

Mining and Gender Gaps in India

Yana van der Meulen Rodgers, Rutgers University

United Nations University World Institute for Development
Economics Research (UNU-WIDER)

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Introduction: Motivation

- Growing interest in relationship between gender equality and econ development
 - Dev't and structural change may not necessarily benefit women
 - Little known about mining industry affects women
- Mining industry: Dutch disease; resource blessing versus resource curse
 - Recent set of studies found some beneficial social impacts
- Our aim: add new evidence to this debate in context of mining in India

Introduction: Approach

- Estimate impact of proximity to mines and mineral deposits on women's agency as measured by:
 - acceptance of domestic violence
 - barriers to accessing medical care
 - shared decision-making
- Examine underlying mechanisms
 - Changes in women's education and health
 - legislation requiring mining companies to invest a share of profits into local communities
- Data: India's 2015-2016 Demographic and Health Survey
 - Includes point coordinates for surveyed clusters
 - Matched to the geo-referenced location of mineral deposits and mines
- Methodology: difference-in-differences approach

Introduction: Contribution

- New evidence on resource curse versus blessing
- Also contributes to debate on association btw women's agency and domestic violence
 - Some studies: women's economic empowerment → less domestic violence (due to increase in women's fallback position and bargaining power)
 - Other studies: women's economic empowerment → more domestic violence (due to backlash effect)
 - Empirically ambiguous; needs more evidence

Background: Mining in India

- India is rich in mineral and metal deposits
 - produces almost 84 minerals; has about 3700 mines
 - produces over 1 billion tons annually
 - biggest minerals: iron ore, manganese ore, bauxite, copper ore, lead & zinc ore, dolomite, limestone, coal
 - Also has copper, gold, silver, diamond, nickel, and cobalt, known for their high value
- Women's employment share in mining is low overall but varies by mineral type
 - Higher in the precious metals and minerals
 - Higher in mines closer to the surface
 - Methodology distinguishes "HFSL" mines: mines with high female labor shares
 - Test Ester Boserup's hypothesis on value of women's labor

More Details on Data

- DHS: 3 samples. Women ages 15-49 (n= \sim 43,000); children ages 0-5 (n= \sim 20,000); men ages 15-54 (n= \sim 35,000).
 - geocoded spatial data documenting geographic location of survey clusters
 - Each respondent matched to nearest mineral deposit and mine
 - Include host of individual and HH characteristics
- Mineral deposit data from Mineral Atlas of India; contains 76 map sheets for minerals all over India (see sample)
 - Geocoded all map sheets to get deposits' geographic coordinates to construct proximity measures
 - Located 2,553 deposits across India
 - Figure 1: India with geocoded deposits of various types overlaid on district boundaries

