Convergence Across Castes

Viktoria Hnatkovska[1]   Sev Hou[2]   Amartya Lahiri[1]

[1]University of British Columbia

[2]CUHK-Shenzen

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Introduction

▶ How do historical inequalities behave during periods of rapid and large macroeconomic changes?

▶ Who gains and who loses?

▶ Does growth lift all boats?

▶ What are the key channels through which distributional changes occur?

Introduction

Indian experience provides a perfect environment:

- ▶ dramatic changes over the past 30 years

- ▶ GDP growth averaged 6-7 percent since the 1990s

- ▶ 1947 to 1980s growth averaged 3 percent

Introduction

India:

▶ long history of social division due to castes

▶ Caste identity by birth and immutable

▶ system often acted as a barrier to entry

This paper

- ▶ Focus on fortunes of SCSTs relative to others since 1983

- ▶ Describe the empirical evidence

- ▶ Develop a heterogenous agent model
  - ▶ examine quantitative effects of aggregate growth shocks on caste gaps

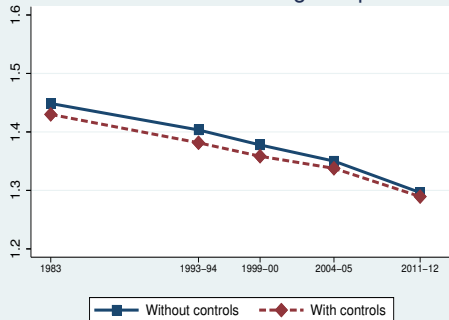- ▶ Identify the mechanisms at play behind the caste convergence

Data

- ▶ National Sample Survey (NSS) of India

- ▶ 6 rounds: R38 (1983-84), R43 (1987-88), R50 (1993-94), R55 (1998-99), R61 (2004-05), R68 (2011-12)

- ▶ Average sample size: 40,000 households; 170,000 individuals
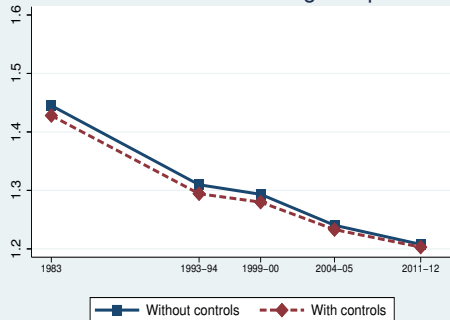
Worker Wage gaps: Non-SCST/SCST

(a) Median gap

Mean Relative Wage Gaps

Without controls — With controls

(b) Mean

Median Relative Wage Gaps

Without controls — With controls
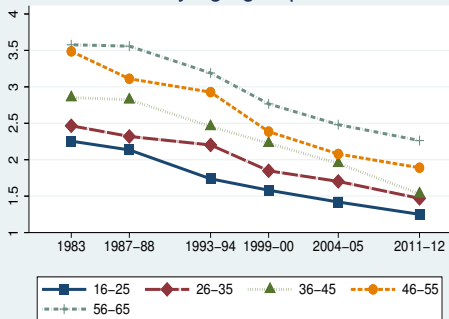
Worker Education gaps (years)

(a) Age cohorts

by age groups

(b) Birth cohorts

by birth cohort
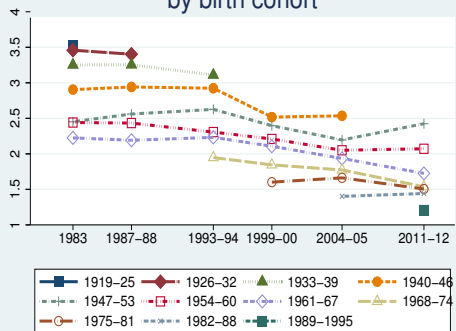
Structural Transformation

Sectoral Employment Share
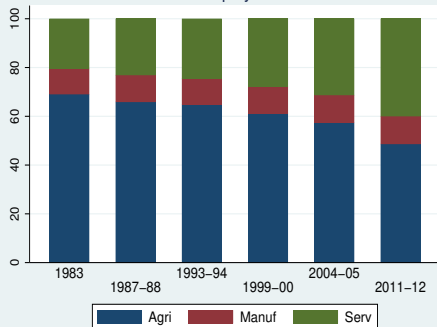
Sectoral Output Share
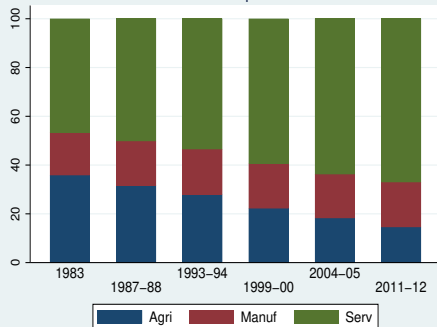
Questions

- ▶ Can aggregate growth shocks explain the caste wage convergence?

