

Vulnerability and Poverty in
Developing Countries
- "Measuring Vulnerability and
Poverty: Estimates for Rural India"

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Outline of Today's Presentation

1. Concepts of poverty and vulnerability
2. Poverty in India
3. Backgrounds of the study
4. Data
5. Methodologies
6. Results
7. Conclusion

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1. Concepts of Poverty and Vulnerability

- The literature on poverty studies focus mainly on 'static' poverty based on income or consumption.
- Need to address (a) dynamics, (b) risk or vulnerability, and (c) non-income poverty.
- How can we define poverty and vulnerability?

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(a) Concepts of poverty

- Absolute *versus* Relative
- Objective *versus* Subjective
(Quantitative *versus* Qualitative)
- Physical *versus* Sociological
- Static *versus* Dynamic
- Household *versus* Individual

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- Income poverty (Foster-Greer-Thorbecke Class of Poverty Indices)

- $P_\alpha = 1/n \sum_i I(y_i < z)[(z - y_i)/z]^\alpha$
- $\alpha=0 \Rightarrow P_0$ Head count index, or proportion poor
(Incidence or prevalence of Poverty)
- $\alpha=1 \Rightarrow P_1$ Poverty-gap index
- $\alpha=2 \Rightarrow P_2$ Squared, Poverty-gap index

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- Basic needs: Deprivation of requirements, mainly material for basic human needs (e.g. food, shelter, schooling, health services, water/ sanitation facilities)
- Human capability Approach: Focus on people's abilities and opportunities to enjoy long, health lives, to be literate and to participate fully in society
Indicators: life expectancy, literacy rates, malnutrition, social and political participation.

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(b) Various Concepts of Vulnerability

Poverty versus Vulnerability

- Related, but not synonymous.
- Simply 'static' poverty versus 'dynamic' poverty? Vulnerability is a part of the latter.

Vulnerability:

- Probability of falling into poverty (defined in a static sense).
- You could be in poverty or *Not* at time t , but in poverty at time t .
- Causes: Expected Consumption Changes and *Unexpected Shocks*
- 'Ex ante' versus 'Ex post.

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'Ex-post' Measures

- (1) Based on expected utility theory (Ligon & Schecter 2003, EJ)- Vulnerability as "Low Expected Utility" (VEU)

$$V_i = U_i(z_{ce}) - EU_i(c_i)$$

-It comes from consumption variability, aggregate and idiosyncratic shocks, and risk aversion of household.

Consumption variability ↑ → V_i ↑

Shocks ↑ → V_i ↑

Risk Aversion ↑ → V_i ↑

-Endogenous income smoothing through portfolio choice cannot be explicitly incorporated.

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'Ex-post' Measures (cont.)

- (2) 4 categories: (see Gaiha & Imai 2002)

- (a) those who remained poor (vulnerable?)
- (b) *those who fell into poverty--Vulnerable!*
- (c) those who escaped from poverty
- (d) those who remained non-poor

- (3) Expected income (or consumption) is the above poverty line. But households were stochastically under the poverty line (e.g. Morduch, AER, 1994)

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'Ex-post' Measures (cont.)

- (4) Excess sensitivity of consumption to income shocks due to lack of consumption insurance. (Vulnerability as "Uninsured Exposure to Risk" (VER) (based on, e.g., Townsend 1994)

$$\Delta \ln c_{itv} = \alpha + \beta \Delta \ln y_{itv} + \gamma \Delta (\overline{\ln y_{vt}}) + \delta X_{itv} + \Delta \varepsilon_{itv}$$

γ Is a measure of vulnerability .

Testing whether $\beta = 0$.

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'Ex-ante' Measures

- (1) Simulation approach based on a dynamic household model (e.g. Zimmerman and Carter, *JDE*, 2003, Elbers and Gunning 2003, 2006)

- a. Lack of endowments or technology- low income
- b. Household's abilities to smooth income
- c. Household's abilities to smooth consumption

Zimmerman and Carter, *JDE*, 2003

A stochastic dynamic programming:

Poverty trap: the richer can choose the higher-yielding portfolio, and the poorer cannot.

