Do Rural Roads Promote Inclusive Entrepreneurship?

Ananyo Brahma [1] Vidhya Soundararajan [2]

[1]UC Santa Cruz

[2]CAFRAL (Reserve Bank of India) & IIT Bombay

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Introduction

- Entrepreneurship is an important engine of growth (Kerr and Nanda 2009; Ghani et al. 2013)
- Attaining inclusivity in entrepreneurship has been elusive.
- In the US, firm ownership share is 3% for Black and 7% for Hispanics in 2020.
  - Black and Hispanic adults population share: 12.4% and 19% (Leppert 2023)
- In India, enterprise ownership share is 7.6% for Scheduled Caste (SC) and 3.9% for Scheduled Tribe (ST) in 1998 (Iyer et al. 2013; Deshpande and Sharma 2013).
  - SC and ST population share: 18.2% and 9.7% respectively.
- Removing constraints to excluded groups has implications for poverty alleviation, employment generation, and inclusive growth.

Research Question & Context

- **Question**: Does rural infrastructure promote entrepreneurship among excluded/disadvantaged groups?

- **Context**: *Pradhan Mantri Gram Sadak Yogna* (PMGSY) in India
  - Rural road program providing new roads/upgrading existing roads
  - Villages with population ≥ 1000 are highest priority, followed by ≥ 500, then ≥ 250, and the rest later
  - Between 2000-2014, 70,256 **new** paved roads built (PMGSY website)

- Caste is a social stratification system in India
  - Scheduled caste (SC), Scheduled Tribe (ST), Other Backward Classes (OBC), Others
  - SC/ST are most backward (Aiyar 2011; Desai and Dubey 2012; Banerjee and Somanathan 2007) and SC/ST entrepreneurship lags behind (Deshpande and Sharma 2013)

Contribution

- Small rural infrastructure
  - improves education in India (Adukia et al. 2020);
  - increases crop diversity, agricultural inputs usage and production in remote villages in India (Shamdasani 2021), and Ethiopia (Nakamura et al. 2019);
  - enables market integration in India (Aggarwal 2018; Asher and Novosad 2020) and Vietnam (Mu and Walle 2011)

- Absence of studies on inclusion and distributional impacts

- Relates to literature on:
  1. Social inclusion and ways to achieve it (Chin and Prakash 2011; Pande 2003; Chakraborty et al. 2023; Garg et al. 2023; Ghani et al. 2014; Naaraayanan 2019)
  2. Effects of market reforms on inequality in outcomes (Ghani et al. 2016)
  3. The determinants and success of entrepreneurs (Kerr and Nanda 2009; Ghani et al. 2013)

Data Sources

1. **Economic Census** (EC): 1990, 1998, 2005, 2013 (4 rounds)
2. **Population Census** (PC): 1991, 2001, 2011 (3 rounds)
3. **PMGSY** road data (from program website)
4. Socioeconomic High-resolution Rural-Urban Geographic Platform for India (**SHRUG**) (Asher et al. 2021)
5. Central Information System for Banking Infrastructure (CISBI)
6. Basic Statistical Returns, Reserve Bank of India

Empirical Strategy: Difference-in-differences

- Outcome variables: Number of enterprises owned by a specific caste group
- Treatment: New road to a previously unconnected village
- The estimating equation is:

$$Y_{vt} = \beta \ NewRoad_{vt} + \gamma_{st} + \eta_v + \epsilon_{vt} \quad (1)$$

  where v denotes village, s denotes state, and t denotes time

- State-time FE (γ_{st}) and village FE (η_v)
- Standard errors are clustered at the village level

Summary Stats: Share

Results: Entrepreneurship by Caste Group

	(1)	(2)	(3)	(4)	(5)	(6)
	Manufacturing			Services		
	Number of Enterprises owned by			Number of Enterprises owned by		
	SC	ST	Others	SC	ST	Others
Panel A: OLS						
New Road	-0.038**	0.001	0.220***	0.092***	0.047***	0.862***
	(0.018)	(0.011)	(0.044)	(0.016)	(0.012)	(0.070)
Observations	529,879	529,879	529,879	529,879	529,879	529,879
Panel B: De Chaisemartin and d'Haultfoeuille 2020						
New Road	-0.034	-0.014	0.139**	0.063***	0.014	0.472***
	(0.022)	(0.012)	(0.061)	(0.018)	(0.014)	(0.077)
Observations	304,932	304,932	304,932	304,932	304,932	304,932

