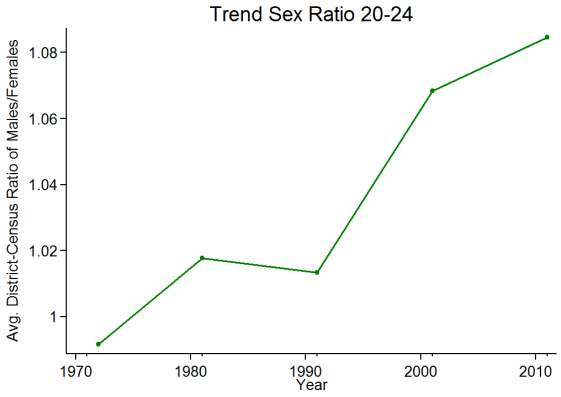
Increases in the relative cost of girls decrease survival rates for girls (Rose, 1999)

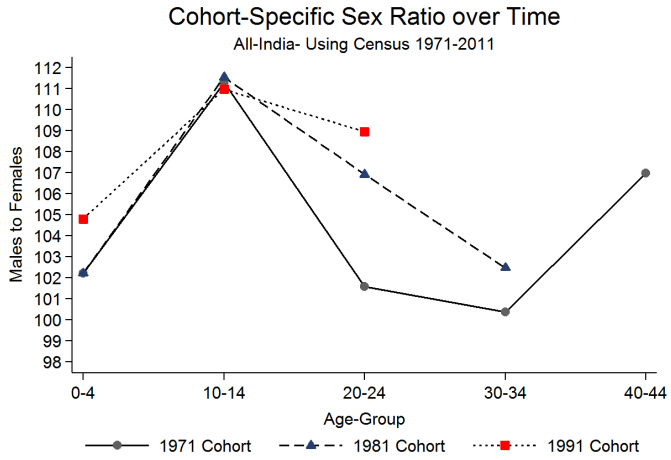
- Shocks to income, expected dowry prices, etc, have short-term effects on sex ratio
- The main cause of high and persistent sex ratios is sex-selection via the use of ultrasound technology
  - Prior to 1980's sex selection methods were confined to "sex tests" and homicide/neglect $\rightarrow$ costly methods
  - The introduction of ultrasound technology started in 1980's and was fully available after 1994
  - Parents now had an accessible and cheap sex-selection technology method
  - Sex ratio increased (Cochrane and Bhalotra, 2013) despite improvements in survival of girls (Anukriti et al., 2016)

Figure 1: Trend in Age-specific Sex Ratios









- Post 1980's infant sex ratios increase (a) and (b)
- Adult sex ratios of those born post 1980's increased
- Within cohort trends are similar to those of the cross-section

Data: Reported Crime

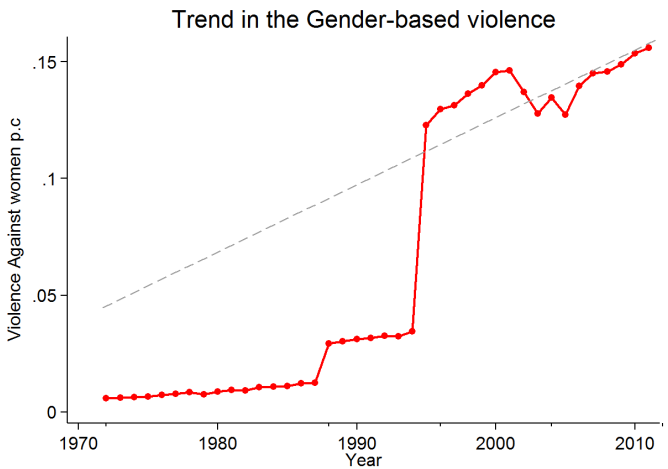
- National Crime Records Bureau:
  - Information is available at the district-level since 1971
  - Data comes from over 18 different crime categories → grouped into gender and acquisitive crime as per the Indian Penal Code
  - Release of category-specific data varies over time (to all India)
- Reporting and recording a crime in India:
  - Following an incident, police officers issue a First Investigative Report (FIR)
  - NCRB data is the aggregation of FIR's by station-district
  - Recording methods and reporting behaviour may vary over time
  - We address this:
    - Using district-linear trends and state-by-year dummies
    - By controlling for crime-year and district-year FE
- Also use police strength to control for crime deterrence