Appendix Figure 1:
Sample Map Sheet
from the Mineral
Atlas of India

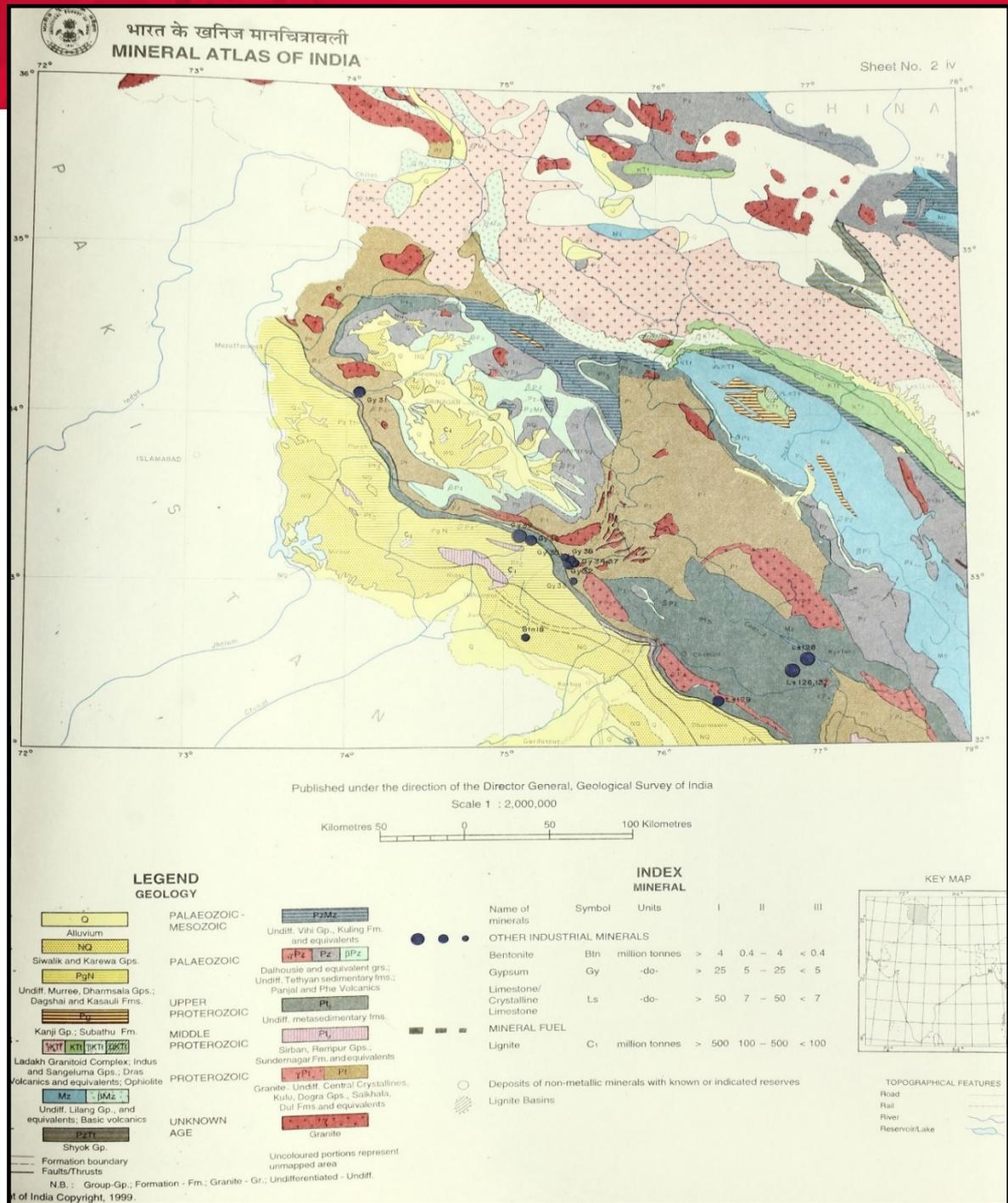
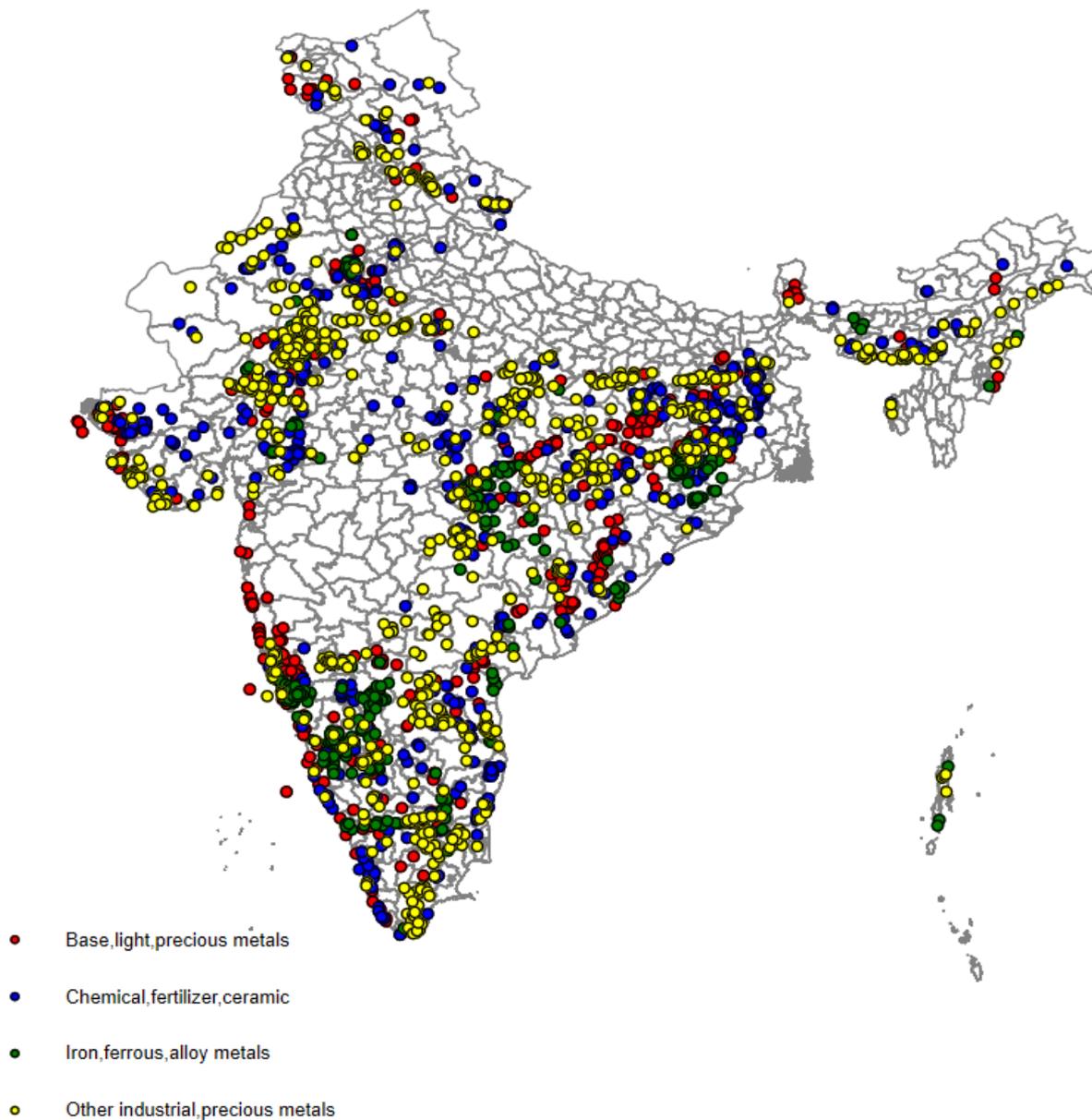


