Lecture VI:
Poverty and Vulnerability

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Overview

- Reducing poverty and hunger is likely to be the most widely shared development goal
- Reducing vulnerability to shocks and to poverty are major instruments for development
- Positive and normative analysis are key:
  - How do we characterize and explain poverty through diagnostic and identification of causal determinants?
  - What can be done to reduce poverty using well designed and targeted policies and programs?
- Steps in poverty and vulnerability analysis

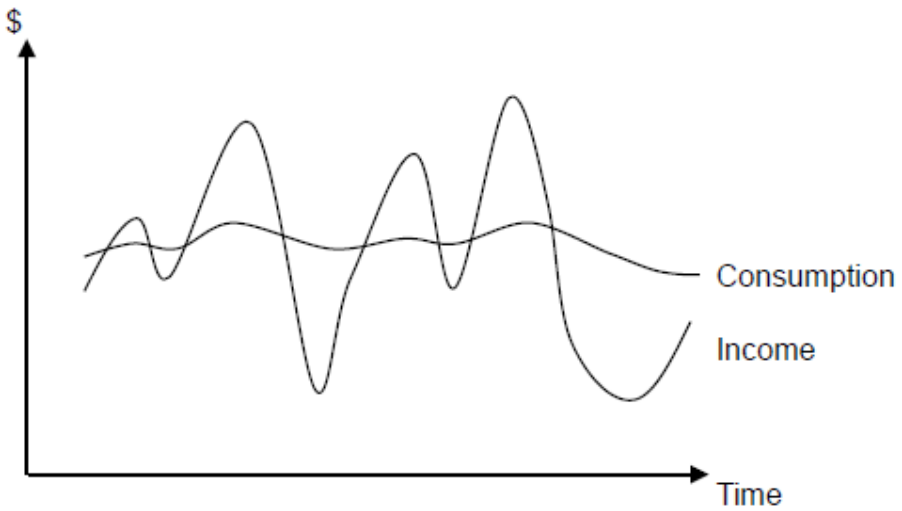
Steps in poverty and vulnerability analysis

1. Choice of a monetary indicator of well-being
2. Agreement on a threshold level for this indicator (poverty line)
3. Description of those below the poverty line (Who are they? What they do? Where are they located?)
4. Estimation of poverty indicators
5. Heterogeneity of poverty: transitory versus chronic poor
6. Special aspects of poverty: intra-household incidence, intergenerational transmission, and mobility
7. Constructing poverty maps
8. Measuring the impact of growth and social programs on poverty
9. Profile of the poor: how do they live? why do they what they do?

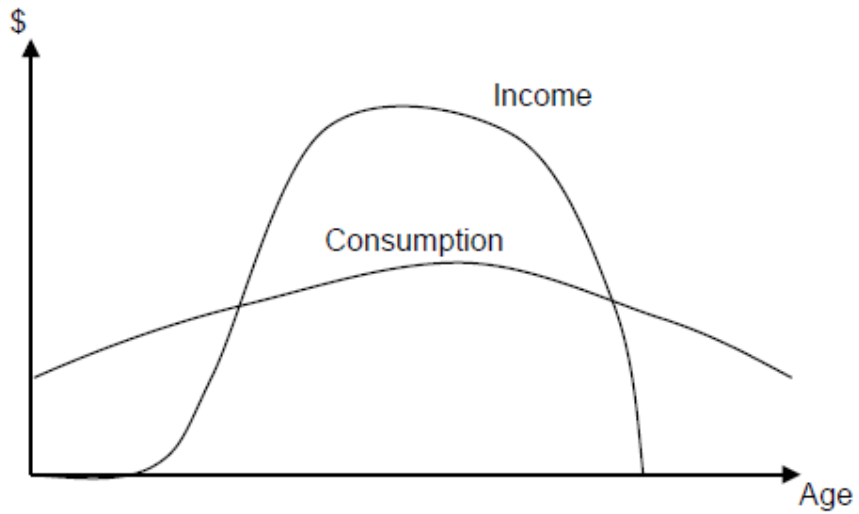
1. Choice of an indicator of well-being (y): income or consumption?

- Two monetary indicators: income per-capita and consumption per-capita
- Consumption seems to be a better measure of wellbeing:
  - Consumption is closer to wellbeing since it creates utility
  - Consumption is smoother over the years and across time when income fluctuates (Fig.1)
  - Consumption is easier to measure
  - Income misreporting is important

Fig.1: Income versus consumption



Consumption smooting across time



Consumption smoothing across the life cycle

- Measuring consumption is not free of difficulties:
  - Information is not available for individuals but households: z-goods
  - There are large errors in measuring consumption: recall problems, seasonality, trade-off of details versus attrition
  - Consumption expenditures varies with tastes: inter-personal comparisons of well-being are limited
  - Measurement of durable goods
  - Differences in terms of households' ability to smooth consumption

Adjusting y for a number of factors

1. **Changes in prices over time**: using a deflator based on the consumer price index (CPI) to convert into real values
2. **Spatial differences in prices**: based on CPI (regions) or PPP-adjusted exchange rate (countries)
3. **Inputing prices for z-goods**: based on opportunity cost or sale price of similar goods in the market
4. **Accounting for imputed value of public goods and services received by the household**: public education, school lunches, health care, etc.

Household versus individual well-being

- Measuring well-being a household level need to account for the household size:
  1. Per-capita consumption is measured using adult equivalence scales
  2. Per-capita consumption should allow for the existence of economies of scale in consumption for household-level public goods and private goods

Adult equivalence scale

- Households members are given weights according to their gender and age:

$$n^* = \sum_k w_k n_k \tag{1}$$

- Where n_k is number of household members in category k and w_k is the consumption weight of demographic category k
- OECD scale:

$$N_{AE} = 1 + 0.7(N_{Adults} - 1) + 0.5N_{Children}$$

- World Bank scale:

$$N_{AE} = N_{Adu>17} + 0.5N_{Chil,13-17} + 0.3N_{Chil,7-12} + 0.2N_{Chil,0-6}$$

Economies of scale

- Say that total household consumption is:

$$y = C_f + p_h C_h \tag{2}$$

- Where C_f is consumption expenditure on private goods, and C_h is consumption expenditure on public goods
- Per-capita consumption:

$$y_{pc} = \frac{C_f}{n^*} + p_h \frac{C_h}{n^{*\beta}} \tag{3}$$

- Where β is the degree of "privateness" of the good: $\beta = 0$ (pure public good) and $\beta = 1$ pure private good

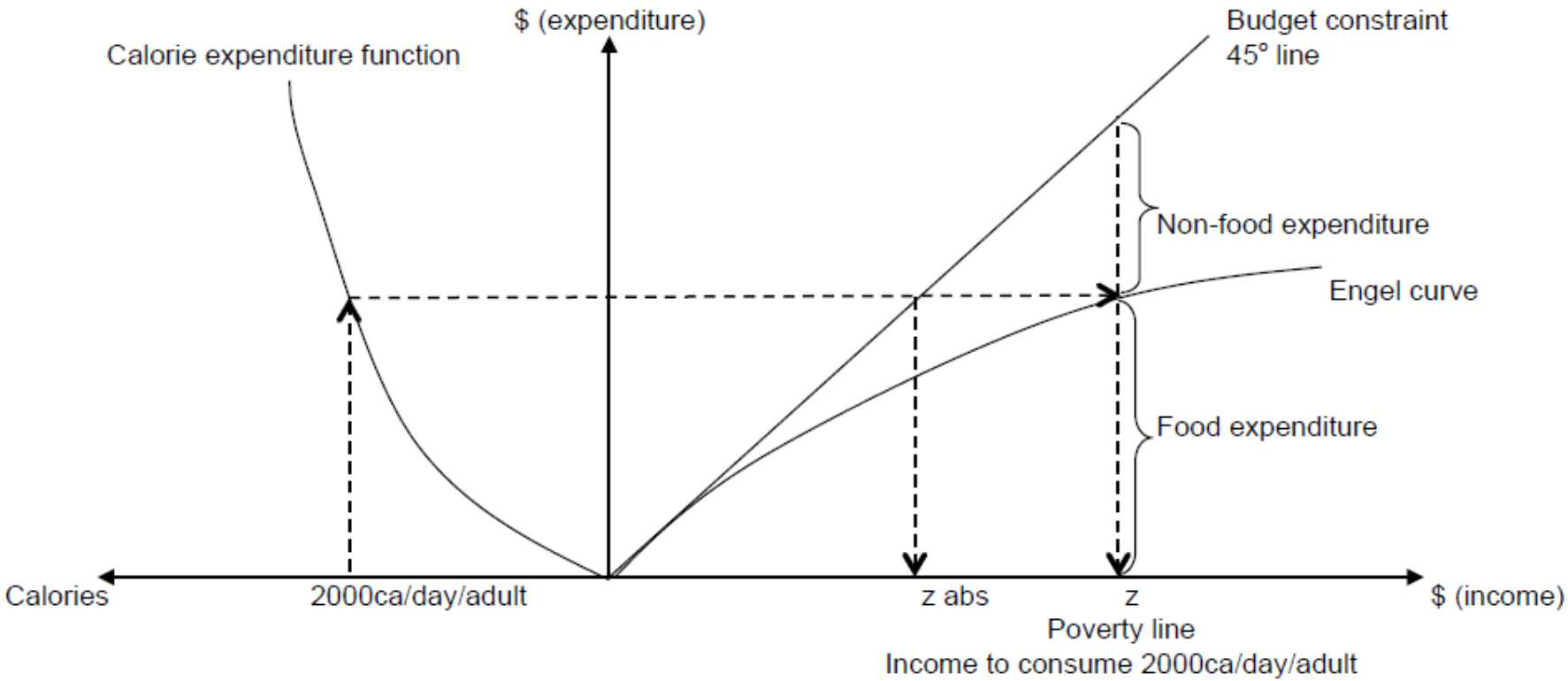
2. Choosing a poverty line z

- A threshold level of y is needed to define who are poor: the poverty line
- We know is hard to define poverty, so it is also hard to define which poverty line to choose:
  - Is poverty absolute?
  - Is it relative to others so it changes with the average level of z?
- Important to note the following:
  - Any statement of poverty is relative to the choice of a poverty line
  - Often is best to use several alternative poverty lines
  - Consistency should be maintained in the definition of poverty line when comparisons are made across time, space and groups
- Several types of poverty lines are available