▸ SumStats

Data: Reported Crime Data

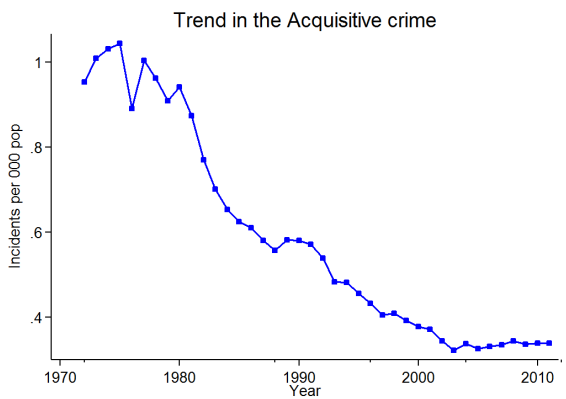
Figure 3: Trend in Crime Rates

(a) Against Women



(b) Other forms of violence

(c) Acquisitive



Empirical challenge: exogenous variation in sex ratio

- We cannot control for unobservable factors that are correlated with gender-based violence
  - E.g. Gender-specific norms
  - Unobservables may vary over time
- We exploit variation in crime and non-crime prone sex ratios within districts:
  - Within district unobservables run across the population
  - Too young cohorts are out of the crime market → should not affect crime
  - Older cohorts are more likely to be engaged in illegal activities
  - We take the 0-4 to be the *control* sex ratios and the 20-24 the relevant crime committing age-group ▸ Profile
- We use two different approaches:
  1. Exploit the variation across age-groups
  2. Exploit the variation across crime types

Approach 1-By Age-Group: Estimation and results

We follow Edlund et al.(2013) and estimate:

$$\log(Crime)_{dt} = \alpha_0 + \gamma_1 SR_{dt}^{20-24} + \pi_1 SR_{dt}^{0-4}$$

$$+\beta' X_{dt} + \lambda_d + \omega_t + g_d t + \epsilon_{dt}$$

- Main specification includes district and year fixed effects and district-linear trends
- We expect $\gamma_1 > 0$ and $\pi_1 = 0$
  - SR_{dt}^{20-24}: is the crime-prone sex ratio
  - SR_{dt}^{0-4}: is the *control* sex ratio and provides a falsification exercise
- Also include time-varying controls such as $rainfall_{dt}$ and $literacy\ gap_{dt}$ $\rightarrow$ proxies for poverty and time-varying gender attitudes
- Standard errors clustered at the district-level

Table 1: Comparison across age-groups

	Gender-Based		Property	
	(1)	(2)	(1)	(2)
SR 20-24	0.931**	1.016***	0.230	0.455
	(0.396)	(0.375)	(0.335)	(0.358)
SR 0-4	-0.406	-0.107	-0.274	-0.945
	(0.539)	(0.526)	(0.623)	(0.702)
N	10,062	10,062	10,062	10,062
# clusters	258	258	258	258
Adj. R-sq.	0.908	0.936	0.758	0.820
District & Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
District Linear Trends	Yes	Yes	Yes	Yes
State*Year	No	Yes	No	Yes

- A one SD increase in the sex ratio of ages 20-24 (0.111) increases gender-based violence by 17.1%-19.6%.