Figure 1:
Distribution
of mineral
deposits in
India



More Details on Data

- Data on location of mines: U.S. Geological Survey, compiled w/ other sources for maps and mineral locations
 - Have information on whether or not mines are active
- Key indicators, each within 5km from respondent:
 - Mineral proximity: Whether there is a mineral deposit
 - Mineral intensity: # of mineral deposits
 - Presence of active mine, any kind of mine
 - Presence of active mine, HFLS
- Various sources support choice of 5km as benchmark distance
- Additional data control for levels of local development:
 - Global Human Footprint index (indicators for urbanization, population density, infrastructure)
 - Access to electricity
 - Source of drinking water

Sample Means for Women Respondents

	mean	standard deviation
Panel A		
<i>Justifies beating if</i>		
wife goes out without telling	0.300	0.458
neglects children	0.368	0.482
argues with husband	0.320	0.467
refuses sex	0.149	0.356
does not cook food properly	0.209	0.407
Index	0.268	0.339
emotional violence	0.140	0.347
Panel B		
<i>Barriers when seeking healthcare</i>		
Permission	0.176	0.381
Money	0.261	0.439
fear to go alone	0.190	0.393
Index	0.209	0.314

Sample Means for Women Respondents

	mean	standard deviation
Panel C		
<i>Shared decision-making related to</i>		
own earnings	0.822	0.383
own healthcare	0.761	0.427
large purchases	0.761	0.427
visits to family	0.774	0.418
husband's earnings	0.716	0.451
index1	0.808	0.309
index2	0.752	0.361

Sample Means for Women Respondents

	mean	standard deviation
Panel D		
<i>Women's health</i>		
Literate	0.622	0.485
Height	152.078	5.892
BMI	22.314	4.262
overweight/obese	0.230	0.421
Underweight	0.183	0.387
Hemoglobin levels (HBA)	11.644	1.635
Anemic	0.541	0.498
high BP	0.109	0.311
high glucose	0.497	0.500
any health insurance	0.277	0.448
health insurance from employer	0.007	0.082
health insurance from central/state government	0.160	0.367

More sample means in paper for other dependent variables and all control variables

Methodology

- Difference-in-differences (DD) framework that conditions on treatment and control groups based on distance measures
- Also interested in additional impacts of mining on younger women (ages 15-25) → include a triple difference term
- $$Y_{icd} = \beta_0 + \beta_1 deposit_c + \beta_2 activemine_c + \beta_3 (deposit_c \times activemine_c) + \beta_4 young_i + \beta_5 (deposit_c \times activemine_c \times young_i) + X_i + \lambda_d + \lambda_s + \epsilon_{icd}$$
 - Include F-test statistics that differential impacts for young women are significantly different from zero
 - Include state and district fixed effects
 - Regressions weighted; robust standard errors clustered at the DHS cluster level.