Nutrition-based poverty line

- A common metric is our daily calorie intake and its minimum recommended value can be use to establish the poverty line (see fig.2):
  - Extreme poverty line: z_{abs}=monetary cost of the recommended minimum calorie intake (2000 ca/day/adult)
  - Normal poverty line: z=expenditure level necessary to consume the recommended minimum calorie intake along with non-food expenditures

Fig.2: Nutrition-based poverty line



International poverty line

- This poverty line is used by the World Bank to make comparisons across countries:
  - \$1/day for extreme poverty measured in PPP dollars (recently updated to 1.25)
  - \$2/day for poverty measured in PPP dollars (recently updated to 2.5)

Relative poverty line

- Poverty is not only an absolute concept, but also relative
- Relative deprivation: people attach value to their income or consumption in relation to the mean of their country or community of residence
- A relative poverty line:

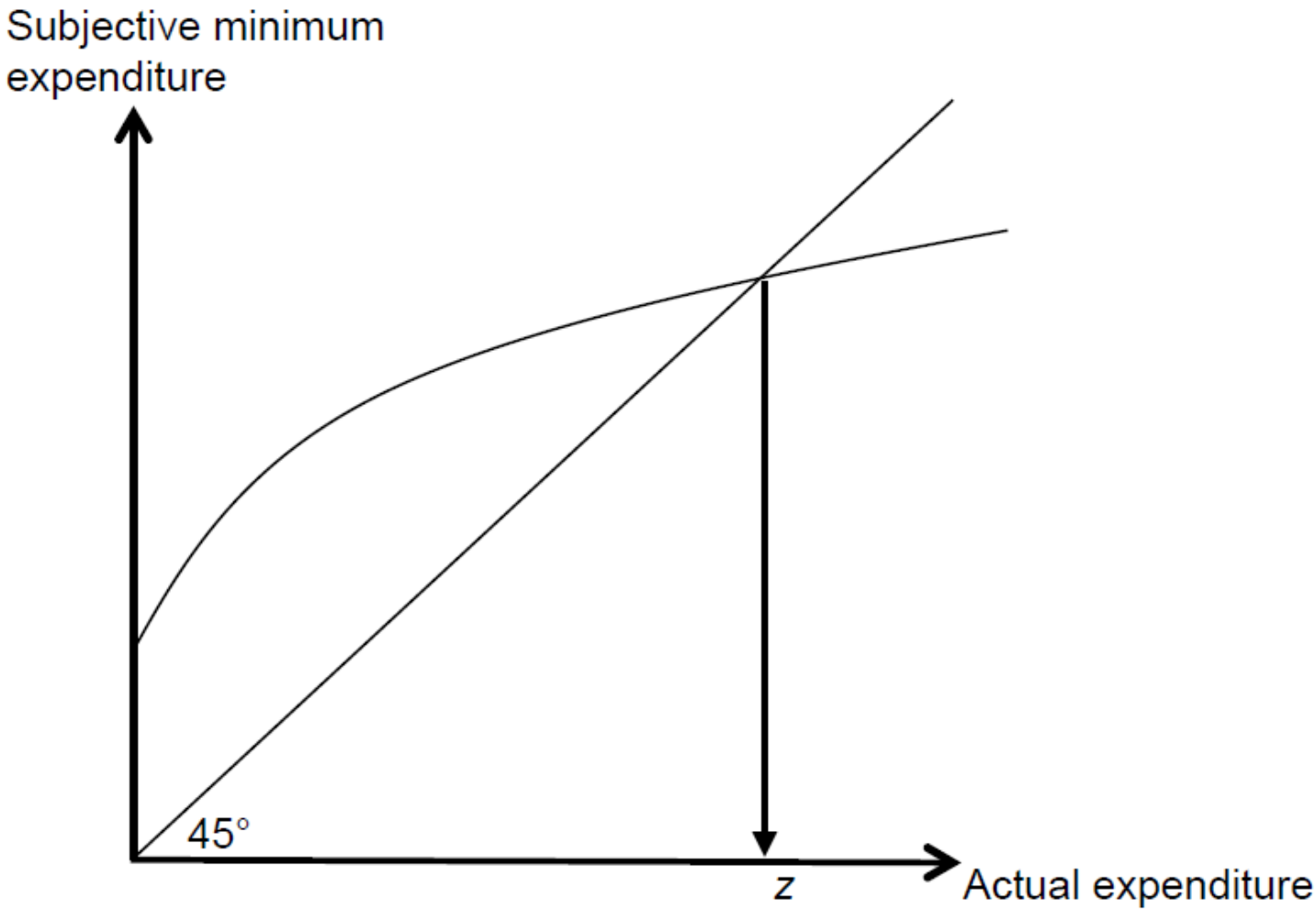
$$z = k\overline{y} \tag{4}$$

- Poverty is affected by inequality

Subjective poverty line

- Poverty is not only an absolute or relative standard, but a perception
- What expenditure do you consider to be absolutely minimal?
- Compare this number with actual expenditure (see Fig.3)
- Problem: framing effects