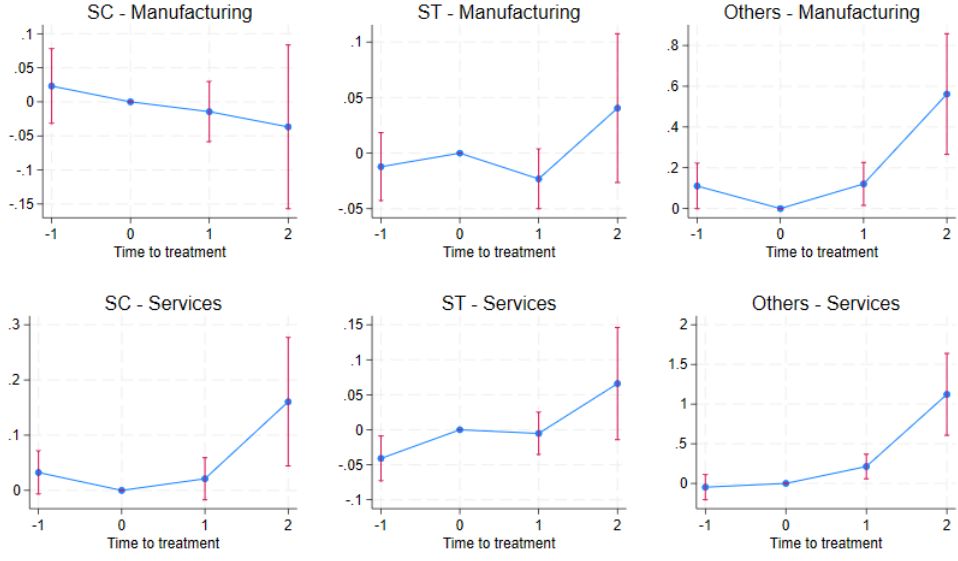
Note: All specifications include village and state-year FE. SE clustered at village level. Top 1% of outcomes winsorized.

Results: Shares in Entrepreneurship by Caste Group

	(1)	(2)	(3)	(4)	(5)	(6)
	Manufacturing			Services		
	Share of Enterprises owned by			Share of Enterprises owned by		
	SC	ST	Others	SC	ST	Others
Panel A: OLS						
New Road	-0.003	0.001	0.002	0.000	-0.001	0.000
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)
Observations	344,575	344,575	344,575	457,521	457,521	457,521
Panel B: De Chaisemartin and d'Haultfoeuille 2020						
New Road	-0.004	0.000	0.004	0.001	-0.001	0.000
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)
Observations	173,970	173,970	173,970	263,231	263,231	263,231

Note: All specifications include village and state-year FE. SE clustered at village level. Top 1% of outcomes winsorized.

Dynamic Event Study (De Chaisemartin and d'Haultfoeuille 2020)



Heterogeneity in Service Enterprises for SC

	(1)	(2)	(3)	(4)	(5)
Panel A	Small	Single Employee	Non-hired labor	No power	Unregistered
New Road	0.092***	0.076***	0.103***	0.134***	0.132***
	(0.016)	(0.012)	(0.018)	(0.032)	(0.041)
Panel B	Large	Multiple Employees	Hired labor	Power	Registered
New Road	0.001	0.018***	0.011**	0.025***	0.013**
	(0.001)	(0.005)	(0.004)	(0.008)	(0.005)
Observations	529,879	529,879	529,879	341,034	204,366

Note: All specifications include village and state-year FE. SE clustered at village level. Top 1% of outcomes winsorized. Power data not reported in EC 2013, and registration data not reported in EC 1990 and 2013.

Heterogeneity in Service Enterprises for ST

	(1)	(2)	(3)	(4)	(5)
Panel A	Small	Single Employee	Non-hired labor	No power	Unregistered
New Road	0.048***	0.036***	0.073***	0.055**	0.030
	(0.012)	(0.009)	(0.014)	(0.022)	(0.030)
Panel B	Large	Multiple Employees	Hired labor	Power	Registered
New Road	-0.000	0.011**	0.006*	0.008	0.004
	(0.000)	(0.005)	(0.003)	(0.007)	(0.003)
Observations	529,879	529,879	529,879	341,034	204,366

Note: All specifications include village and state-year FE. SE clustered at village level. Top 1% of outcomes winsorized. Power data not reported in EC 2013, and registration data not reported in EC 1990 and 2013.

Financial Channel: Heterogeneity by Number of Banks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	SC	ST	Others	SC	ST	Others	SC	ST	Others
New Road	0.074***	0.050***	0.567***	0.071***	0.052***	0.533***	0.092***	0.050***	0.627***
	(0.020)	(0.015)	(0.089)	(0.020)	(0.014)	(0.087)	(0.017)	(0.012)	(0.074)
New Road × Bank branches	0.005*	0.001	0.009						
	(0.003)	(0.002)	(0.011)						
New Road × Public banks				0.006**	0.001	0.017			
				(0.003)	(0.002)	(0.012)			
New Road × Private banks							0.009	0.009	-0.027
							(0.008)	(0.008)	(0.036)
Observations	463,531	463,531	463,531	463,531	463,531	463,531	463,531	463,531	463,531
R-squared	0.556	0.609	0.692	0.556	0.609	0.692	0.556	0.609	0.692
Village FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
State × Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
District-Time trend	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note: All specifications include village and state-year FE, and district-trends. SE clustered at village level. Top 1% of outcomes winsorized. The data on bank presence are sourced from the Central Information System for Banking Infrastructure (CISBI) data from the Reserve Bank of India.