Elbers and Gunning, 2003, 6 *Ex-ante response matters*; Needs a lot of assumptions; Complicated.

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'Ex-ante' Measures (cont.)

Vulnerability as "Expected Poverty" (VEP) (Chaudhuri, Jalan and Suryahadi 2003)

---Focusing on Explaining Error Terms

Estimate log consumption and variance of error terms at the same time.

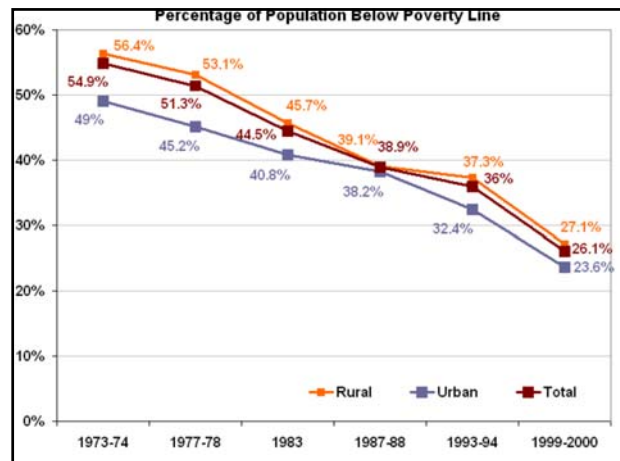
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2. Poverty in India

The National sample survey organisation (NSSO) estimated that 22.15% of the population was living below the poverty line in 2004-5 (down from 51% in 1977-8, 36% in 1993-4, 36%, 26% in 1999/2000 and 25% in 2002)
 ----c.f. 'The great poverty debate' (Deaton 2005)

As of 2004, India's Human Development Index is 0.611, higher than that of nearby countries like Bangladesh (0.530) and Pakistan (0.539), but lower than Vietnam (0.709) or China (0.768).

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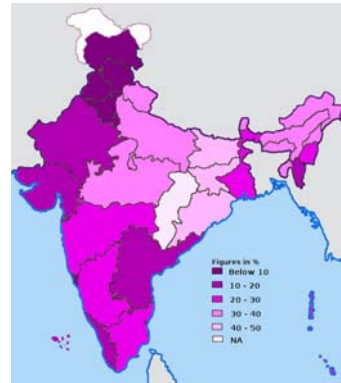


Poverty Trends based on NSS data

Year	Round	Poverty Rate
1977-78	32	51.3
1983	38	45.65
1987-88	43	39.09
1993-94	50	37.27
1999-2000	55	26.09
2004-2005	61	22.15

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Poverty by Indian states (1999-2000)



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'The Great Indian Poverty Debate'

Deaton & Kozel (2005, WBRO)

- Official estimates of Poverty reduction in 1990s (37% in 1993/4 → 26% in 1999/2000) were too optimistic.
- Changes in reporting periods in NSS increased consumption and decreased poverty.
 - 30 days reporting period → 7 days & 30 days (food tobacco etc.)
 - 30 days → 365 days (low frequency items)

Deaton & Tarrozi

Sensitive to price indices

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Sen & Himanshu (2004)

	Rural		Urban	
	Official	Adjusted	Official	Adjusted
1993-94 (50th)	37.3	27.1	32.4	28
1999-2005 (55th)	27.1	28.8	23.6	25.1

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- These are all about static poverty-
No accounts were taken for risk and vulnerability.
- Needs the study based on panel data.

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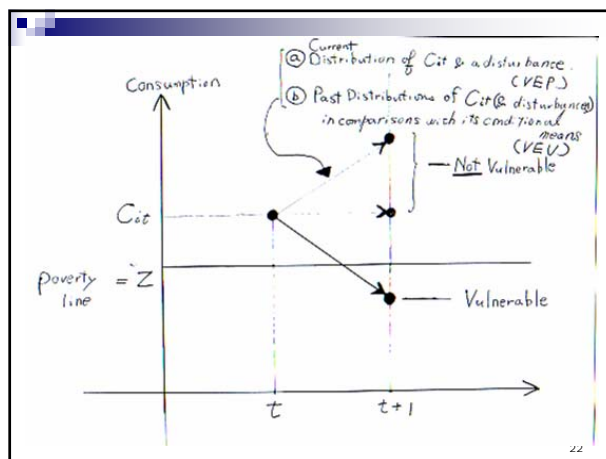
3. Backgrounds of the study