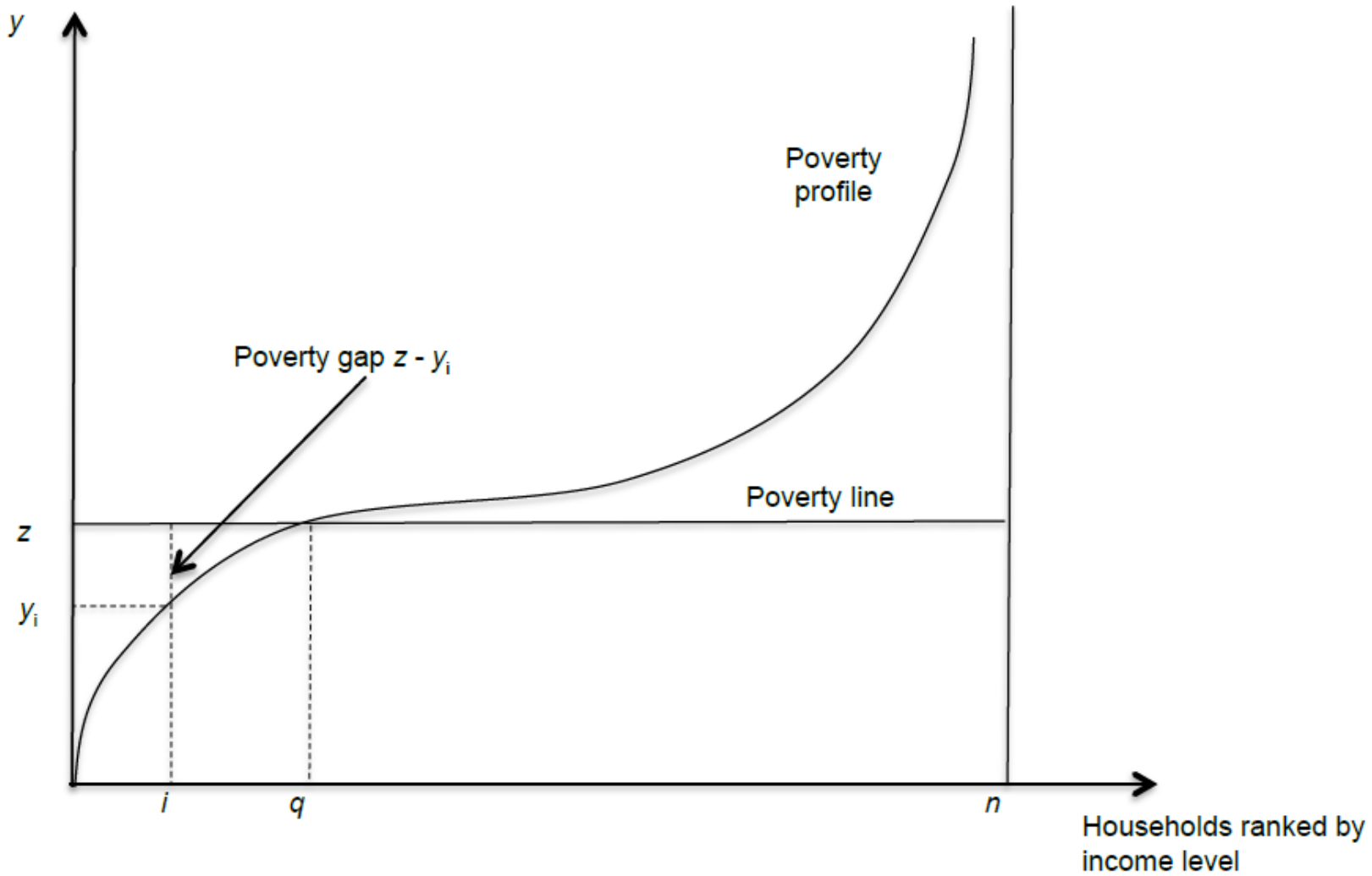
Fig.3: Subjective poverty line



3. Describing poverty

- We build a poverty profile (fig.4):
  - Consider data from n individuals and their per-capita expenditure levels y_i
  - Rank individuals by increasing level of expenditure from the poorest to the richest
  - Compare y_i to z, then q individuals have $y_i < z$ (poor)
- Two useful observations:
  - The poverty profile tends to be quite flat precisely where it crosses the poverty line because there are a lot of people with similar income levels around z
  - There is a lot more information than the number of people below z: poverty gap

Fig.4: Poverty profile



Correlates of poverty

- One poor people is identified, a comparison between poor and non-poor in terms of a set of characteristics can be performed
- What dimensions can be explored?
  - **Individual characteristics**: age, gender, race, ethnicity, education, and health
  - **Household characteristics**: gender of HH head, size, dependency ratio
  - **Assets ownership**: land, livestock, tools, social capital
  - **Activities**: sector of economic activity, type of employment
  - **Location**: rural/urban, region
  - **Access to public services**: electricity, piped water, school, health facilities
  - **Access to market and private services**: distance to market, roads, access to financial services
- Empirical strategies: tests or descriptive regressions

Table 1: Poor and non-poor in Ecuador

Ecuador, 2000	Poor	Non-poor
Household characteristics		
Age of household head	46.4	49.4***
Number of members	5.5***	3.9
Education of househod head		
Primary or no education (%)	63.1***	38.1
Secondary (%)	32.2	36.6*
Higher education (%)	4.6	25.3***
Sector of employment		
Informal sector (%)	80.4***	55.8
Formal private sector (%)	16.4	31***
Public sector (%)	3.1	13.2***
Sector of activity		
Primary (agriculture)	56.9***	26.4
Inustrial	15.3	15.2
Services	27.8	58.4***
Occupational category		
Self-employed	67.1***	42.9
Worker	22.5	26.2
Employer	10.4	30.9***
Annual income	137.3	509.4***
Access to public services		
Water	43.5	70.7***
Electricity	54	85.1***
Sewage	26.3	60.9***

Significantly larger at the *** 1% confidence level, ** 5% level, * 10% level.

Table 2: Poor and non-poor in Nicaragua

Dependent variable: log of household per capita consumption

	1998	2001	2005
Region			
Urban Pacific	**-0.28**	**-0.19**	-0.2
Rural Pacific	-0.27	**-0.11**	**-0.15**
Urban Central	**-0.22**	**-0.16**	**-0.15**
Rural Central	-0.33	-0.23	-0.22
Urban Atlantic	-0.03	0.03	0.07
Rural Atlantic	-0.3	-0.04	-0.03
Household head			
Female	-0.03	-0.03	-0.01
Under age 35	**-0.13**	**-0.13**	-0.09
Primary education	**0.14**	**0.14**	**0.17**
Secondary education	0.37	**0.37**	**0.36**
More than sec. education	0.86	**0.82**	**0.87**
Not in labor force	0.07	0.09	0.1
Household head sector			
Agriculture	0.09	0.08	0.06
Mining	0.08	-0.04	-0.08
Manufacturing	0.02	0.04	0.03
Gas, electricity, water	0.08	0.11	0.1
Construction	0.04	0.01	0
Commerce	**0.17**	**0.18**	**0.18**
Transport	**0.3**	**0.27**	**0.17**
Financial services	0.22	**0.24**	0.14
Community services	0.04	0.02	0

Table 2: Poor and non-poor in Nicaragua

Household services			
Piped water	**0.17**	**0.18**	**0.19**
Electricity	**0.22**	**0.23**	**0.21**
Paved road	**0.22**	**0.19**	**0.11**
Household composition			
# infants (under 5)	**-0.17**	**-0.15**	**-0.16**
# children (5-14)	**-0.14**	**-0.14**	**-0.14**
# adults	-0.05	-0.06	-0.07
# seniors	**-0.1**	**-0.04**	-0.06
Constant	**9.34**	**9.1**	**9.1**
Number of observations	3827	4165	6856
R-squared	0.56	0.57	0.55

4. Measuring poverty

- Poverty indicators offer summary measures of (lack of) wellbeing
- Properties of poverty indicators:
  - **Monotonicity**: a decrease in y of a poor person should increase the poverty index
  - **Transfer**: a transfer of y from poor to less poor should increase the index
  - **Transfer sensitivity**: the rise in the index declines as the y transfer from poor to less poor is taken from richer poor
  - **Population symmetry**: if two identical populations are pooled, the index should not change
  - **Proportion of poor**: if the share of poor increases, the index should increase
  - **Focus**: the index is independent of y level of people above z
  - **Decomposability**: if the poverty of a subgroup increases, the index increases

FGT poverty indicators

- Foster et al (1984) proposed a general class of poverty indicators, the P_α class, also known as FGT, defined as:

$$P_\alpha = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z - y_i}{z}\right)^\alpha \tag{5}$$

- The index specifies 3 indicators according to the value of α:
  - If $\alpha = 0$: Incidence of poverty, headcount ratio or poverty rate

$$P_0 = q/n \tag{6}$$

  - If $\alpha = 1$: Poverty gap or depth of poverty

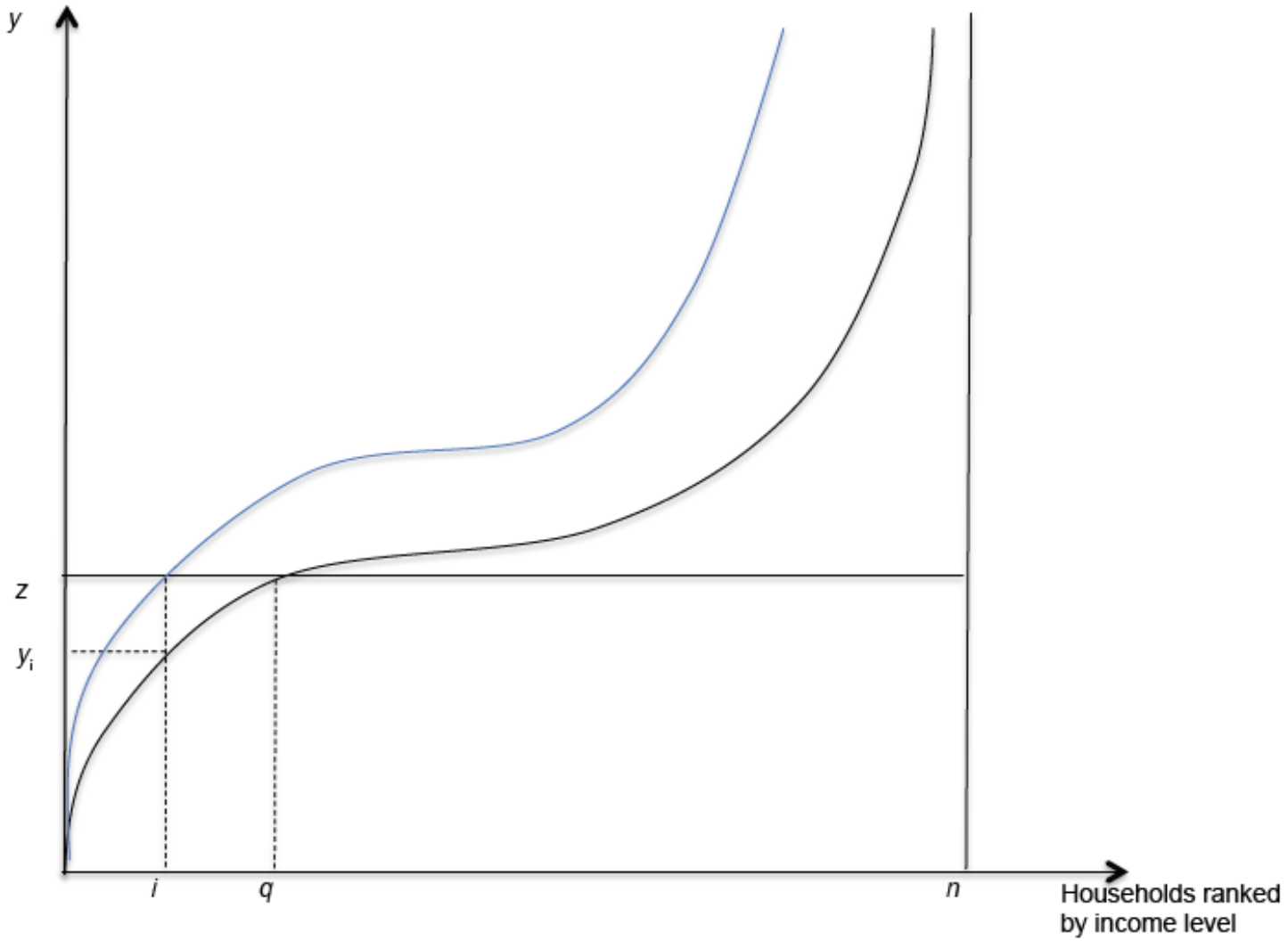
$$P_1 = \frac{\sum_{i=1}^{q}(z - y_i)}{nz} \tag{7}$$

