Rural Roads Infrastructure and Women Empowerment in India

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Motivation

- The paper evaluates the impact of a transportation investment policy on women outcomes in India

- Why roads? Physical mobility restrictions have been recognised as a critical constraint limiting socio-economic participation of females

- GoI policy eased constraints to mobility for women by connecting previously unconnected villages to the nearest market centre

- The intervention roll-out provides us with an exogenous variation in the exposure of rural population to paved roads allowing to uncover the causal impact

Policy

- 6,00,000 villages in India; as of 2000 50% of them were unconnected by a paved road

- Geographical isolation - impediment to provision of public services and engagement in economic activities outside agriculture

- GoI in 2000 launched Pradhan Mantri Gram Sadak Yojna (PMGSY) - a flagship rural roads construction program

- Objective - connecting previously unconnected habitations with a population of more than 500 to the nearest market center by constructing all-weather roads

- Used population census of 2001

Policy

- Staggered rollout

- Villages with population above 1000 were to be connected first

- Followed by villages with population size of 500 and then 250 (if eligible)

- By 2010-11, around 290,000 km of paved roads have been constructed

- Connecting nearly 85000 villages to their nearest market centers

- PMGSY is centrally funded but implemented by states

Impact of PMGSY

- Paved roads facilitated by improved transportation facilities and reduction in transportation cost can make it easier for women to travel within and outside their village

- Women in developing countries have to travel long distance to fetch water and firewood

- Time saved by making quicker trips can be used on other employment activity

- Better connection with market town provides easy access to education and employment opportunities outside agriculture

- Increased intercultural assimilation and change the perception about the appropriate role of women in society

- However, underlying social norms might limit the impact

- Women are less likely than men to have access to motorized transport options

Literature

- Large body of work assessing the impact of transportation infrastructure on economic development

- (Ghani, Goswami and Kerr, 2016; Asturias, García-Santana and Ramos, 2019; Alder, 2016), poverty reduction (Lokshin and Yemtsov, 2005; Khandker, Bakht and Koolwal, 2009), education (Chaudhary and Fenske, 2023) and employment generation (Roberts, Bougna, Melecky and Xu, 2018)

- Growing interest in the evaluation of PMGSY

- Improve employment opportunities for males outside agriculture (Asher and Novosad, 2020), adoption of agricultural technology (Shamdasani, 2021), crop and diet diversity, reduce price disparity (Aggarwal, 2018), improve education opportunities for the younger cohort (Adukia, Asher and Novosad, 2020), increase health care utilisation and health outcomes for women (Aggarwal, 2021) and children (Dasgupta, Karandikar and Raghav, 2022)

- Closest to our research - Lei, Desai and Vanneman (2019) that evaluates the impact of rural roads construction of female employment in non-agriculture

- Female non-agricultural employment increased after the construction of rural roads and the gap in female and male employment declines

- Our results in line with Shimamura, Shimizutani, Yamada and Yamada (2023), (Dasgupta, Karandikar and Raghav, 2022) and (Khandker, Bakht and Koolwal, 2009)

PMGSY Data

- Administrative Data on Road Construction

- PMGSY data is available online through Online Management and Monitoring System (OMMS)

- Village level information

- Baseline level of road-connectivity, population, whether it got a road under the program, and year in which the road was approved and built

Empowerment

- Processes by which women gain the ability to exercise choice, voice and influence – both within their personal lives and in the wider community

- Women's empowerment is not a single-dimensional phenomenon (Moghadam (1996); Kabeer (1999); Janssens (2010))

- Women's economic empowerment extends beyond women's economic position (Kabeer et al. (2011) and Golla et al. (2011))

- Use several economic outcomes to capture women's empowerment

- Include indicators for mobility, perceptions about domestic violence, participation in household discussion, fertility, financial autonomy, agency within the household, educational attainment, labor market participation

Women outcomes data

- India Human Development Survey - nationally representative multi-topic panel household survey