▸ Economics, Acquisitive, NGBV

Table 2: Comparison across age-groups (additional groups)

	Gender-Based		Property	
	(1)	(2)	(1)	(2)
SR 0-4	-0.005	-0.021	-0.214	-0.840
	(0.578)	(0.560)	(0.663)	(0.719)
SR 10-19	0.880**	0.360	-0.181	-0.242
	(0.391)	(0.361)	(0.437)	(0.404)
SR 20-24	0.797**	1.032***	-0.037	0.109
	(0.402)	(0.382)	(0.365)	(0.369)
SR 25-34	0.626*	0.001	0.707	0.897**
	(0.360)	(0.290)	(0.438)	(0.431)
N	10,062	10,062	10,062	10,062
# of clusters	258	258	258	258
Ad. R-sq.	0.909	0.936	0.758	0.820
District & Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
District Trends	Yes	Yes	Yes	Yes
State*Year	No	Yes	No	Yes

▸ Economics, Acquisitive, NGBV

Approach 2-By Crime: Estimation and results

We then estimate the following model:

$$\begin{aligned} Crime_{cdt} &= \alpha_0 + \beta_1 SR_{dt}^{20-24} + \gamma_1 SR_{dt}^{20-24} \times C_c \\ &\quad + \beta' X_{dt} + \lambda_{cd} + \omega_{ct} + \epsilon_{cdt} \end{aligned}$$

- Each cell is the crime rate of a specific category c within a d measured in year t
- γ_1 captures for the differential effect of the sex ratio of ages 20-24 on gender-based crimes
- β_1 captures for the effect on *control* crime categories
- This approach allows us to:
  - Take into account differences in reporting behaviour by *category* within a district
  - Account for general crime-propensity
  - Better isolate the effect of a surplus of males at crime-marriage ages across crime types

Table 3: Comparison across crime types

	Dep. Var: Crime Rate (log of)				
	(1)	(2)	(3)	(4)	(5)
SR 20-24*GBV	0.841***	0.934***	0.838***	0.829***	0.843***
	(0.148)	(0.149)	(0.148)	(0.149)	(0.157)
SR 20-24	-1.073***	-0.619***	-0.266	-0.044	-0.809
	(0.183)	(0.187)	(0.256)	(0.280)	(0.440)
N	32,913	32,913	32,913	32,913	32,913
Adj. R-sq.	0.914	0.918	0.931	0.934	0.934
District-Crime FE	Yes	Yes	Yes	Yes	Yes
Crime-Year FE	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes
District Trend	No	No	Yes	Yes	Yes
State*Year	No	No	No	Yes	No

- A one SD increase in the sex ratio of ages 20-24 (0.107) increases gender-based violence by 14%.
- Results are unchanged with the inclusion of the 0-4 ratio (col 5)

Robustness

1. Using different comparison groups does not change the results:
   - E.g. 5-9 or 25-34 ▸ Table
2. Account for within district serial correlation by crime-type: double-clustering does not change the significance of the results ▸ DC
3. Results are not driven by selection on observables (Altonji et.al, 2005)

So far..

- Show that a surplus of males at crime-marriageable ages increases GBV
- A surplus of males does not seem to affect other crime types

Why are more "bachelors" committing GBV?

We consider two channels:

1. Marriage rates:
   - A surplus of males increases the number of unmarried men → particularly true if cohort sizes are shrinking
2. Changing attitudes towards violence against women:
   - Transmission of culture is exacerbated with a more competitive marriage market (Grosjean and Khattar, 2015)

Marriage Market Mechanism: Estimation and results

We estimate the following model:

$$Unmarried_{dc}^{g,k} = \alpha_0 + \gamma SR_{dc}^{k} + X'_{dc} + \alpha_c + \lambda_d + \epsilon_{dc}$$

- Use marriage status data from the Census 1991 and 2001
- All specifications control for district FE and a dummy for the Census 2011.
- We expect that higher sex ratios increase the rate single men and decrease the rate of single women
- The coefficient for the cohort 20-24 is the difference between surplus of males of those born pre and post ultrasound

Table 4: Dep Var: Never Married Females/Males per Total

	Females		Males	
	All	20-24	All	20-24
SR All	-0.222***		-0.0282	
	(0.079)		(0.031)	
SR 20-24		-0.0627***		0.366***
		(0.022)		(0.029)
Ad. R- sq	0.577	0.813	0.646	0.769
F	79.33	280.0	116.8	181.1
N	782	782	782	782
# of clusters	391	391	391	391