- ▶ Can this be consistent with the sectoral dynamics?

- ▶ How important were affirmative action programs?

- ▶ Were selection effects important for the convergence?

- ▶ How large are the welfare costs of caste barriers?

Model

▶ One-period lived heterogenous agents of measure L

▶ Measure S of these agents belong to caste s for SC/ST

▶ Measure $N = L - S$ belong to caste n for non-SC/ST

Talent Misallocation

- Castes differ along two margins

    - cost of education

    - costs of accessing labor market

- All individuals draw from same innate ability distribution

- Caste-specific schooling and sectoral ability distribution

- Costly misallocation of talent

Agent Objective

▶ Each agent i maximizes utility from $u\left(c_i\right)$

▶ The final good is produced by agent's by combining three intermediates:

$$y_i = \left(y_i^A - \bar{y}\right)^\theta \left(y_i^M\right)^\eta \left(y_i^H\right)^{1-\theta-\eta}$$

▶ Final good used for consumption, schooling costs and sectoral entry costs

Endowments

- Agent i: one unit of labor time and ability endowment a_i

- Ability productive in both market work and skill acquisition

- Ability a_i drawn from i.i.d. process with cdf

$$G(a), \quad a \in [\underline{a}, \bar{a}]$$

- Assume that $G(a)$ uniform distribution

- Ability distribution identical for both castes

Sectoral production technologies

- Output produced by agent i of caste $j = n, s$:

    - Sector **a** : $\qquad w_{ij}^{a} = Ae_{ij}$

    - Sector **m** : $\qquad w_{ij}^{m} = Me_{ij}$

    - Sector **h** : $\qquad w_{ij}^{h} = He_{ij}$

- A, M, H: exogenous sectoral labor productivities

Human Capital and Sectoral Entry Costs

▶ Sectoral entry costs for agent i of caste $j = n, s$:

    ▶ Sector a: $f_j^a = 0$

    ▶ Sector m: $f_j^m(e_i) = \phi\left(\gamma_j^m - \alpha e_i\right)$

    ▶ Sector h: $f_j^h(e_i) = \phi\left(\gamma_j^h - \alpha e_i\right)$

▶ $e_i = a_i q_i^\chi$

    ▶ schooling q raises human capital e

    ▶ human capital reduces entry costs in sectors m, h

▶ Marginal cost of schooling: λ_j, $j = n, s$

Optimal Sector-Contingent Schooling

▶ Sectoral entry costs are caste and sector-specific

▶ Schooling costs are caste-specific

▶ Schooling choice reflects caste and expected sector of work

Sector Choice

- Agents maximize $\hat{c}_{ij} = \max\{\hat{c}_{ij}^a, \hat{c}_{ij}^m, \hat{c}_{ij}^h\}$

- Problem gives three ability thresholds

Lemma

All individuals $i \in$ caste $j = n, s$ with ability a_{ij} prefer employment in sector-m to sector-a if $a_{ij} \geq \hat{a}_j^m$; employment in sector-h to sector-a if $a_{ij} \geq \hat{a}_j^h$; and employment in sector-h to sector-m if $a_{ij} \geq \tilde{a}_j^h$.