- Use two waves conducted in 2004-05 and 2011-12

- IHDS randomly chose one ever-married woman above the age of 15 from each surveyed household

- This module contains questions on gender norms

- Also use National sample Survey (NSS) rounds conducted in 2004-05 and 2011-12 to get information on education and employment status of women

Summary statistics

Variable	Obs	Mean	Std. Dev.
Independent variable			
Exposed pop (till 2004)	464	5.9	5
Exposed pop (till 2010)	465	14.3	13
Exposed pop (average)	929	10.1	10.7
Controls (IHDS)			
HH size	31,839	5.58	2.46
Age	31,839	36.58	8.96
HH cons exp	31,825	98764.04	95022.22
Initial wealth	31,835	11.70	5.69
Controls (NSS)			
HH size	1,82,923	5.81	3.05
ST	1,82,923	0.09	0.29
SC	1,82,923	0.19	0.39
OBC	1,82,923	0.44	0.50
Hindu	1,82,923	0.84	0.37
Muslim	1,82,923	0.09	0.28
Age	1,82,923	36.77	12.92
Land Owned	1,76,831	1233.86	2533.20
Monthly cons exp	1,82,923	219.38	190.44
Married	1,82,911	0.92	0.27

Table 3: Summary statistics

Table 2: Summary statistics

Variable	Obs	Mean	Std. Dev.	Mean (2005)	Mean (2011)
Outcome Variables (IHDS)					
HealthCentreVis	31,674	0.78	0.41	0.79	0.78
FriendHomeVis	31,485	0.74	0.44	0.78	0.69
KiranaShopVis	26,162	0.58	0.49	0.58	0.57
LeaveWoPerm	31,748	0.49	0.50	0.43	0.56
ExtrMarAff	31,720	0.88	0.33	0.89	0.86
NoDowry	31,745	0.32	0.46	0.29	0.34
HouseNglct	31,755	0.40	0.49	0.36	0.45
BadCooking	31,743	0.33	0.47	0.31	0.34
WorkDiscuss	30,912	0.42	0.49	0.39	0.45
ExpDiscuss	30,926	0.51	0.50	0.48	0.53
PolitDiscuss	30,911	0.20	0.40	0.19	0.21
DesirChild	30,023	2.55	0.99	2.49	2.60
SonPref	27,760	0.29	0.45	0.30	0.28
CashInHand	31,776	0.87	0.34	0.80	0.93
BankAccount	15,638	0.53	0.50	0.42	0.58
HousePaper	30,630	0.16	0.37	0.15	0.18
Cooking	31,686	0.73	0.44	0.73	0.74
HHPurchase	31,589	0.11	0.31	0.09	0.12
NumChildren	30,671	0.21	0.40	0.16	0.25
ChildIllness	31,001	0.29	0.45	0.28	0.30
ChildWedding	30,813	0.11	0.32	0.08	0.14
AnimalCare	19,765	0.45	0.50	0.41	0.48
Purdah	31,779	0.60	0.49	0.59	0.61
Menmealfirst	31,733	0.33	0.47	0.37	0.28
English	31,546	0.09	0.29	0.07	0.11
Outcome Variables (NSS)					
Attending edu inst	1,57,340	0.40	0.49	0.36	0.46
Attending tech inst	2,89,349	0.01	0.08	0.01	0.01
Employed	1,77,951	0.38	0.49	0.42	0.32
Inlabforce	1,77,951	0.40	0.49	0.44	0.33
Wageemployee	1,77,951	0.02	0.16	0.02	0.03
Casuallabor	1,77,951	0.12	0.33	0.14	0.10
Selfemployed	1,77,951	0.24	0.42	0.27	0.19
Socialsecurity	8,416	0.26	0.44	0.25	0.26
Subsidiary	1,82,923	0.28	0.45	0.31	0.23

Empirics

- Ideally, we would like to exploit the program rule that uses village population threshold to determine eligibility in a RDD framework for identification