- A surplus of males increases the number of unmarried men
- The difference between the effect on men and women is large
- Evidence is consistent with Bhaskar (2011)

▸ Females ▸ Males

Male Attitudes Mechanism: Estimation and results

We estimate the following difference-in-differences model:

$$\begin{aligned} Attitudes_{ist} &= \alpha_0 + \delta CSR_{st} \times Post_{is} + \beta_1 CSR_{st} + \beta_2 Post_{is} + \\ &\quad + X'_{ist} + \gamma_s + \lambda_t + \epsilon_{ics} \end{aligned}$$

- $Attitudes_{ist}$ is a binary or index measure of attitudes towards the use of domestic violence for men i in state s born in year t
- CSR_{st} is a state-specific measure of exposure to sex selection and $Post_{is}$ is a dummy for being born after 1980
- δ measures the differential effect for men born before-after being exposed to the introduction of ultrasound technology
- Assumption: attitudes towards GBV would have been the same in the absence of the introduction of ultrasound ▸ Trends
- Use the male questionnaire of DHS-2005

Table 5: Attitudes towards Intimate Partner Violence

Dep. Variable:	Index		Binary	
	(1)	(2)	(1)	(2)
Post*CSR	1.951**	2.071**	0.556**	0.572**
	(0.740)	(0.716)	(0.216)	(0.209)
Post Ultrasound	-1.725*	-1.807**	-0.494*	-0.558**
	(0.821)	(0.812)	(0.251)	(0.225)
Child Sex Ratio	-2.037	-2.000	-0.615	-0.633
	(1.752)	(1.697)	(0.492)	(0.482)
N	53,199	53,200	53,199	53,200
Adj. R-sq.	0.127	0.128	0.140	0.140
Mean (SD)	0.94 (1.39)		0.40 (0.49)	
SES Controls	Yes	Yes	Yes	Yes
State & Birth Year FE	Yes	Yes	Yes	Yes
State*Hindu FE	No	Yes	No	Yes
Birth-Year*Hindu FE	No	Yes	No	Yes

- Men born post-ultrasound in areas with "intensity of usage" are more likely to accept domestic abuse

▸ Sumstats

Conclusion

- We investigate the relationship between sex ratios and women's security
- We find that pre-determined sex ratios of those at crime-marriageable ages increased GBV
- Our results are in contrast with classic theoretical predictions that imply that a shortage of women improves their security
- Theoretical models that address the link between son preference and sex-selection are more suitable to explain our results

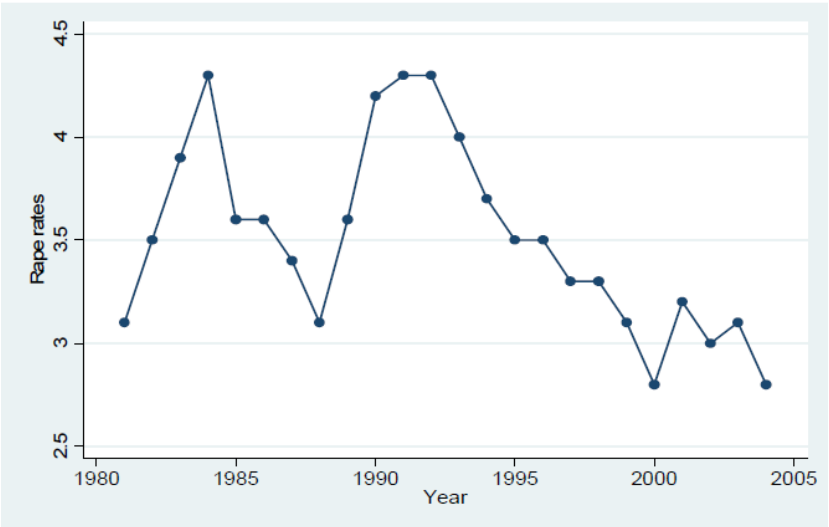
Implications:

- The remaining post-ultrasound cohorts are now coming into adulthood $\rightarrow$ increased risks for women
- Interventions tackling changing views of gender-based violence and improved prevention are relevant to address the problem

Thank you!
Comments are welcome: sfmont@essex.ac.uk

Rape in China

Figure 5: Trend in Rape in China



Source: Edlund et al, 2013.