Results: Women's Acceptance of Domestic Violence

- Overall: women near active mines and deposits (especially HFLS mines) less likely to accept that violence is justified
 - signals improvement in their agency
- Examples of results from Table 2:
 - Women in proximity of deposits and active HFLS mines are 16.4 percentage points less likely to accept that violence is justified for going out without permission
 - Women near deposits and HFLS mines are 38.1 percentage points less likely to accept that violence is justified for arguing with one's husband or partner
 - young women are 15.5 percentage points less likely to agree that physical abuse is justified in terms of the aggregate index indicator
- Next 2 slides show structure of results table for Panel A: near active HFLS mines. Table in paper also has Panel B: near active mines (of any kind).

Results for Women's Acceptance of Domestic Violence

	goes out without permissio n (1)	neglects children (2)	Beating justified if the wife: argues with husband (3)	refuses sex (4)	does not cook food properly (5)	index (6)	emotiona l violence (7)
Panel A: HFLS mines							
Proximity (whether there is a deposit within 5 km):							
presence of deposit*presence of HFLS active mine	-0.164*	-0.186	-0.381**	0.001	-0.054	-0.149	-0.066
	(0.093)	(0.194)	(0.161)	(0.079)	(0.106)	(0.098)	(0.104)
presence of deposit*presence of HFLS active mine*young	0.017	0.003	0.007	-0.008	0.033	0.010	0.036**
	(0.022)	(0.024)	(0.024)	(0.020)	(0.023)	(0.017)	(0.015)
net effect for young	-0.147	-0.183	-0.374	-0.007	-0.020	-0.139	-0.030
F-statistic	2.400	0.880	5.400	0.010	0.040	2.140	0.080
	[0.121]	[0.347]	[0.020]	[0.936]	[0.848]	[0.144]	[0.774]

Results for Women's Acceptance of Domestic Violence

	Beating justified if the wife:						
	goes out without permissio n (1)	neglects children (2)	argues with husband (3)	refuses sex (4)	does not cook food properly (5)	index (6)	emotiona l violence (7)
Panel A Continued: HFLS mines							
Intensity (number of deposits within 5km):							
number of deposits*presence of HFLS active mine	-0.191** (0.088)	-0.206 (0.193)	-0.363** (0.157)	-0.011 (0.076)	-0.066 (0.102)	-0.164* (0.093)	-0.0525 (0.102)
number of deposits*presence of HFLS active mine*young	0.017 (0.022)	0.003 (0.024)	0.007 (0.024)	-0.008 (0.020)	0.033 (0.023)	0.010 (0.017)	0.036** (0.015)
net effect for young	-0.174	-0.203	-0.356	-0.020	-0.033	-0.155	-0.016
F-statistic	3.880 [0.049]	1.110 [0.293]	5.140 [0.024]	0.060 [0.799]	0.100 [0.748]	2.780 [0.095]	0.030 [0.871]

Results: Women's Barriers to Healthcare

- Overall: proximity to HFLS mines brings benefits to women in reducing barriers to seeking healthcare
- Examples of results from Table 3:
 - For young women, fear of going alone declines by 41.4 percentage points, while the need to ask for permission decreases by 24.6 percentage points.
 - proximity to HFLS mines increases need for money among young women by 68.1 percentage points. Likely due to seeking higher quality healthcare
 - Women in the proximity of HFLS mines conditional on the number of deposits experience a 15.8 percentage point decline in barriers as measured by the index
- Next slide shows structure of results table for Panel A: near active HFLS mines. Table in paper also has Panel B: near active mines (of any kind).

Results for Women's Barriers to Healthcare

	Barriers while seeking medical care related to:			
	permission	money	fear of going alone	index
	(1)	(2)	(3)	(4)
Panel A: HFLS mines				
Proximity (whether there is a deposit within 5 km):				
presence of deposit*presence of HFLS active mine	-0.248*** (0.072)	-0.180** (0.073)	-0.070 (0.077)	-0.166*** (0.059)
presence of deposit*presence of HFLS active mine*young	0.002 (0.016)	0.861*** (0.017)	-0.345*** (0.015)	0.173*** (0.013)
net effect for young	-0.246	0.681	-0.414	0.007
F-statistic	11.470 [0.000]	84.700 [0.000]	28.470 [0.000]	0.010 [0.907]
Intensity (number of deposits within 5km):				
number of deposits*presence of HFLS active mine	-0.232*** (0.070)	-0.177** (0.071)	-0.065 (0.075)	-0.158*** (0.058)
number of deposits*presence of HFLS active mine*young	0.002 (0.016)	0.861*** (0.017)	-0.345*** (0.015)	0.173*** (0.013)
net effect for young	-0.229	0.683	-0.409	0.015
F-statistic	10.600 [0.001]	92.090 [0.000]	29.080 [0.000]	0.060 [0.799]

Results: Women's Say in Shared Decision-making

- Overall: compared to the other measures of agency, effects of mining on shared decision-making are noisier
- Examples of results from Table 4:
 - Women less likely to have shared decision-making about visiting family
 - In the case of shared decision making about husband's earnings, young women in the proximity of HFLS mines report an 8.2 percentage point increase
- Next slide shows structure of results table for Panel A: near active HFLS mines. Table in paper also has Panel B: near active mines (of any kind).