- However, IHDS does not have village level identifiers

- Make use of two-way fixed effects methodology

- We estimate:

$$y_{idt} = \alpha_i + \gamma_t + \beta PopExposed_{dt} + \delta X_{idt} + \varepsilon_{idt}, \ t = 2005, \ 2011$$

Empirics

- Identification - the variation in the percentage of population receiving roads in each district is primarily a function of variation in the distribution of sizes of unconnected villages in each district

- Acknowledge factors other than population could be playing a role in selection

- Aggarwal (2018) shows that there is a discontinuous jump in the probability of road construction by 2010 around the village population of 500 and 1000

- Initial provision of public goods at the village level is not correlated with likelihood of road construction by 2011

Impact of PMGSY on mobility restrictions and domestic violence

Table 4: Mobility restrictions and Domestic violence perceptions

	Mobility				Domestic violence					
	(1) HealthCentreVis	(2) FriendHomeVis	(3) KiranaShopVis	(4) Mobil	(5) LeaveWoPerm	(6) ExtrMarAff	(7) NoDowry	(8) HouseNglct	(9) BadCooking	(10) IPV
Exposed pop	-0.005***	-0.008***	-0.008***	-0.007***	-0.008***	0.001	-0.008***	-0.010***	-0.008***	-0.007***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean DV	0.78	0.74	0.58	0.67	0.49	0.88	0.32	0.40	0.33	0.46
Sharpened q values	0.001	0.001	0.001	0.001	0.001	0.099	0.001	0.001	0.001	0.001
N	31657	31469	26150	26034	31731	31703	31728	31738	31726	31646

Standard errors in parentheses

Notes: Refer to Table 1 for definition of outcome variables. *Exposedpop* is the percentage of district 2001 population exposed to PMGSY roads. Standard errors are clustered at the district level in all specifications. For computing sharpened q values, we follow a procedure proposed by Benjamini et al. (2006) and outlined in Anderson (2008).
+ $p < 0.15$, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Results

Table 5: Intrahousehold agency

	(1) Cooking	(2) HHPurchase	(3) NumChildren	(4) ChildIllness	(5) ChildWedding	(6) AnimalCare	(7) WorkDiscuss	(8) ExpDiscuss	(9) PolitDiscuss	(10) Agency
Exposed pop	-0.002	-0.001+	-0.003**	0.003	0.000	0.006***	0.004	0.009**	0.002	0.003**
	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.004)	(0.004)	(0.002)	(0.001)
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DV mean	0.73	0.11	0.21	0.29	0.11	0.45	0.42	0.51	0.20	0.33
Sharpened q values	0.283	0.183	0.048	0.25	0.5	0.001	0.5	0.163	0.283	0.072
N	31670	31572	30654	30984	30796	19762	30895	30909	30894	18079

Standard errors in parentheses

Notes: Refer to Table 1 for definition of outcome variables. *Exposedpop* is the percentage of district 2001 population exposed to PMGSY roads. For computing sharpened q values, we follow a procedure proposed by Benjamini et al. (2006) and outlined in Anderson (2008). Standard errors are clustered at the district level in all specifications.

+ $p < 0.15$, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Financial autonomy

	(1) CashInHand	(2) BankAccount	(3) HousePaper	(4) Finauto
Exposed pop	0.003*	-0.002	-0.000	-0.001
	(0.002)	(0.003)	(0.001)	(0.002)
Individual FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
DV mean	0.87	0.53	0.16	0.57
Sharpened q values	0.25	1	1	1
N	31759	15614	30613	15188

Standard errors in parentheses

Notes: Refer to Table 1 for definition of outcome variables. *Exposedpop* is the percentage of district 2001 population exposed to PMGSY roads. For computing sharpened q values, we follow a procedure proposed by Benjamini et al. (2006) and outlined in Anderson (2008). Standard errors are clustered at the district level in all specifications.