Sectoral Employment Gaps

$$\Delta s^a = \frac{\hat{\underline{a}}_n^m - \underline{a}}{\hat{\underline{a}}_s^m - \underline{a}}$$

$$\Delta s^m = \frac{\tilde{a}_n^h - \hat{a}_n^m}{\tilde{a}_s^h - \hat{a}_s^m}$$

$$\Delta s^h = \frac{\bar{a} - \tilde{a}_n^h}{\bar{a} - \tilde{a}_s^h}$$

▶ *Ability thresholds key for sectoral employment gaps*

Sectoral Wage Gaps

$$\Delta w^a = \left(\frac{\lambda_s}{\lambda_n}\right)^{\frac{\chi}{1-\chi}} \left(\frac{(\hat{a}_n^m)^{\frac{1}{1-\chi}+1} - (\underline{a})^{\frac{1}{1-\chi}+1}}{(\hat{a}_s^m)^{\frac{1}{1-\chi}+1} - (\underline{a})^{\frac{1}{1-\chi}+1}}\right) \left(\frac{\hat{a}_s^m - \underline{a}}{\hat{a}_n^m - \underline{a}}\right)$$

$$\Delta w^m = \left(\frac{\lambda_s}{\lambda_n}\right)^{\frac{\chi}{1-\chi}} \left(\frac{(\tilde{a}_n^h)^{\frac{1}{1-\chi}+1} - (\hat{a}_n^m)^{\frac{1}{1-\chi}+1}}{(\tilde{a}_s^h)^{\frac{1}{1-\chi}+1} - (\hat{a}_s^m)^{\frac{1}{1-\chi}+1}}\right) \left(\frac{\tilde{a}_s^h - \hat{a}_s^m}{\tilde{a}_n^h - \hat{a}_n^m}\right)$$

$$\Delta w^h = \left(\frac{\lambda_s}{\lambda_n}\right)^{\frac{\chi}{1-\chi}} \left(\frac{\bar{a}^{\frac{1}{1-\chi}+1} - (\tilde{a}_n^h)^{\frac{1}{1-\chi}+1}}{\bar{a}^{\frac{1}{1-\chi}+1} - (\tilde{a}_s^h)^{\frac{1}{1-\chi}+1}}\right) \left(\frac{\bar{a} - \tilde{a}_s^h}{\bar{a} - \tilde{a}_n^h}\right)$$

▶ *Ability thresholds and relative schooling costs are key*

Relative Ability Thresholds

- Two key thresholds: $\hat{a}_j^m$ and $\tilde{a}_j^h$

$$\frac{\hat{a}_n^m}{\hat{a}_s^m} = \left(\frac{\lambda_n}{\lambda_s}\right)^{\chi} \left(\frac{\gamma_n^m}{\gamma_s^m}\right)^{1-\chi}$$

$$\frac{\tilde{a}_n^h}{\tilde{a}_s^h} = \left(\frac{\lambda_n}{\lambda_s}\right)^{\chi} \left(\frac{\gamma_n^h - \gamma_n^m}{\gamma_s^h - \gamma_s^m}\right)^{1-\chi}$$

- *Relative schooling and entry costs are key for caste gaps*

Can model generate the observed changes?

- ▶ Approach: calibrate model to match 1983 facts

- ▶ Hit it with observed sectoral productivity shocks

- ▶ What is the implied time path of the caste wage gap?

Calibration

- ▶ Targets: eight key data moments

    - ▶ three sectoral caste employment distribution gaps

    - ▶ three sectoral caste wage gaps

    - ▶ two mean schooling levels

- ▶ We choose eight parameters

    - ▶ schooling cost parameters $\left(\lambda_s, \frac{\lambda_s}{\lambda_n}\right)$

    - ▶ entry cost parameters $\left(\gamma_s^m, \gamma_s^h, \gamma_n^m, \gamma_n^h\right)$

    - ▶ human capital elasticity of schooling: χ

    - ▶ scaling parameter for sectoral entry cost ϕ

Parameterization for 1983

Variable	Value	Variable	Value
$\underline{c}$	0.5	θ	0.46
η	0.15	α	1
$\underline{a}$	1	$\bar{a}$	50
M/A	1.2	H/A	1.1
L	1	S	0.25
Calibrated variables for 1983			
γ_s^m	20.14	γ_s^h	299.14
$\frac{\gamma_n^m}{\gamma_s^m}$	1.04	$\frac{\gamma_n^h - \gamma_n^m}{\gamma_s^h \gamma_s^m}$	1.33
$\frac{\lambda_s}{\lambda_n}$	1.55	ϕ	0.53
λ_s	2.53	χ	0.61
Productivity Growth 1983-2012			
Agriculture	Manufacturing		Services
1.14	2.14		2.41