- (Cont..)
  - If $\alpha = 2$: Severity of poverty

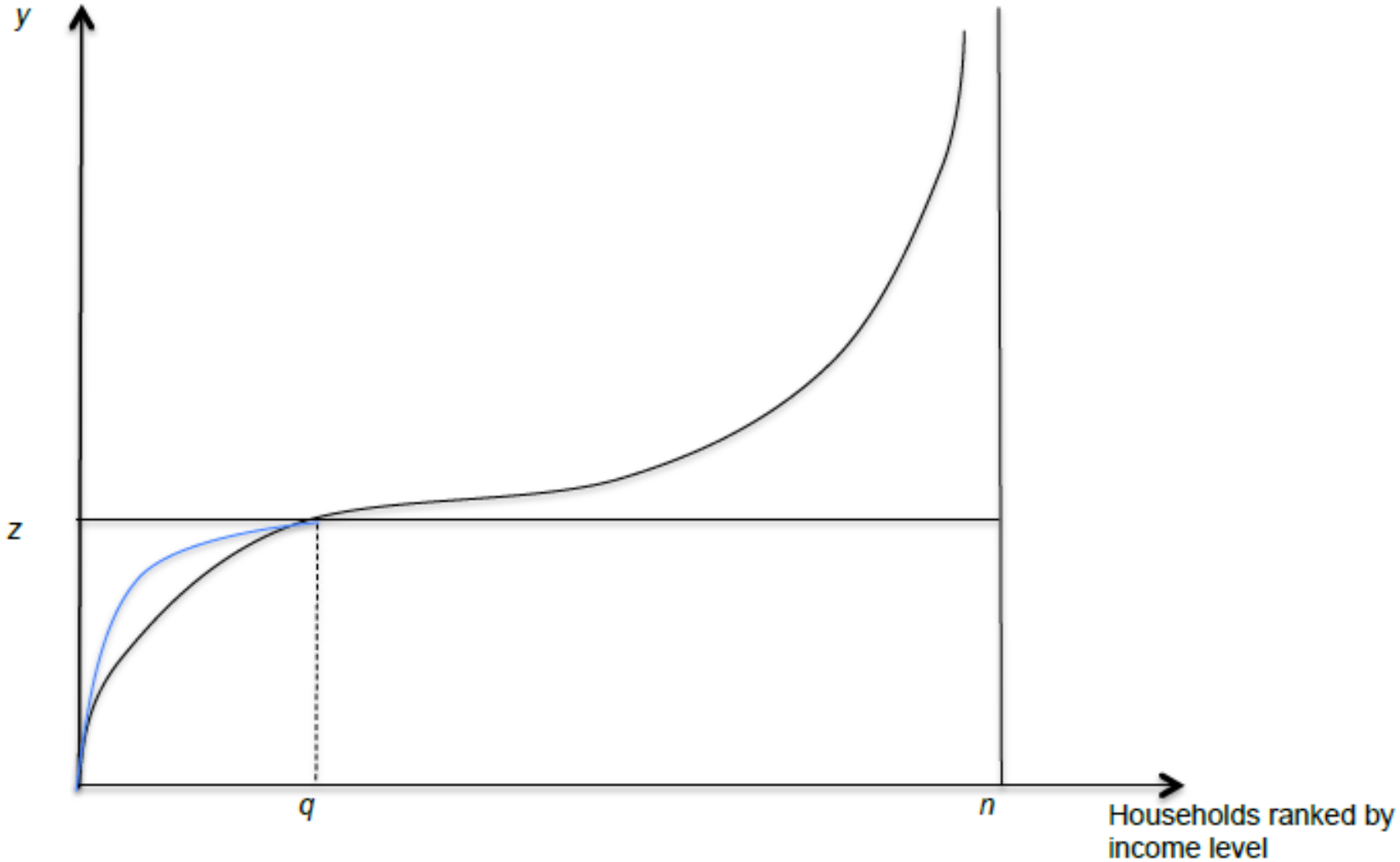
$$P_2 = \frac{1}{n} \sum_{i=1}^{q} \left(\frac{z - y_i}{z} \right)^2 \tag{8}$$

- Notice that α can be interpreted as a policymaker's measure of aversion to poverty
- How does the P_α change as a consequence of movements in the poverty profile?

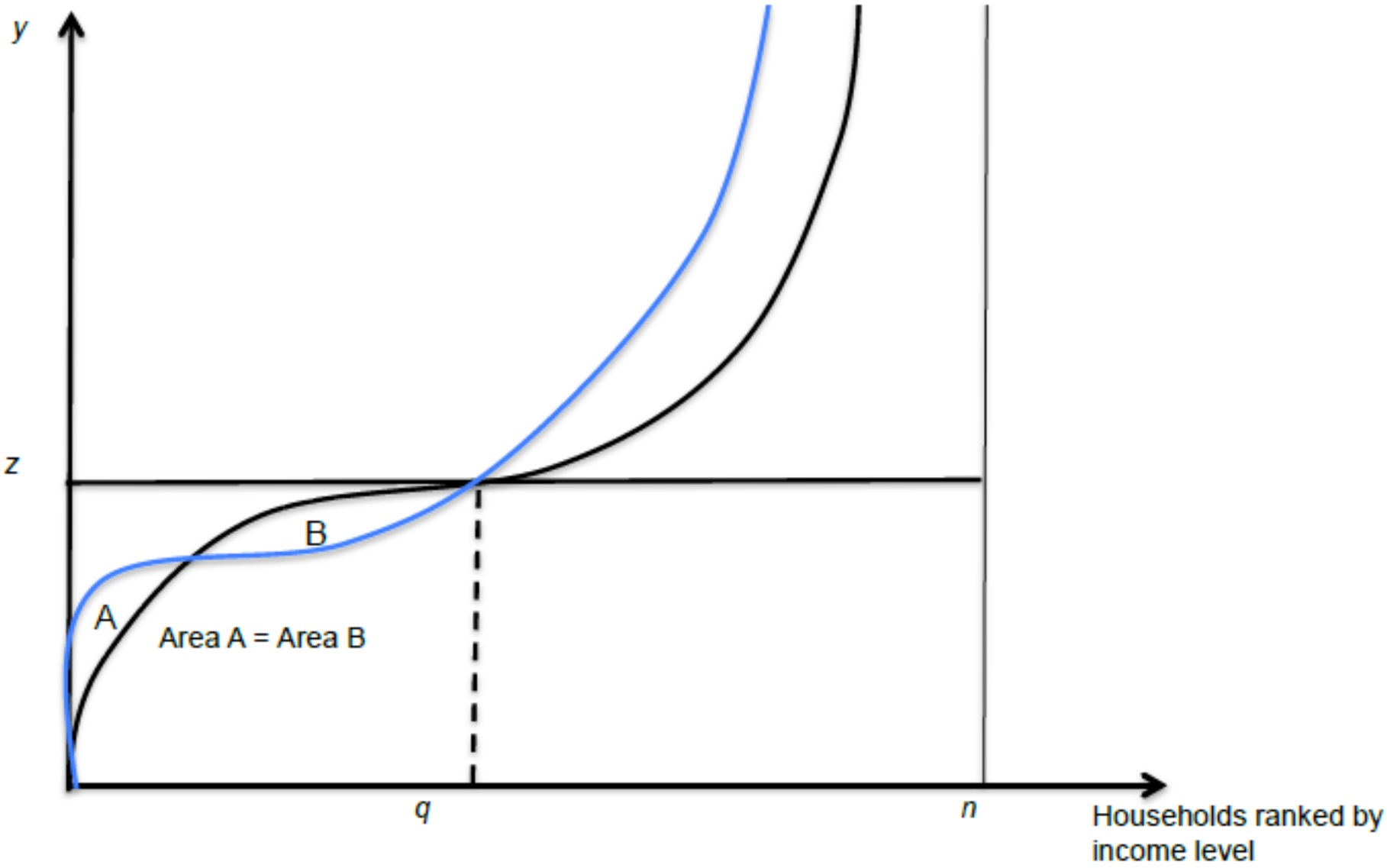
Case 1: Changes in P_0, P_1, and P_2



Case 2: P_0 constant



Case 3: P_0 and P_1 constant



- Each FGT indicator provides differential information about poverty and complement each other
- Some comments on poverty indicators:
  - P_0 does not satisfy the monotonicity and transfer axioms
  - P_1 is insensitive to the inequality among the poor