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Table 6: Summary Statistics

	Mean	SD
Panel A: Crime Rates per 100,000		
Gender-Based	6.233	8.325
Violent	25.61	23.83
Property	53.37	48.10
Economic	5.225	4.641
Acquisitive	58.59	50.12
Panel B: Males per Females		
SR 0-4	1.054	0.0504
SR 5-9	1.077	0.0631
SR 10-14	1.119	0.0884
SR 20-24	1.033	0.111
SR 25-34	1.011	0.0985
Panel C: Socio-Economic Controls		
SC	16.63	6.870
ST	9.848	16.12
Rural	78.29	13.77
Literate	43.12	15.83
Literacy Gender Gap	11.59	3.322
Income per capita	1.358	0.857
Election Year	0.217	0.412
Police per capita	1.371	0.464
Annual Rainfall (in logs)	6.919	0.491
N (No. of clusters)	10, 647 (273)	

Back-SR Back-Crime

Offender-Victim Profiling

Table 7: Summary Statistics - By Age-Gender-Crime Type Offender Profile

	Female Offenders		Male Offencer	
	Gender	Non-gender	Gender	Non-gender
< 18	0%	1%	1%	1%
18-30	36%	32%	51%	44%
30-45	52%	40%	41%	38%
45-60	6%	26%	6%	15%
> 60	6%	2%	0%	1%
% Total Crime	1%	4%	10%	85%

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Table 8: Comparison across age=groups

	Non-gender based	Economics	Acquisitive
SR 20-24	0.606	0.401	0.543
	(0.462)	(0.334)	(0.353)
SR 0-4	-1.361	-0.675	-0.973
	(0.907)	(0.676)	(0.698)
N	10,062	10,062	10,062
#. of clusters	258	258	258
Adj. R-sq.	0.773	0.549	0.803
District FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes
District Linear Trends	Yes	Yes	Yes
State Year Dummies	Yes	Yes	Yes

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Table 9: Comparison across age-groups

Dep. Var: Rate per capita	(1) Gender-Based	(1)
SR 20-24	1.051***	0.935**
	(0.380)	(0.385)
SR 25-34	0.050	
	(0.278)	
SR 5-9		0.589
		(0.406)
N	10,062	10,062
# of clusters	258	258
Adj. R-sq	0.936	0.908
District FE	Yes	Yes
Year FE	Yes	Yes
Controls	Yes	Yes
District Linear Trends	Yes	Yes

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Robustness

Table 10: Comparison across crime types- Robustness Exercises

	(1)	(3)	(6)
SR 20-24*GBV	0.841***	0.838***	0.838***
	(0.148)	(0.148)	(0.157)
SR 20-24	-1.073***	-0.266	-0.266
	(0.183)	(0.256)	(0.370)
N	32,913	32,913	32,913
Adj. R-sq.	0.914	0.931	0.931
District-Crime FE	Yes	Yes	Yes
Crime-Year FE	Yes	Yes	Yes
Controls	No	Yes	Yes
District Trend	No	No	Yes
State-Year Dummies	No	No	No

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Table 11: Sex Ratio and Marriage Rates-Females

	All	10-14	20-24	30-39	40-49
Sex Ratio- All	-0.222***				
	(0.0787)				
10-14		-0.179***			
		(0.0255)			
20-24			**-0.0627*** **		
			(0.0223)		
30-39				0.0372***	
				(0.0113)	
40-49					-0.0203***
					(0.00310)
Ad. R- sq	0.577	0.990	0.813	0.282	0.377
F	79.33	7840	280.0	8.552	25.57
N	782	782	782	782	782
# of clusters	391	391	391	391	391

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Table 12: Sex Ratio and Marriage Rates-Males