- Measures “vulnerability” (versus poverty) of a household using the ICRISAT panel data in India and identified who are vulnerable.
- Why ‘Vulnerability’ not poverty in LDCs?
 - (1) ‘Risky’ and ‘Uncertain’ economy
 - (2) Fluctuating income or consumption
 - (3) Poor insurance & credit constraints
- Few studies to measure vulnerability

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- Uses 3 measures of vulnerability
 - (a) Vulnerability as “Expected Poverty” (VEP) (Chaudhuri, Jalan and Suryahadi 2003)
 - (b) Vulnerability as “Low Expected Utility” (VEU) (Ligon & Schechter 2003)
 - (c) Vulnerability as “Uninsured Exposure to Risk” (VER) (based on, e.g., Townsend 1994)

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Key Issues:

- (a) Data Requirements:
Cross-sectional (VEP) versus Panel (VEU)
Panel- Monthly versus Annual
- (b) Aggregate versus Idiosyncratic
Decomposition based on VEU
- (c) Ex-ante (VEP) versus Ex-post (VEU)
- (d) What are the Determinants of Vulnerability?

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4. Data

- The ICRISAT Village Level Studies (VLS) data sets that cover SAT (semi-arid tract) in Andhra Pradesh and Maharashtra in India.
- Panel data for 183 households in 5 villages for 10 years (1975-1984)
- Covers income, expenditure, employment, asset-holdings, farming, various hh characteristics.
- Discussions on measurement errors-
Underreporting of own consumption (Ravallion & Chaudhuri, 1997)- Most of the works based on the original consumption data (including Townsend, 1994) are misleading.

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-Past works based on the same data
 Jacoby & Skoufias (1997;1998) –consumption smoothing; child school attendance

Townsend (1994) vs. Ravallion & Chaudhuri (1997) – Risk insurance

Kochar (1995,1999) –Labour Mkt

Gaiha and Imai (2004)- Vulnerability of the poor (the landless vs. land owners)

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5. Methodologies

(a) Vulnerability as “Expected Poverty” (VEP)

-The probability that i -th household’s level of consumption will be below the poverty line in the next period.

$$V_{it} = \Pr(c_{i,t+1} < z) \quad (1)$$

-Chaudhuri et al.’ method based on cross-sectional data.---- *ex-ante* measure

1) Estimate consumption function using a feasible generalised least squares (FGLS).

$$\ln c_i = X_i \beta + e_i \quad (2)$$

$$\sigma_{e,i}^2 = X_i \theta \quad (3)$$

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2) Derive the predicted values for log consumption and its variance.

$$\hat{E}[\ln c_i | X_i] = X_i \hat{\beta} \quad (4)$$

$$\hat{V}[\ln c_i | X_i] = X_i \hat{\theta} \quad (5)$$

3) Assuming log consumption is normally distributed, the estimated probability that a household will be poor in the future is given by:

$$\hat{v}_i = \hat{Pr}(\ln c_i < \ln z | X_i) = \Phi\left(\frac{\ln z - X_i \hat{\beta}}{\sqrt{X_i \hat{\theta}}}\right) \quad (6)$$

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(b) Vulnerability as “Low Expected Utility” (VEU) (Ligon & Schechter 2003)

$$V_i = U_i(z_{ce}) - EU_i(c_i) \quad (7)$$

where U_i is a (weakly) concave, strictly increasing function; Z_{ce} is a certainty-equivalent consumption.

$$\Leftrightarrow V_i = [U_i(z_{ce}) - U(Ec_i)] + [U(Ec_i) - EU_i(c_i)] \quad (8)$$

$$\Leftrightarrow V_i = [U_i(z_{ce}) - U_i(Ec_i)] \quad (Poverty) \\ + \{U_i(Ec_i) - EU_i[E(c_i|\bar{x})]\} \quad (Aggregate Risk) \\ + \{EU_i[E(c_i|\bar{x})] - EU_i(c_i)\} \quad (Idiocyncratic Risk) \quad (9)$$