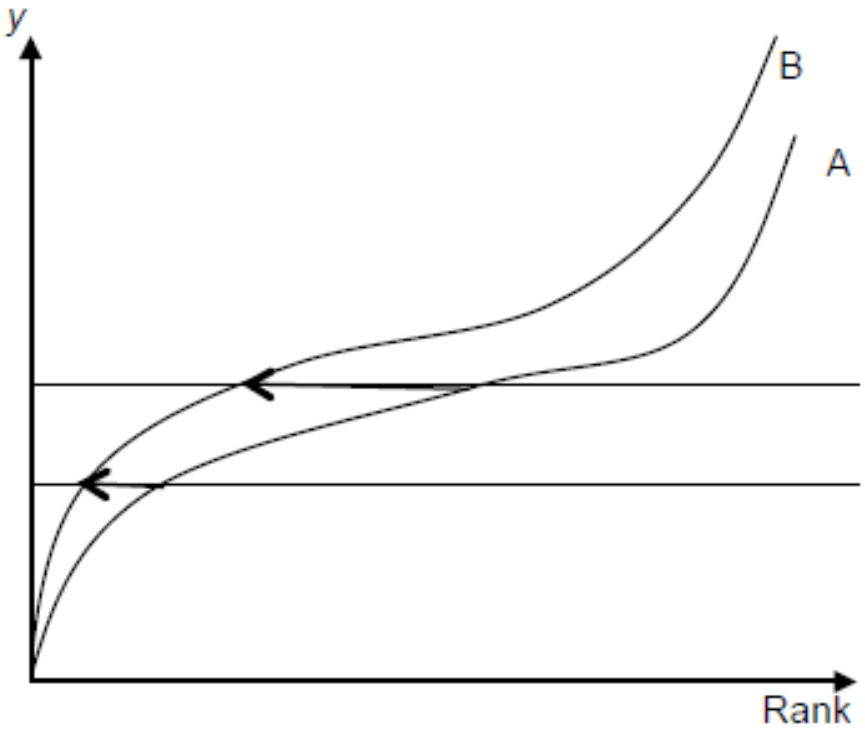
Table 3: Poverty in Madagascar

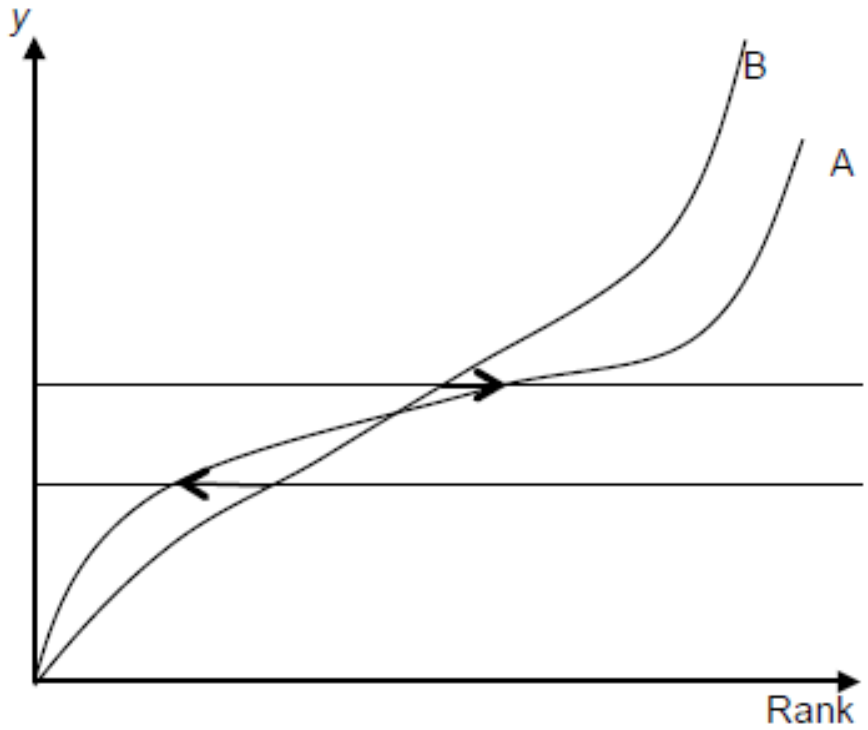
Socioeconomic group	P_0	Rank	P_1	Rank	P_2	Rank
Small farmers	81.6	1	41	1	24.6	1
Large farmers	77	2	34.6	2	19	2
Unskilled workers	62.7	3	25.5	4	14	5
Herders/fiahermen	61.4	4	27.9	3	16.1	3
Retirees/handicapped	50.6	5	23.6	5	14.1	4

Robustness of a poverty profile

- One inconvenient with poverty statements is that they are conditional on the choice of a poverty line
- However, there is possible in some cases to compare poverty in two scenarios without using a poverty line:
  - Case A: no crossing of poverty profiles (first order stochastic dominance)
  - Case B: crossing of poverty profiles

Example





Comparing population groups: relative risk of being poor

- Usually comparisons across population groups are of interest, specially the relative risk of being poor
- The relative risk of being poor:

$$(P_0^A - P_0^B)/P_0^A \tag{9}$$

- Example: Madagascar
  - P_0^{rural}=0.77
  - P_0^{urban}=0.47
  - $(P_0^{rural} - P_0^{urban})/P_0^{rural} = (0.77 - 0.47)/0.47 = 0.64$

Decomposing P_α by population subgroups

- How much different population subgroups contribute to total poverty?
- Let $j = 1, 2, ..., k$ be k exclusive population subgroups with a population size of n_j and poverty index P_α^j. Then:

$$P_\alpha = \sum_{j=1}^{k} m_j P_\alpha^j, m_j = n_j/n \tag{10}$$

- This indicator is additively decomposable

Decomposing the change of P_α over time

- How much the aggregate change in the poverty indicator came from changes in poverty within each group, and how much came from the changing importance of the groups in the population?
- A change can be decomposed in the following way:

$$\begin{aligned}\Delta P_\alpha = P_{\alpha 1} - P_{\alpha 0} &= \sum_{j=1}^{k} \Delta(m_j P_\alpha^j) \\ &= \sum_{j=1}^{k} m_{j0} \Delta P_\alpha^j + \sum_{j=1}^{k} P_{\alpha 0}^j \Delta m_j + \sum_{j=1}^{k} \Delta m_j \Delta P_\alpha^j \\ &= \Delta Poverty_j + \Delta Size_j + CrossEffects\end{aligned}$$

Poverty patterns in Guatemala

	Headcount ratio		Population share		Contribution to poverty	
	2000	2006	2000	2006	2000	2006
Total Guatemala	56.2	51	100	100	100	100
By area						
Urban	27.1	30.0	38.6	48.1	18.6	28.3
Rural	74.5	70.5	61.4	51.9	81.4	71.7
By ethnicity						
Non-indigenous	41.4	36.2	57.4	62.4	42.3	44.3
Indigenous	76.2	75.7	42.6	37.6	57.8	55.8
By gender of household head						
Male	57.6	53.4	85.3	81.2	87.4	85.0
Female	47.9	40.8	14.7	18.8	12.5	15.0

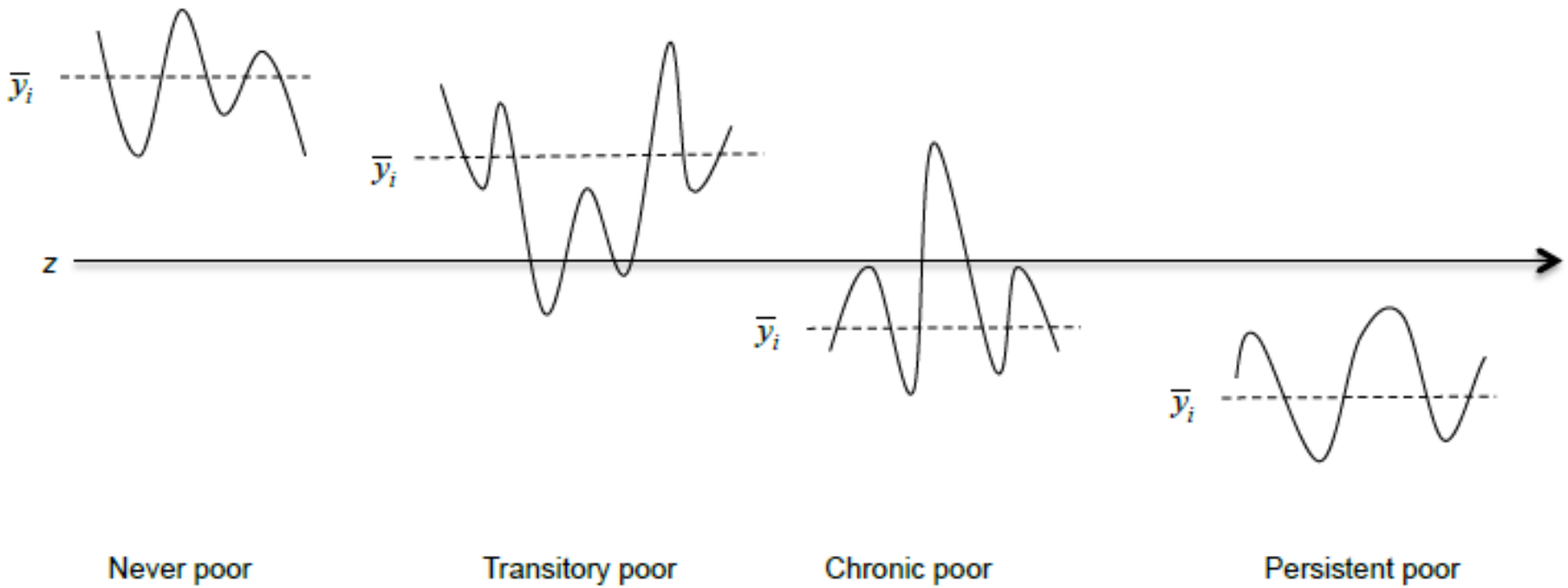
Poverty impact of the debt crisis in Buenos Aires