	All	10-14	20-24	30-39	40-49
Sex Ratio- All	-0.0282				
	(0.0312)				
10-14		-0.0210			
		(0.0134)			
20-24			**0.366*** **		
			(0.0287)		
30-39				0.0502***	
				(0.0143)	
40-49					-0.00389
					(0.00482)
Ad. R- sq	0.646	0.997	0.769	0.532	0.665
F	116.8	22444	181.1	59.37	115.8
N	782	782	782	782	782
# of clusters	391	391	391	391	391

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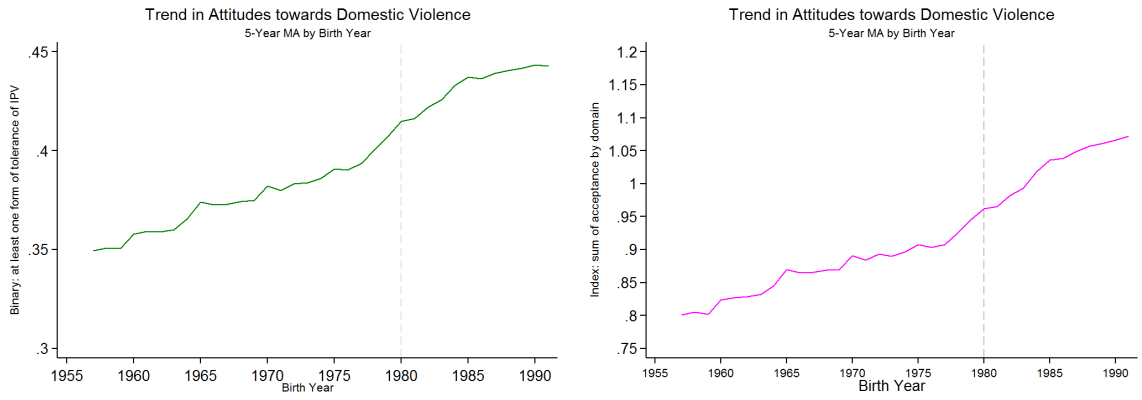
Attitudes Trends

Figure 6: Trend in Male's Attitudes towards Domestic Violence



Notes: The left-hand side figure presents the cohort average of the binary measure of attitudes and the right-hand side panel present the cohort average of the index measure. The attitudes towards intimate-partner violence module ask whether men accept to beat their wifes under 5 domains: if they go out without their permission; if they neglect the children; if they refuse to have sex; if they burn the food or if the spouse argues with him. The binary measure is a variable that takes values 1 if men accept domestic violence in at least one domain and 0 if they dont accept in all domais. The index measure is an individual sum of responses to each of the domains. Confidence intervals are at the 95% confidence level.

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Table 13: Summary Statistics- Male's DHS III

	Mean	SD	Min	Max
Hindu	0.807	0.395	0	1
Muslim	0.133	0.340	0	1
Rural	0.480	0.500	0	1
SC	0.190	0.392	0	1
ST	0.060	0.237	0	1
HH Size	5.902	3.082	1	35
Wealth Index	3.500	1.345	1	5
Acceptance Index	0.943	1.390	0	5
Acceptance Binary	0.403	0.490	0	1
Acceptance by Domain:				
Movement	0.226	0.418	0	1
Children	0.289	0.453	0	1
Argues	0.243	0.429	0	1
Sex	0.072	0.259	0	1
Food	0.113	0.317	0	1
N		53,240		