Heterogeneity by credit activity

Financial Channel: SC effects correlated with micro-firm service loan accounts (2013 cross-section)

	(1)	(2)	(3)	(4)
New Road	0.180***	0.241***	0.233***	0.235***
	(0.026)	(0.024)	(0.023)	(0.023)
New Road × Number of accounts for micro firms	1.316***			
	(0.330)			
New Road × Number of accounts for small firms		-2.307		
		(1.687)		
New Road × Number of accounts for medium firms			-2.022	
			(3.571)	
New Road × Number of accounts for large firms				-7.663
				(8.063)
Observations	117,928	117,928	117,928	117,928

Note: All specifications include state FE. SE clustered at village level. Top 1% of outcomes winsorized. The data on credit accounts are sourced from the Basic Statistical Returns (BSR) data from the Reserve Bank of India.

Financial Channel: ST effects correlated with micro-firm service loan accounts (2013 cross-section)

	(1)	(2)	(3)	(4)
New Road	0.155***	0.173***	0.179***	0.175***
	(0.019)	(0.017)	(0.017)	(0.017)
New Road × Number of accounts for micro firms	0.716***			
	(0.241)			
New Road × Number of accounts for small firms		2.011		
		(1.232)		
New Road × Number of accounts for medium firms			1.963	
			(2.608)	
New Road × Number of accounts for large firms				11.401*
				(5.888)
Observations	117,928	117,928	117,928	117,928

Note: All specifications include state FE. SE clustered at village level. Top 1% of outcomes winsorized. The data on credit accounts are sourced from the Basic Statistical Returns (BSR) data from the Reserve Bank of India.

Human Capital Channel, Services

	(1)	(2)	(3)
	SC	ST	Others
New Road	0.026	0.023	0.170**
	(0.019)	(0.015)	(0.078)
New Road × High Number of Primary Schools	0.117***	0.057**	0.890***
	(0.034)	(0.026)	(0.151)
Observations	408,291	408,291	408,291

Note: All specifications include village and state-year FE, and district-trends. SE clustered at village level. Top 1% of outcomes winsorized.

Conclusion: Did rural roads promote inclusivity?

- Increase in SC/ST owned service enterprises from road construction
- For OBC/Others, significant impacts on both services and manufacturing
- Quality of SC/ST owned firms are not good
- No change in the share of the pie across caste groups
- Financial channel and human capital channel are major mechanisms

Appendix: Summary Statistics (Shares of each social group - Rural)

Year	Industry-Type	SC	ST	Others
1990	Manufacturing	17.21%	4.71%	78.08%
1998	Manufacturing	13.32%	6.82%	79.86%
2005	Manufacturing	13.37%	6.29%	80.34%
2013	Manufacturing	13.34%	6.42%	80.24%
1990	Services	9.49%	2.32%	88.19%
1998	Services	10.08%	4.51%	85.41%
2005	Services	11.58%	4.36%	84.07%
2013	Services	12.73%	5.74%	81.54%

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Financial Channel: Heterogeneity with Credit Activity

	(1)	(2)	(3)	(4)	(5)	(6)
	SC	ST	Others	SC	ST	Others
New Road	0.023	0.020	0.400***	0.039*	0.038**	0.479***
	(0.022)	(0.017)	(0.094)	(0.020)	(0.016)	(0.087)
New Road × Number of accounts	0.125***	0.072***	0.258			
	(0.039)	(0.028)	(0.157)			
New Road × Amount outstanding				0.058***	0.015	0.033
				(0.016)	(0.012)	(0.065)
Observations	371,418	371,418	371,418	371,418	371,418	371,418

Note: All specifications include village and state-year FE, and district-trends. SE clustered at village level. Top 1% of outcomes winsorized. The data on credit accounts and amount outstanding are sourced from the Basic Statistical Returns (BSR) data from the Reserve Bank of India.

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Addressing Endogeneity: Eligible villages (with population ≥ 500)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	SC	ST	Others	SC	ST	Others	SC	ST	Others
New Road	0.043**	0.022	0.323***	0.028*	0.026**	0.439***	0.052***	0.007	0.403***
	(0.019)	(0.014)	(0.080)	(0.016)	(0.012)	(0.071)	(0.015)	(0.012)	(0.066)
Observations	347,509	347,509	347,509	529,877	529,877	529,877	529,881	529,881	529,881
State $\times$ Year FE	YES	YES	YES						
District-Time Trend	YES	YES	YES						
Eligible vil.-State x Year FE				YES	YES	YES			
Eligible vil.-State-Trend							YES	YES	YES
Control group	Eligible Villages			All villages			All villages		

Note: All specifications include village FE. SE clustered at village level. Top 1% of outcomes winsorized.