	Headcount ratio		Population share		Contribution to poverty	
Educational levels	1980	1989	1980	1989	1980	1989
Illiterate	0.34	0.51	7	5	40	12
Grade school	0.05	0.27	61	57	51	70
High school	0.03	0.13	23	27	12	16
University	0.01	0.04	9	11	2	2
Total	0.06	0.22	100	100	100	100

5. Dynamics of poverty and vulnerability

- Poverty is a dynamic condition: overall poverty rate may be misleading
- Type of poor:
  - **Transitory poor**: those with average y above z, but who are sometimes in poverty
  - **Chronic poor**: those with average y below z, but who are sometimes out of poverty
  - **Persistent poor**: those with average y always below z
- Example: Jalan and Ravallion (2000) for China
  - Never poor: 41%
  - Transitory poor: 36%
  - Chronic poor: 18%
  - Persistent poor: 5%

Dynamics of poverty



Vulnerability to poverty

- So far, we have focused on measuring who are currently poor, but policy-makers may wish to know what impact current policies may have on future poverty
- Vulnerability to poverty identifies who the future poor may be (ex-ante concept)
- A household is vulnerable to poverty if it has a high probability of being poor in the next year:

$$v_{it} = Pr(y_{i,t+1} < z) > \alpha \tag{11}$$

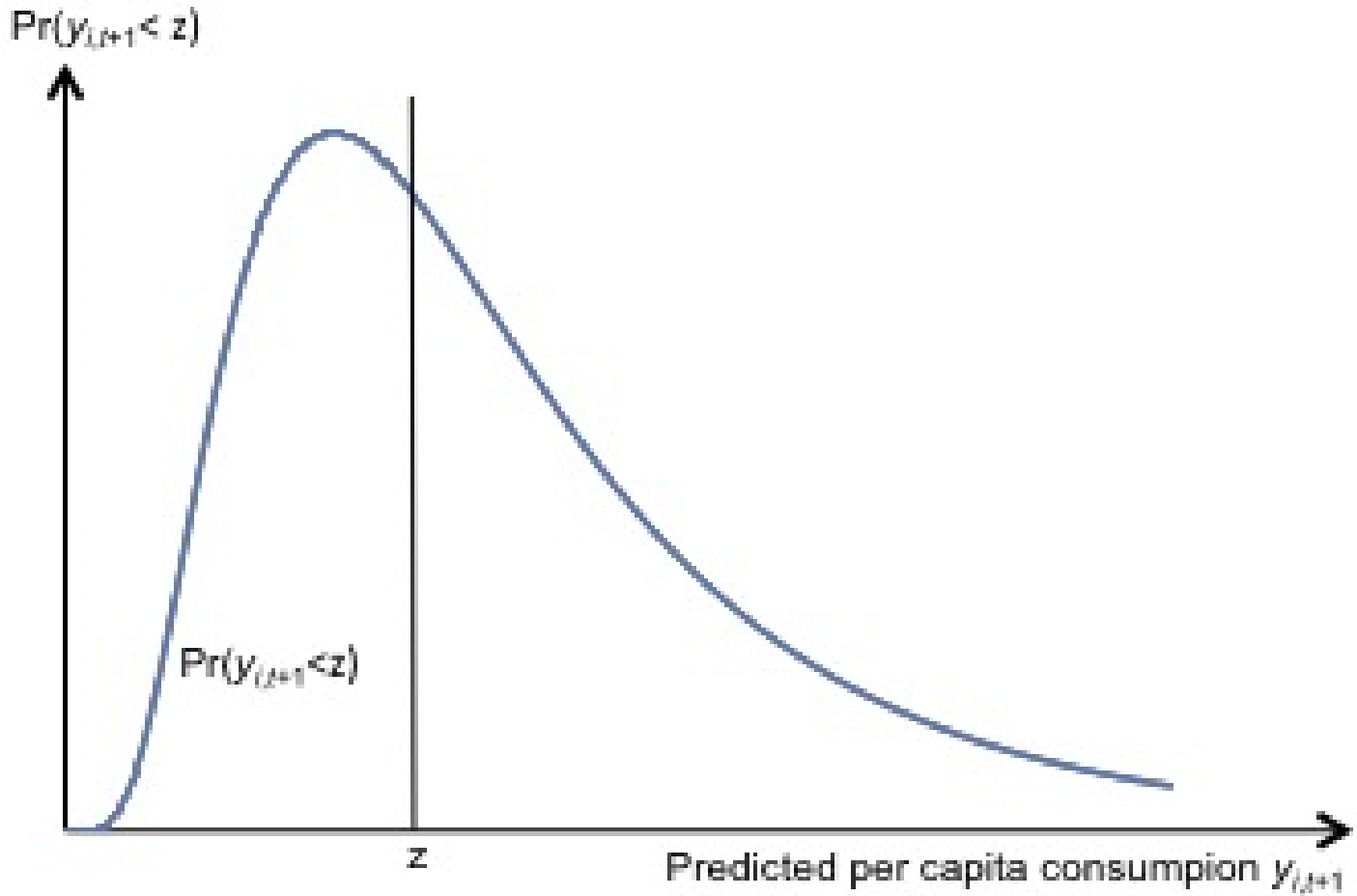
- Type of households:
  - Highly vulnerable: $v_{it} = Pr(y_{i,t+1} < z) \geq 50\%$
  - Moderately vulnerable: $v_{it} = Pr(y_{i,t+1} < z) \geq P_0$ and $< 50\%$
  - Not vulnerable: $v_{it} = Pr(y_{i,t+1} < z) < P_0$

- Measuring vulnerability to poverty requires predicting household's future consumption
- This is done by estimating a consumption equation where y_{it} is a function of a set of determinants $X_{i,t-1}$ including:
  - HH characteristics
  - HH asset endowments
  - Environmental factors
  - Transfers
- The estimated equation:

$$\ln y_{it} = \alpha + \beta X_{i,t-1} + \epsilon_{it} \tag{12}$$

- Using the estimated parameters and the observed values of $X_{i,t}$, values for household's expected value of per-capita consumption in the next period $\mathbb{E}(y_{i,t+1})$ and its variance σ

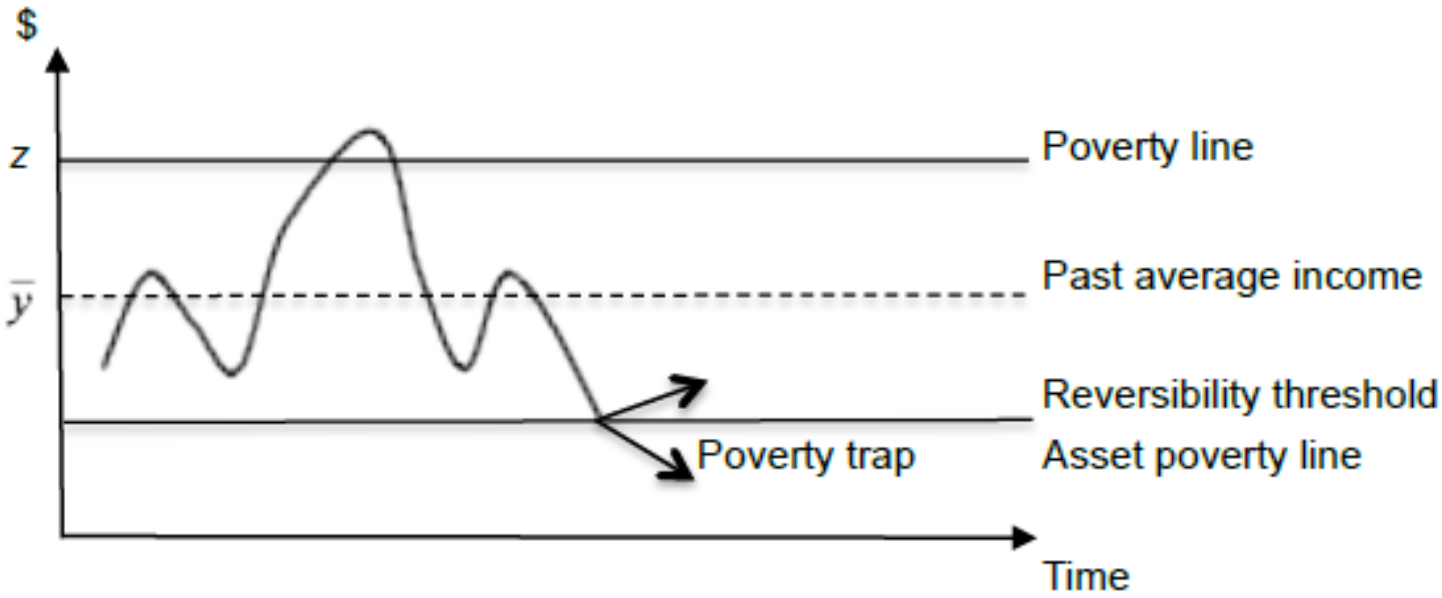
Estimated vulnerability to poverty for a household