Results for Women's Say in Shared Decision-making

	Final say in decision-making related to:						
	own earnings (1)	own healthcare (2)	large purchases (3)	visits to family (4)	husband's earnings (5)	index 1 (6)	index 2 (7)
Panel A: HFLS mines							
Proximity (whether there is a deposit within 5 km):							
presence of deposit*presence of HFLS active mine		-0.107 (0.086)	0.020 (0.075)	-0.148** (0.067)	-0.001 (0.054)		-0.058 (0.062)
presence of deposit*presence of HFLS active mine*young		0.062*** (0.017)	0.100*** (0.018)	0.075*** (0.017)	0.081*** (0.018)		0.079*** (0.016)
net effect for young		-0.045	0.120	-0.072	0.080		0.021
F-statistic		0.260 [0.609]	2.510 [0.114]	1.130 [0.288]	2.320 [0.128]		0.120 [0.734]

Results for Women's Say in Shared Decision-making

	Final say in decision-making related to:						
	own earnings (1)	own healthcare (2)	large purchases (3)	visits to family (4)	husband's earnings (5)	index 1 (6)	index 2 (7)
Panel A: HFLS mines continued							
Intensity (number of deposits within 5km):							
number of deposits*presence of HFLS active mine		-0.115 (0.080)	0.008 (0.070)	-0.153** (0.064)	0.001 (0.047)		-0.062 (0.058)
number of deposits*presence of HFLS active mine*young		0.062*** (0.017)	0.100*** (0.018)	0.075** * (0.0172)	0.081*** (0.018)		0.079*** (0.015)
net effect for young		-0.053	0.108	-0.078	0.082		0.017
F-statistic		0.390 [0.532]	2.290 [0.130]	1.450 [0.229]	2.980 [0.085]		0.080 [0.777]

What are the Mechanisms?

- Hypothesis: proximity to active mines affects women's agency measures by improving their education and health
 - Hypothesis tested by running similar regressions for women's human capital:
 - Women's education
 - Women's health
 - Women's access to health insurance
 - Overall: Results show strong positive impact of proximity to mines on these measures of human capital, especially for young women and especially for proximity to HFLS mines
- Validity of these results checked with robustness tests for children's health (given strong prior evidence on positive effect of women's human capital on child health)
 - Find positive effects for children's WAZ, WHZ, & HAZ scores

Why do these Mechanisms Occur?

- Hypothesis: mining companies are sharing profits with local communities
 - Hypothesis tested by constructing a profit-sharing variable and interacting it with presence of active mines
 - Ran regressions capturing how profit sharing would affect women's earning capacity as measured by:
 - Employment
 - Cash earnings
 - Asset ownership
 - Financial awareness
 - Overall profit-sharing near HFLS mines increases the probability that women are employed, earn cash, and have access to financial capital, which improves their agency.

Robustness, Falsification and Specification Checks

- Conducted a series of robustness checks:
 - Sorting into mining areas not an issue
 - Men's responses for employment, attitudes toward domestic violence, and shared decision-making mirror those of women
 - Checked for pre-trends, determining treatment distance non-parametrically, falsification tests, and results that condition on environmental impacts as measured by PM2.5
- Conducted a spatially randomized placebo test for model mis-specification; randomly displaced location of active mines
 - Estimated effects still held

Conclusion

- Proximity to mineral/metal mines results in measurable benefits for women:
 - Women less accepting of physical violence, face lower costs of accessing medical care, and report more equitable decision-making in a variety of spheres
 - Impacts pronounced for younger women (ages 15-25)
 - Impacts stronger in vicinity of HFLS mines, which are more likely to value women's labor compared to other types of mines (e.g. coal) so women's status is relatively higher.
- Key mechanism: Mining company sharing of profits with local populations, which benefits women's employment and financial awareness and access
- Conclude that mining industry can contribute to sustainable development and social well-being conditional on policies to share rents and protect women

Source

Amanda Guimbeau, James Ji, Nidhiya Menon, and Yana van der Meulen Rodgers “Mining and Gender Gaps in India,” working paper.