$^+$ $p < 0.15$, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Results
Miscellaneous gender norms

Table 7: Miscellaneous gender outcomes

	(1) Purdah	(2) menmealfirst	(3) natalvisit	(4) NoEnglish	(5) SonPref	(6) Miscnorm
Exposed pop	-0.001	-0.005***	-0.001	-0.001	0.000	-0.002***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
DV mean	0.60	0.33	0.27	0.29	0.29	0.46
Sharpened q values	0.316	0.001	0.345	0.316	0.563	0.006
N	31762	31716	30707	31531	27749	26519

Standard errors in parentheses

Notes: Refer to Table 1 for definition of outcome variables. *Exposedpop* is the percentage of district 2001 population exposed to PMGSY roads. For computing sharpened q values, we follow a procedure proposed by Benjamini et al. (2006) and outlined in Anderson (2008). Standard errors are clustered at the district level in all specifications.

[+] $p < 0.15$, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Results
Education outcomes

Table 8: Rural roads and education outcomes for females

	(1) Attending edu inst	(2) Attending tech inst
Exposed pop	0.002***	0.000**
	(0.000)	(0.000)
District FE	Yes	Yes
Year FE	Yes	Yes
Controls	Yes	Yes
DV mean	0.40	0.01
Sharpened q values	0.001	0.006
Observations	151433	279572

Standard errors in parentheses

Notes: Refer to Table 1 for definition of outcome variables. *Exposedpop* is the percentage of district 2001 population exposed to PMGSY roads. For computing sharpened q values, we follow a procedure proposed by Benjamini et al. (2006) and outlined in Anderson (2008). Standard errors are clustered at the district level in all specifications.

$^{+}$ $p < 0.15$, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Results

Female employment

Table 9: Rural roads and female employment

	(1) Employed	(2) inlabforce	(3) wageemployee	(4) casuallabor	(5) selfemployed	(6) socialsecurity	(7) subsidiary
Exposed pop	0.000	0.000	0.000*	-0.000	0.000	0.004***	0.001
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DV mean	0.38	0.40	0.02	0.12	0.24	0.26	0.28
Sharpened q values	0.725	0.725	0.429	0.725	0.725	0.001	0.539
Observations	171998	171998	171998	171998	171998	7705	176821

Standard error in parentheses

Notes: Refer to Table 1 for definition of outcome variables. *Exposedpop* is the percentage of district 2001 population exposed to PMGSY roads. For computing sharpened q values, we follow a procedure proposed by Benjamini et al. (2006) and outlined in Anderson (2008). Standard errors are clustered at the district level in all specifications.

[+] $p < 0.15$, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Results

Differential impact

Table 10: Differential impact: Rural roads and education outcomes

	(1) Attending edu inst	(2) Attending tech inst
Exposed pop	0.002***	0.000
	(0.000)	(0.000)
Female	0.014***	-0.012***
	(0.004)	(0.001)
Fem × Exposed pop	-0.000*	0.000***
	(0.000)	(0.000)
District FE	Yes	Yes
Year FE	Yes	Yes
Controls	Yes	Yes
Sharpened q values	0.037	0.001
Observations	314913	572052

Standard errors in parentheses

Notes: Refer to Table 1 for definition of outcome variables. *Exposedpop* is the percentage of district 2001 population exposed to PMGSY roads. For computing sharpened q values, we follow a procedure proposed by Benjamini et al. (2006) and outlined in Anderson (2008). Standard errors are clustered at the district level in all specifications.

$^{+}$ $p < 0.15$, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Results
Differential impact

Table 11: Differential impact: Rural roads and employment

	(1) Employed	(2) inlabforce	(3) wageemployee	(4) casuallabor	(5) selfemployed	(6) socialsecurity	(7) subsidiary
Exposed pop	0.003***	0.003***	0.000	0.002***	0.001	0.000	0.002***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Female	-0.538***	-0.534***	-0.084***	-0.131***	-0.323***	-0.005	-0.017
	(0.015)	(0.015)	(0.003)	(0.008)	(0.010)	(0.013)	(0.012)
Fem × Exposed pop	-0.005***	-0.006***	0.000	-0.003***	-0.002**	0.000	-0.003***
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sharpened q values	0.001	0.001	0.331	0.001	0.007	0.311	0.001
Observations	341248	341248	341248	341248	341248	47939	355141

Standard errors in parentheses

Notes: Refer to Table 1 for definition of outcome variables. *Exposedpop* is the percentage of district 2001 population exposed to PMGSY roads. For computing sharpened q values, we follow a procedure proposed by Benjamini et al. (2006) and outlined in Anderson (2008). Standard errors are clustered at the district level in all specifications.