Types of shocks

- Shocks can be classified into 4 types:
  1. Shocks to assets
  2. Shocks to the context in which assets are used
  3. Shocks to the context in which assets are transformed into consumption
  4. Shocks to transfers
- Shocks can be idiosyncratic or covariate
- Identifying the causes of vulnerability is essential for designing anti-poverty strategies that can reduce vulnerability to poverty
- Short-run shocks have long-term consequences that affect the likelihood of being in poverty
- Exposure to negative shocks can create poverty traps

Shocks and poverty traps



Entry and exit from poverty, Poland 1993-96

Poland, 1993-96		Probability of exit from poverty	
		High	**Low**
Probability of entry into poverty	**High**	**High poverty mobility** Single Married w/out children Has savings account Participate to transfer network	**High poverty persistence** Low education Married with many children Disabled Employed in public sector Welfare recipient
	Low	**Low poverty persistence** University degree Single Employees Self-employed Pensioners	**Low poverty mobility** Widowed Divorced Indebted Farmers

6. Special aspects of poverty

- Some key dimensions of poverty are the following:
  - Economic mobility
  - Intergenerational transmission of poverty
  - Intra-household poverty: role of gender

Economic mobility

- Transition matrices allows us to track economic mobility over time
- Indicators of mobility
  - % households that remain in the same expenditure category
  - % households that move up or down by one or more quintiles
- Example: Transition matrix for poverty in Vietnam

	Poor in 1998	Not poor in 1998	Poverty rate in 1993
Poor in 1993	0.29	0.27	0.56
Not poor in 1993	0.05	0.39	
Poverty rate in 1998	0.34		1

Intergenerational transmission of poverty

- Children born to poor parents are much likely to be poor themselves
- Conditional cash transfers (CCT) have been proposed as a tool to reduce intergenerational transmission of poverty, but limited evidence about their long-term impacts is available

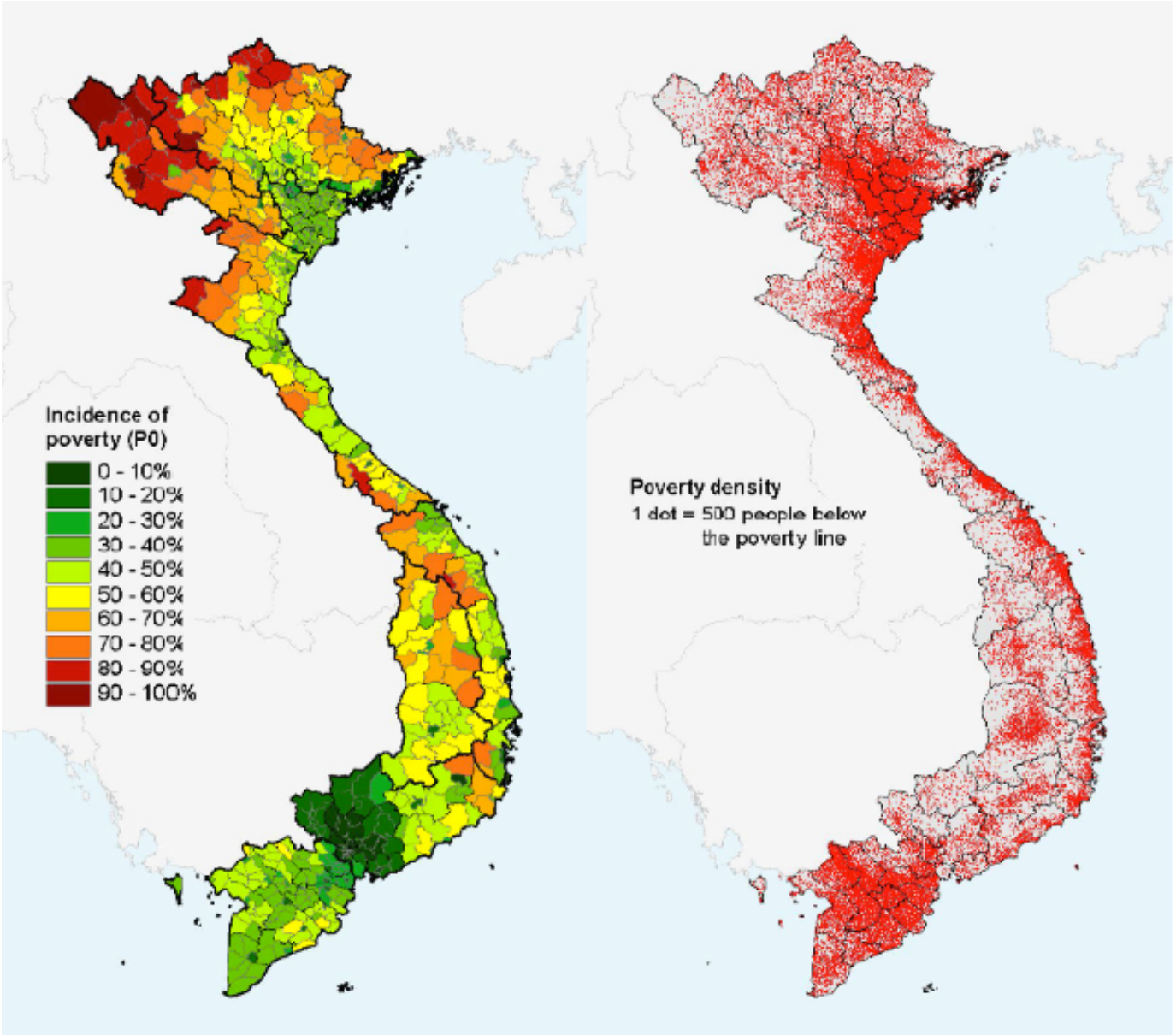
Intra-household poverty

- Even though altruism prevails in the allocation of food across household members, consumption is unequally distributed
- How does this affect poverty?
  - Intra-household disparities underestimates the true extent of individual poverty by about 25% (Haddad and Kanbur 1989)

7. Constructing poverty maps

- Poverty maps are useful in helping visualize the geographical location of poverty
- The goal is to get an income or consumption prediction for each household in a given country or region
- Steps in building a poverty map:
  1. Step 1: Use household data to estimate a predictive equation of the per-capita expenditure level y_i of an individual i with characteristics X_i
  2. Step 2: Use population census data for individuals to predict individual expenditures levels using the predictive function estimated with household surveys
  3. Step 3: Map the poverty indicators for each small area using GIS techniques