Model Results: 1983 and 2012

| | 1983 | | 2012 | |
Variable	Data	Model	Data	Model
	Targeted			
Δw^a	1.04	1.04	1.08	1.05
Δw^m	1.20	1.20	1.14	1.20
Δw^h	1.45	1.45	1.33	1.16
Δs^a	0.80	0.85	0.79	0.85
Δs^m	1.43	1.43	1.57	2.15
Δs^h	1.61	1.60	1.21	1.32
Mean edu ST	1.81	1.75	4.73	3.78
Mean edu Non-ST	4.08	3.86	5.78	6.59
	Not Targeted			
Δw	1.45	1.34	1.30	1.24

Non-Targeted Moments: 1983 and 2012

Variable	1983 Data	1983 Model	2012 Data	2012 Model
Edu: Pareto shape param ST	0.57	0.77	1.33	1.19
Edu: Pareto shape param NST	1.12	1.16	1.52	1.58

Overview

▶ Model fits targeted 1983 distributional data quite well

▶ Productivity growth can explain over 70% of the observed caste wage convergence between 1983 and 2012

▶ We consider this suggestive of the power of growth in narrowing historical inequalities

Counterfactuals

- ▶ Model has number of built-in features
  - ▶ affirmative action
  - ▶ selection effects
  - ▶ caste distortions
- ▶ How important were each of these aspects?

Affirmative Action: Equalize entry costs

Variable	Data	Baseline	γ_m	γ_h	both
			1983		
Δs^a	0.80	0.85	0.84	0.85	0.84
Δs^m	1.43	1.43	1.54	0.79	0.84
Δs^h	1.61	1.60	1.58	93.37	82.78
Δw^a	1.04	1.04	1.01	1.04	1.01
Δw^m	1.20	1.20	1.18	1.01	1.00
Δw^h	1.45	1.44	1.45	1.26	1.26
Δw	1.45	1.34	1.31	1.62	1.58
			2012		
Δs^a	0.79	0.85	0.84	0.85	0.84
Δs^m	1.57	2.15	2.54	0.77	0.84
Δs^h	1.21	1.33	1.31	3.90	3.84
Δw^a	1.08	1.05	1.01	1.05	1.01
Δw^m	1.14	1.20	1.18	1.02	1.00
Δw^h	1.33	1.16	1.16	1.02	1.02
Δw	1.30	1.24	1.22	1.33	1.31

Affirmative Action Takeaway

▶ Affirmative action reduced wage gap in 1983

▶ Dynamics of wage gap driven by growth

▶ Convergence would have been greater without protections

Selection Effects: Random Re-Sorting

Wage Gaps and Growth			
Variable	Baseline 1983	Baseline 2012	Random Sorting 2012
Δw^a	1.04	1.05	1.07
Δw^m	1.20	1.20	1.197
Δw^h	1.45	1.16	1.14
Δw	1.34	1.24	1.25

Sectoral average ability			
Ee_{nst}^a	17.06	17.69	17.85
Ee_{nst}^m	38.00	37.68	38.01
Ee_{nst}^h	46.49	45.54	44.67
Ee_{st}^a	19.86	20.57	20.67
Ee_{st}^m	42.19	41.72	42.18
Ee_{st}^h	47.81	46.64	45.84

Selection Effects

- Role of selection in wage convergence is quantitatively small

- Most of the convergence is due to

  - falling labor gaps in services

  - differential increase in education

Removing Caste Distortions

- ▶ No rebate

  - ▶ Consumption gains are 10.2% (1983) and 10.3% (2012)

  - ▶ Output gains are 11.4% (1983) and 8.4% (2012)

- ▶ With lump-sum rebates

  - ▶ Output side unaffected

  - ▶ Consumption gains: 3.3% (1983) and 2.5%

Other mechanisms

▶ Non-homotheticity: *not important*

▶ Differential sectoral growth: *not important*

▶ Structural transformation: *needed*

▶ Education re-sorting: *key for results*

Conclusions

▶ India has seen a catch-up in education and wages of SC/STs

▶ Productivity growth can explain 72% of the wage convergence

▶ Convergence mostly driven by education

▶ Affirmative action policies and selection effects have played minimal roles

▶ Growth has mitigated caste-based talent misallocation