$^{+}$ $p < 0.15$, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Robustness and Future checks

- Robust to district as well as village controls

- Robust to IV-2SLS specification – use the share of population in a district above 500 [first stage coefficient – 0.67, F – 41]

- Future work –heterogeneous treatment effects

Robustness

Table A1: Mobility restrictions and domestic violence

	(1) HealthCentreVis	(2) FriendHomeVis	(3) KiranaShopVis	(4) Mobil	(5) LeaveWoPerm	(6) ExtrMarAff	(7) NoDowry	(8) HouseNglct	(9) BadCooking	(10) IPV
Panel A - District Controls										
Exposed pop	-0.005***	-0.009***	-0.008**	-0.007***	-0.011***	0.001	-0.009***	-0.012***	-0.010***	-0.008***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)
N	31657	31469	26150	26034	31731	31703	31728	31738	31726	31646
Panel B - Village Controls										
Exposed pop	-0.005***	-0.009***	-0.008***	-0.008***	-0.010***	0.001	-0.007***	-0.010***	-0.009***	-0.007***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)
N	30515	30328	25137	25024	30586	30560	30586	30594	30583	30506
Panel C - IV-2SLS										
Exposed pop	-0.008**	-0.012***	-0.012**	-0.010***	-0.009*	0.003	-0.010**	-0.017***	-0.011***	-0.009**
	(0.003)	(0.004)	(0.005)	(0.004)	(0.005)	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)
N	31254	30888	22000	21808	31390	31334	31384	31404	31380	31220
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

Notes: Refer to Table 1 for definition of outcome variables. *Exposedpop* is the percentage of district 2001 population exposed to PMGSY roads.

Standard errors are clustered at the district level in all specifications.

+ $p < 0.15$, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Robustness

Table A2: Intrahousehold agency

	(1) Cooking	(2) HHPurchase	(3) NumChildren	(4) ChildIllness	(5) ChildWedding	(6) AnimalCare	(7) WorkDiscuss	(8) ExpDiscuss	(9) PolitDiscuss	(10) Agency
					Panel A - District controls					
Exposed pop	-0.002	-0.001**	-0.004**	0.001	-0.000	0.006***	0.001	0.007*	0.002	0.002$^+$
	(0.003)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.004)	(0.004)	(0.002)	(0.001)
N	31670	31572	30654	30984	30796	19762	30895	30909	30894	18079
					Panel B - Village controls					
Exposed pop	-0.002	-0.002**	-0.005***	0.001	-0.000	0.006***	0.001	0.006$^+$	0.002	0.002
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.003)	(0.004)	(0.002)	(0.001)
N	30535	30435	29543	29888	29720	19321	29778	29792	29779	17692
					Panel C - IV-2SLS					
Exposed pop	0.005	-0.000	-0.002	0.002	-0.001	0.003	-0.001	0.008	-0.000	0.004*
	(0.003)	(0.001)	(0.002)	(0.004)	(0.001)	(0.003)	(0.005)	(0.006)	(0.003)	(0.002)
N	31268	31092	29334	30112	29748	15428	29966	29994	29962	13164
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses
Notes: Refer to Table 1 for definition of outcome variables. *Exposedpop* is the percentage of district 2001 population exposed to PMGSY roads. Standard errors are clustered at the district level in all specifications.
$^+$ $p < 0.15$, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Robustness