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The form of utility function used: $U(c) = \frac{c^{1-\gamma}}{1-\gamma}$

Consumption is estimated by two-way error component panel-data estimation.

$$c_{it} = X_{it} \beta_i + \eta_i + \alpha_i + v_{it} \quad (10)$$

$$V_i = [U_i(z_{ce}) - U_i(Ec_i)] \quad (Poverty) \\ + \{U_i(Ec_i) - EU_i[E(c_i|\bar{x})]\} \quad (Aggregate Risk) \quad (9) \\ + \{EU_i[E(c_i|\bar{x})] - EU_i(c_i|x_t, x_{it})\} \quad (Idiocyncratic Risk) \\ + \{EU_i(c_i|\bar{x}, x_{it}) - EU_i(c_i)\} \quad (Unexplained Risk)$$

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IV is used to estimate (10)

$$1^{\text{st}} \text{ stage: } y_{it} = X'_{it}\beta_1 + L'_{it}\beta_2 + H'_{it}\beta_3 + \eta_t + \mu_i + e_{it}$$

$$2^{\text{nd}} \text{ stage: } c_{it} = \gamma_1 y_{it} + X'_{it}\gamma_2 + H'_{it}\gamma_3 + \mu_t + \alpha_i + v_{it}$$

X_{it} : A vector of household characteristics

L_i : owned land area, the share of irrigated land, and non-land assets (instruments)

H_i : Human capital

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(c) Vulnerability as “Uninsured Exposure to Risk” (VER) (based on, e.g., Townsend 1994)

$$\Delta \ln c_{itv} = \alpha + \beta \Delta \ln y_{itv} + \gamma \Delta (\overline{\ln y_{vt}}) + \delta X_{itv} + \Delta \varepsilon_{htv}$$

v denotes village.

Testing whether $\beta = 0$ (complete risk sharing; Townsend 1994; Mace 1991; Jacoby & Skoufias 1998).

We tried an alternative variable on village-level shock (crop-shock) defined as the deviation from the time-series trend of aggregate crop income.

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6. Results

(a) Vulnerability as “Expected Poverty” (VEP)

It has been applied for cross-sectional data as well as panel data.

Income equation:

- Age of household head: + ve and significant
- Household size: - ve and significant
- Caste (high): + ve and significant
- Land holding: + ve and significant
- Irrigation: + ve and significant
- Non-land asset: + ve and significant
- Schooling: + ve (significant or insignificant)

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Variance equation:

Variance is affected by household size (& its square), non-land production assets, schooling years in some years.

(b) Vulnerability as “Low Expected Utility” (VEU)

Idiosyncratic risk has the largest share to be followed by ‘poverty and ‘aggregate risk’.

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Table 1 Decomposition of VEU

Average Value	VEU = 0.75	Pover ty = 0.26	Agg Risk = 0.17	Idio Risk = 0.28	Unexp Risk = 0.05
age of hh head	- *	- *			
(age of hh head) ²	+ *	+ *			
hh size	+ *	+ *			
Caste (middle low)	+			+ *	
Owned area of land	-			- *	
(Owned area) ²	+	+		+	
Non-land prod. assets	-	- *			
(Non-land assets) ²	+	+ *			

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Table 2 Determinants of VEU & VEP

	VEU (ex-post)	VEP (ex-ante)	Poverty (static)
age of hh head	- *	- **	
(age of hh head) ²	+ *	+	
hh size	+ *	+ **	+ **
Caste (middle low)	+		- *
Owned area of land	-	- **	- **
Owned area squared	+	+ *	+ *
Non-land prod. assets	-	- **	- *
(Non-land assets) ²	+	+ **	+
Irrigation Share	-	- **	-

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(c) Vulnerability as “Uninsured Exposure to Risk” (VER)

Table 3 Results for VER

GLS Random-effects GLS for Panel Data

	Dep. Variable: $\Delta \ln c_{it}$			
	Aurepalle			
	Case A		Case B	
	Coef.	t value	Coef.	t value
$\Delta \ln y_{it}$	0.21	(5.34) **	0.22	(5.32) **
$\frac{\Delta \ln y_{it}}{\Delta \ln y_{it}}$	0.09	(0.94)	-	-
Crop shock	-	-	0.18	(3.02) **

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Table 3 Results for VER (cont.)