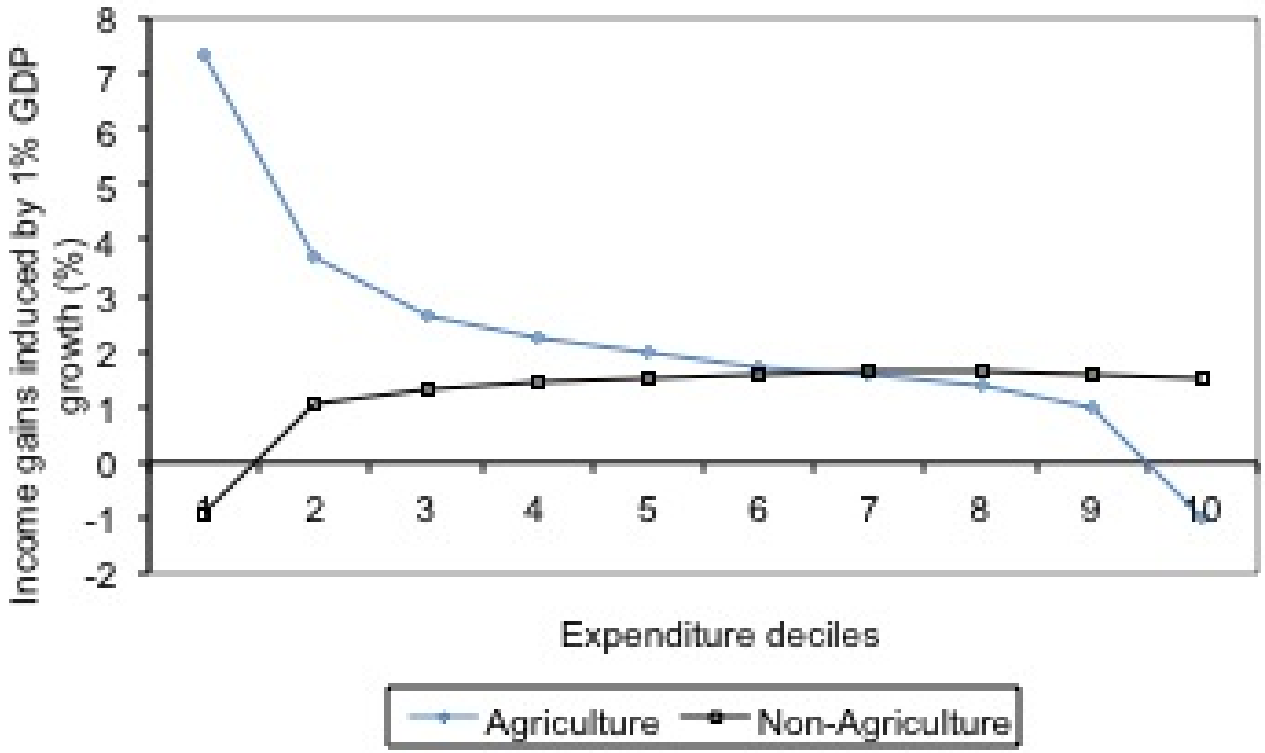
Poverty map for Vietnam



8. Measuring the impact of growth and social programs on poverty

- Key questions:
  - Growth is expected to be the main instrument to reduce poverty, but how effective is it for this purpose?
  - How much does aggregate income growth effectively trickle down to the poor?
- We need to measure the elasticity E of the income of the poor with respect to aggregate income: $E > 1$ means that growth is "pro-poor"
- Dollar and Kraay (2002) found that $E = 1$ implying the growth is good for the poor and that growth is the most effective strategy for poverty reduction, but this overlooks the existence of important heterogeneities

- Can we do better than $E = 1$?
  - Quality of growth matters: labor-intensive growth complemented by targeted transfers and safety nets
  - Agriculture may play a critical role on this regard: Ligon and Sadoulet (2007) show that GDP growth in agriculture is more effective in raising income for poor households



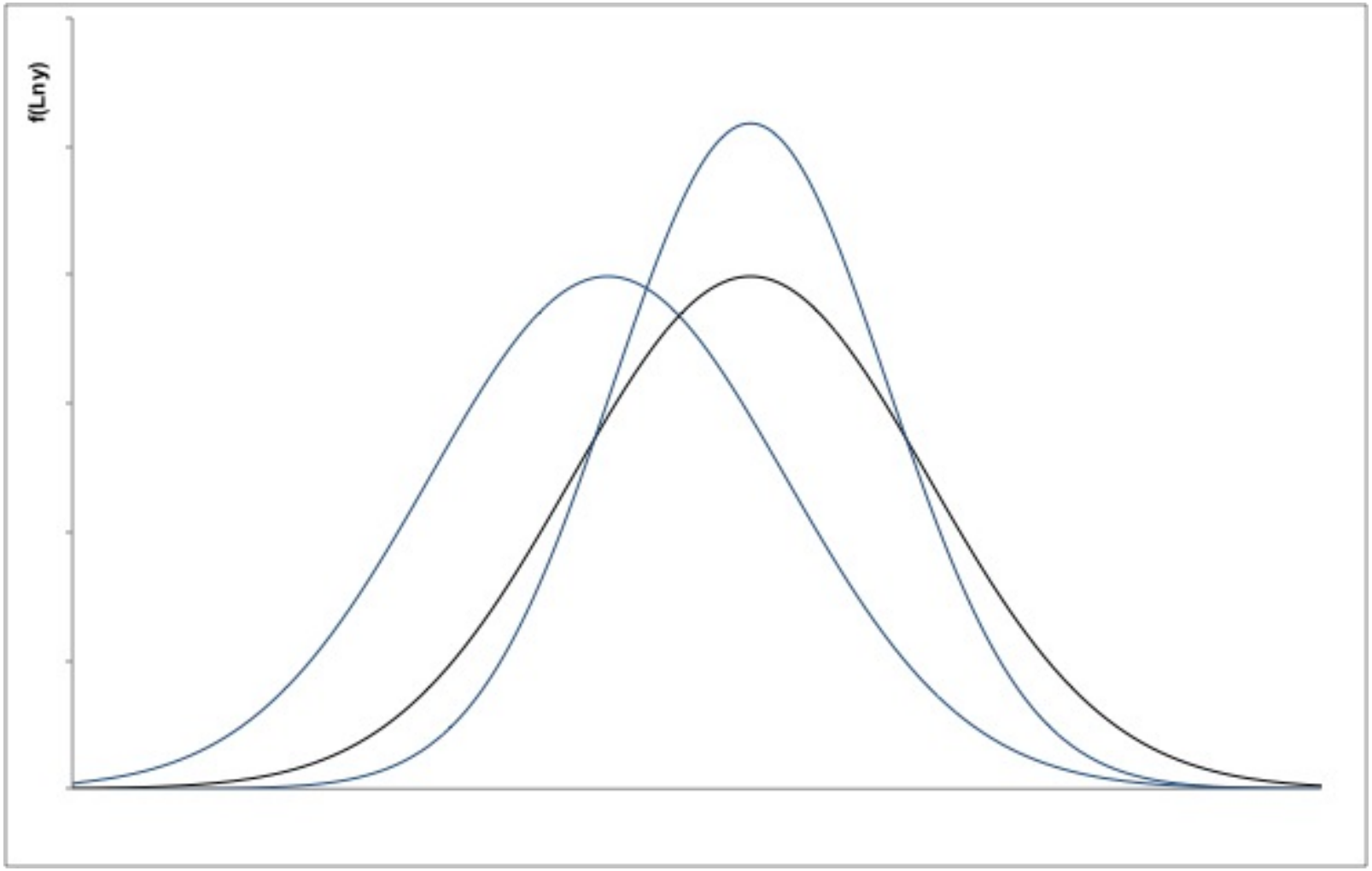
Reduced inequality can contribute to poverty reduction

- In a two-period comparison, income growth occurs along with changes in inequality, therefore a change in poverty is a result of both forces (see figure)
- This effects can be approximated in the following way:

$$\dot{P}_0 = E_p^y \dot{y} + E_p^G \dot{G} + Residual \tag{13}$$

- Where:
  - $\dot{P}_0$: growth in the poverty rate
  - $\dot{y}$: effect of income growth
  - $\dot{G}$: inequality growth
  - E_p^y: income elasticity of poverty
  - E_p^G: inequality elasticity of poverty

Decomposition of poverty change due to growth and inequality effects



Role of growth and distribution on poverty reduction

	Observed growth in poverty rate	% role of income growth	% role of equality growth	% role of residual term	Total effect
All countries	-8.4	76.5	10.4	13.1	100
SSA	-3.1	67.7	-4.8	37.1	100

- Datt and Ravallion (1992) proposed an exact decomposition of the observed change in P between two periods
- Let P be written as a function of z, the mean income μ, and the distribution of per-capita income f: $P(z/\mu, f)$
- The discrete change of poverty between 2 periods:

$$\Delta P = P(z/\mu_1, f_1) - P(z/\mu_0, f_0),$$

- It can be decomposed into growth and inequality effects:

$$\frac{1}{2}[P(z/\mu_1, f_1) - P(z/\mu_0, f_1) + P(z/\mu_1, f_0) - P(z/\mu_0, f_0)]$$

$$+\frac{1}{2}[P(z/\mu_0, f_1) - P(z/\mu_0, f_0) + P(z/\mu_1, f_1) - P(z/\mu_1, f_0)]$$

Growth and distribution components of changes in poverty

Country	Period	Change in P_0	Growth component	Distribution component	Source
Brazil	1981-1988	0	-4.5	4.5	World Bank (2006)
Brazil	1998-2004	-2.9	0.9	-3.7	World Bank (2006)
China rural	1996-2001	-1.5	-2.2	0.4	World Bank (2006)
China urban	1996-2002	-3.2	-6.9	6	World Bank (2006)
Madagascar	1993-2001	14.7	13.6	3.3	World Bank (2006)
Nigeria	1996-2003	-6.9	-3.6	-2.3	World Bank (2006)
Pakistan	1998-2002	3.7	-5.7	9.4	World Bank (2006)
Peru	1996-2002	3.7	-5.7	9.4	World Bank (2006)
Ivory Coast	1985-1988	15.9	16.9	-0.1	Grootaert (1995)
India rural	1977-1988	-15.9	-9.7	-6.1	Datt and Ravallion (1992)
India urban	1977-1989	-7.1	-7.9	-0.2	Datt and Ravallion (1992)

9. Profile of the poor

1. Extended household structure
2. Multiple sources of income
3. Second-best entrepreneurship
4. Underconsumption of staple foods
5. Low investment in health and education
6. Lack of formal savings, borrowing, and insurance
7. Temptation and procrastination
8. Migration
9. Under-use of public services
10. Lack of risk management
11. Adverse risk coping
12. Precarious asset ownership
13. A heavy burden of decision-making

Behavioral poverty traps

- Can poverty induce patterns of behavior that contribute to reproducing poverty?
- The most famous argument was advanced by anthropologist Oscar Lewis (1959): fatalism and resignation to the fact of being poor is an important aspect of the culture of the poor
- Behavioral responses to poverty can also create poverty traps: Mullainathan and Shafir (2013) showed that scarcity creates cognitive impairments (scarcity trap)