Table A3: Financial autonomy

	(1) CashInHand	(2) BankAccount	(3) HousePaper	(4) Finauto
Panel A - District Controls				
Exposed pop	0.004*	-0.001	0.000	0.000
	(0.002)	(0.003)	(0.002)	(0.002)
N	31759	15614	30613	15188
Panel B - Village Controls				
Exposed pop	0.003*	-0.001	0.001	0.001
	(0.002)	(0.003)	(0.002)	(0.002)
N	30615	14938	29489	14517
Panel C - IV-2SLS				
Exposed pop	0.002	-0.005	0.001	0.001
	(0.003)	(0.005)	(0.003)	(0.004)
N	31448	7378	29238	6998
Individual FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

Standard error in parentheses

Notes: Refer to Table 1 for definition of outcome variables. *Exposedpop* is the percentage of district 2001 population exposed to PMGSY roads. Standard errors are clustered at the district level in all specifications.

+ $p < 0.15$, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Robustness

Table A4: Miscellaneous gender outcomes

	(1) Purdah	(2) menmealfirst	(3) natalvisit	(4) NoEnglish	(5) SonPref	(6) Miscnorm
Panel A - District Controls						
Exposed pop	-0.000	-0.006***	-0.002	-0.002***	-0.000	-0.002***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
N	31762	31716	30707	31531	27749	26519
Panel B - Village controls						
Exposed pop	0.000	-0.006***	-0.002	0.002***	0.000	-0.002***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
N	30617	30573	29621	30387	26829	25661
Panel C - IV-2SLS						
Exposed pop	-0.004**	-0.009***	0.002	0.001	-0.004*	-0.003***
	(0.002)	(0.003)	(0.002)	(0.001)	(0.002)	(0.001)
N	31452	31360	29540	30990	24126	22206
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Standard error in parentheses

Notes: Refer to Table 1 for definition of outcome variables. *Exposedpop* is the percentage of district 2001 population exposed to PMGSY roads. Standard errors are clustered at the district level in all specifications.

+ $p < 0.15$, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Robustness

	(1)	(2)
	Attending edu inst	Attending tech inst
Panel A - District Controls		
Exposed pop	0.002***	0.000[+]
	(0.000)	(0.000)
Observations	150918	278482
Panel B - IV-2SLS		
Exposed pop	0.002***	-0.000
	(0.000)	(0.000)
Observations	151282	279294
District FE	Yes	Yes
Year FE	Yes	Yes
Controls	Yes	Yes

Table A5: Rural roads and education outcomes for females

Standard error in parentheses

Notes: Refer to Table 1 for definition of outcome variables. $Exposedpop$ is the percentage of district 2001 population exposed to PMGSY roads. Standard errors are clustered at the district level in all specifications.

[+] $p < 0.15$, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Robustness

Table A6: Rural roads and female employment

	(1) Employed	(2) inlabforce	(3) wageemployee	(4) casuallabor	(5) selfemployed	(6) socialsecurity	(7) subsidiary
Panel A - District Controls							
Exposed pop	0.000	-0.000	0.000***	-0.001*	0.000	0.003*	0.002*
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.002)	(0.001)
Observations	171257	171257	171257	171257	171257	7659	176066
Panel B - IV-2SLS							
Exposed pop	0.001	0.001	0.000	0.000	0.001	0.007***	0.000
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.002)	(0.001)
Observations	171840	171840	171840	171840	171840	7690	176652
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard error in parentheses

Notes: Refer to Table 1 for definition of outcome variables. *Exposedpop* is the percentage of district 2001 population exposed to PMGSY roads. Standard errors are clustered at the district level in all specifications.

[+] $p < 0.15$, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Conclusion

- The paper finds that women experience lower mobility restrictions and improved norms related to IPV

- Mixed results for education and employment.

- Our findings suggest that a part of this reason could be that men gain more, in terms of employment, than women

- Even gender-neutral policies like road construction programs can have gendered impact

- Policy makers must pay special attention to ensuring that women are not left behind and become equal beneficiaries of government policies