GLS Random-effects GLS for Panel Data

	Dep. Variable: $\Delta \ln c_{it}$			
	Shirapur			
	Case A		Case B	
	coef.	t value	coef.	t value
$\Delta \ln y_{it}$	0.10	(2.39) *	0.07	(1.83) +
$\frac{\Delta \ln y_{it}}{\Delta \ln y_{it}}$	-0.45	(-3.86) **	-	-
Crop shock	-	-	-0.72	(-3.40) **

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Table 3 Results for VER (cont.)

GLS Random-effects GLS for Panel Data

	Dep. Variable: $\Delta \ln c_{it}$			
	Kanzara			
	Case A		Case B	
	coef.	t value	coef.	t value
$\Delta \ln y_{it}$	0.54	(4.91) *	0.40	(3.63) **
$\frac{\Delta \ln y_{it}}{\Delta \ln y_{it}}$	-1.39	(-4.46) *	-	-
Crop shock	-	-	-0.32	(-1.30)

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Table 4 Comparisons of Vulnerability across Different Groups

Variable	Land-holding status			
	Landless	Small farmers	Middle Farmers	Large Farmers
VEP (cross section)	0.64	0.63	0.51	0.20
VEP_GLS (panel data)	0.60	0.63	0.51	0.16
POVERTY (static)	0.67	0.57	0.50	0.16
VEU	0.90	1.21	0.61	0.21
VEU_POVERTY	0.56	0.36	0.23	-0.15
VEU_AGGREGATE	0.27	0.02	0.37	0.05
VEU_IDIOSYNCRATIC	0.26	0.97	-0.34	0.05
VEU_UNEXPLAINED	-0.19	-0.14	0.36	0.25

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Table 4 (cont.)

Variable	Household Head's Schooling Years		
	0.00	<=5	>5
VEP (cross section)	0.62	0.36	0.29
VEP_GLS (panel data)	0.60	0.37	0.25
POVERTY (static)	0.57	0.35	0.36
VEU	1.01	0.40	0.41
VEU_POVERTY	0.40	0.06	0.10
VEU_AGGREGATE	0.20	0.11	0.14
VEU_IDIOSYNCRATIC	0.54	-0.03	-0.16
VEU_UNEXPLAINED	-0.13	0.26	0.33

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Table 4 (cont.)

Variable	Caste			
	Low	Middle-low	Middle-high	high
VEP (cross section)	0.77	0.59	0.44	0.28
VEP_GLS (panel data)	0.81	0.56	0.43	0.22
POVERTY (static+B15)	0.70	0.50	0.48	0.31
VEU	0.88	1.25	0.58	0.42
VEU_POVERTY	0.57	0.30	0.22	0.03
VEU_AGGREGATE	0.37	0.11	0.38	-0.05
VEU_IDIOSYNCRATIC	-0.04	1.27	-0.27	0.15
VEU_UNEXPLAINED	-0.02	-0.43	0.25	0.29

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5. Conclusion

- (a) Decomposition of 'vulnerability' into 3 parts
-idiosyncratic risks (37%); aggregate risks (22%);
poverty (35%); (& unexplained)
- (b) Risk-sharing mechanism exists to some extent,
but it is not enough to remove vulnerability.
- (c) The most vulnerable-the landless or small
farmers without education in lower castes.

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5. Conclusion (cont.)

- (d) Income or consumption based targeting
could be misleading. – To help small
farmers or the landless by building risk-
coping or management abilities is crucial.
- (e) Use of panel data is ideal. But cross-
sectional measure of vulnerability (VEP) is
also useful in the absence of panel data.

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