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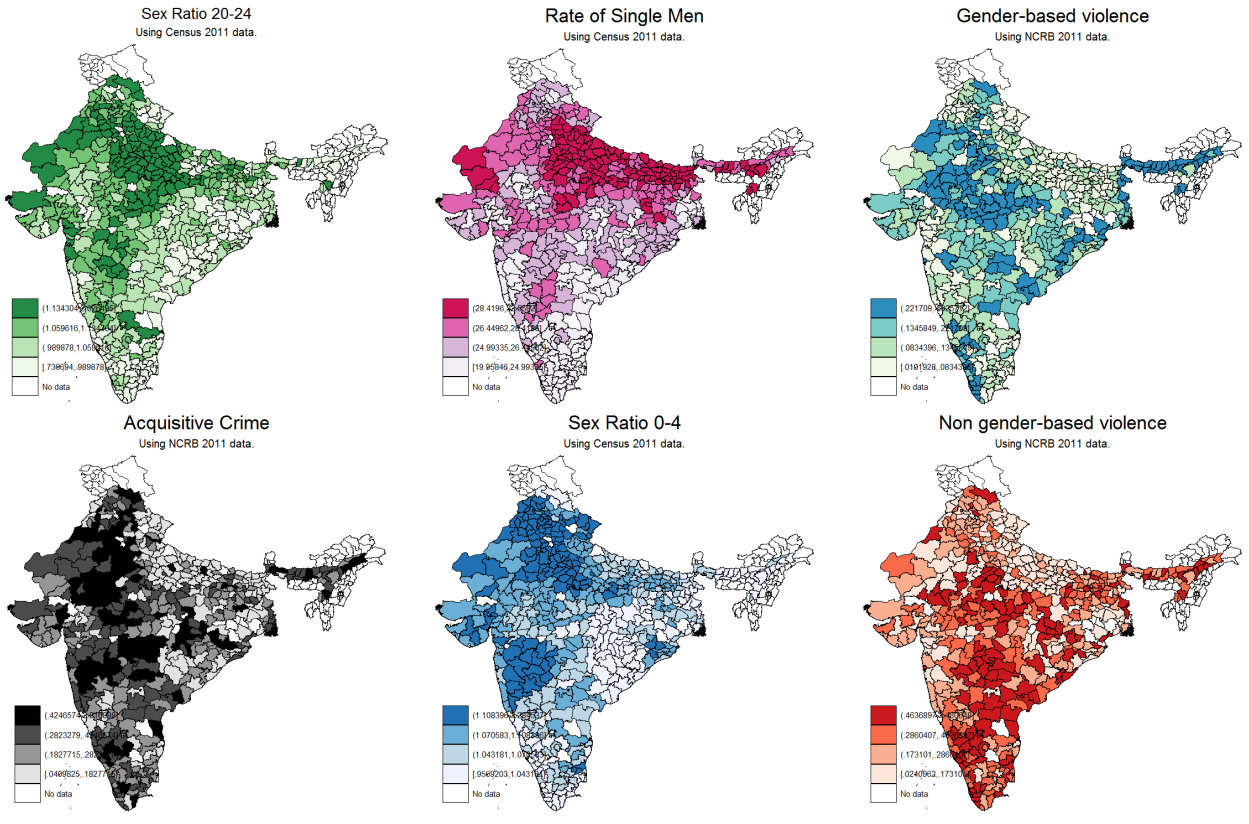
Table 14: Sex Ratio and Attitudes towards domestic violence - disaggregated by domain

Dep. Var: Index of Acceptance	(1) Movement	(2) Children	(3) Arguing
Post Ultrasound * Child Sex Ratio	0.186	0.444**	0.629***
	(0.218)	(0.190)	(0.173)
Post Ultrasound	-0.086	-0.369	-0.622***
	(0.232)	(0.215)	(0.185)
Child Sex Ratio	-0.711	-0.703	-0.147
	(0.544)	(0.417)	(0.365)
N	53,199	53,199	53,199
Adj. R-squared	0.094	0.133	0.071
Mean (SD) of Dep. Var	0.22 (0.42)	0.29(0.45)	0.24(0.43)
Controls	Yes	Yes	Yes
State FE	Yes	Yes	Yes
Birth-Year FE	Yes	Yes	Yes

Heterogeneity: The North and South Divide

Figure 7: Variation across districts in sex ratios, gender-based violence and single men



Notes: Spatial distribution of the main independent and dependent variables. Using 2011 data to calculate i) ratio of male to female population ages 20-24 and 0-4; ii) ratio of unmarried men per total males and, iii) crime rates per 100,000 population.