Introduction Framework Common Axioms Differences 0000 0000000 000 000 0000000

> The Measurement of Multidimensional Poverty and Intertemporal Poverty: Same Toolkit? Chronic Poverty Research Centre 2010 Conference

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Introduction Framework Common Axioms Differences • 000 Introduction Introduction

- Two types of poverty measurements
 - Single period and multiple dimensions *multidimensional measurement*
 - Imperfect and incomplete markets (Atkinson, 2003; Bourguignon and Chakravarty, 2003; Tsui, 2002; Ravallion, 1996)
 - Basic needs approach (Streeten et al., 1981)
 - Capability approach (Sen 1992)
 - Single dimension and multiple periods *intertemporal measurement*
 - Better understanding of poverty dynamics
 - Distinguishing the chronic poor from the transient poor

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Introduction Framework Common Axioms Differen 00000000 Introduction Multidimensional Vs. Intertemporal Poverty Measurement

- Certain aspects are common across these two measurement literatures
 - Basic framework
 - Invariance properties
 - Dominance and subgroup properties
- However, there are certain aspects that are different
 - Methods of identifying the poor
 - Types of transfer principle
 - Interpretation of weights
 - Interaction acorss attributes and time periods
 - Intermediate groups

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Introduction 00●0	Framework 0000000	Common Axioms 000	Differences 0000000
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Literature			

- Early studies on intertemporal poverty
 - Levy (1977), Coe (1978), Rainwater (1981), Duncan et al. (1984), Bane and Ellwood (1986), Ruggles and Williams (1989), Duncan and Rodgers (1991)
- Intertemporal Poverty Measures
 - Rodgers and Rodgers (1993), Jalan and Ravallion (2000), Duclos, Araar and Giles (2006), Foster and Santos (2006), Foster (2007), Cruces and Wodon (2007), Calvo and Dercon (2007) and Porter and Quinn (2008), Hoy and Zheng (2007) and Bossert, Chakravarty and D'Ambrosio (2008)

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Introduction ○○○●	Framework 0000000	Common Axioms 000	Differences 0000000
Introduction			
Literature			

- Early multidimensional measures
 - Human Poverty Index (UNDP)
- Multidimensional Poverty Mearsures
 - Tsui (2002), Bourguignon and Chakravarty (2003), Alkire and Foster (2007), Maasoumi and Lugo (2008), Bossert, Chakravarty & D'Ambrosio (2009)

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Introduction Framework Common Axioms Difference 0000000 Framework Common Framework and Notation

- Consider any society with *N* individuals and *D* attributes
 - Our attributes could be *dimensions* or *time periods*
- The *achievement matrix* $H \in \mathbb{R}^{ND}$ can be written as

$$H = \begin{bmatrix} h_{11} & \cdots & h_{1D} \\ \vdots & \ddots & \vdots \\ h_{N1} & \cdots & h_{ND} \end{bmatrix}$$

- h_{nd} : *achievement* of individual *n* in attribute $d \forall n, d$
- $h_{n} = (h_{n1}, ..., h_{nD})$: achievement vector of individual n
- $h_{\cdot d} = (h_{1d}, ..., h_{Nd})$: achievement vector across attribute d

Introduction Framework Common Axioms Difference: 0000 Framework Common Framework and Notation

- z_d : poverty line for attribute *d*
- $\mathbf{z} = (z_1, \dots, z_D)$: vector of poverty lines
- The poverty function is defined as

 $P: H \times \mathbf{z} \to \mathbb{R}.$

- Any person *n* is *deprived* in attribute *d* if and only if $h_{nd} < z_d$
 - Terms *deprived* and *poor* are equivalent for single-attribute framework
 - This equivalence does not hold for multiattribute framework

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There are two types of identification approach followed in both literatures

- Attribute-Specific Poverty Line Approach (ASPL)
 - Stage one: identifies if an individual is deprived in each attribute
 - Stage two: identifies if the person is poor based on an identification function
 - Union criterion
 - Intersection criterion
 - Intermediate criterion
- Aggregate Poverty Line Approach (APL)
 - A person is identified as poor if the aggregate individual poverty function ψ (h_n, z) is less than a certain threshold
 - Example: poor if and only if $\phi(h_{n}) \phi(\mathbf{z}) < 0$

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Introduction 0000	Framework ○○○●○○○	Common Axioms 000	Differences 0000000
Aggregation			
Aggregation			

- Two types of aggregation approach followed in both literatures

 - Aggregation directly from achievementsAggregation based on normalized gaps

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- For ASPL Approach, define
 - H^* : A censored matrix whose nd^{th} element is

$$h_{nd}^* = \begin{bmatrix} h_{nd} & \text{if } h_{nd} < z_d \\ z_d & \text{otherwise} \end{bmatrix}$$

- For APL Approach, define
 - H^{**} : A censored matrix whose nd^{th} element is

$$h_{nd}^{**} = \begin{bmatrix} h_{n}. & \text{if } \psi(h_{n}, \mathbf{z}) < 0\\ \mathbf{z} & \text{otherwise} \end{bmatrix}$$

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Introduction Framework Common Axioms Differences Aggregation Aggregation Based on Normalized Gaps October Common Axioms

- For ASPL Approach, define
 - G^* : A normalized gap matrix, such that

$$g_{nd}^* = \frac{z_j - h_{nd}^*}{z_j}$$

- For APL Approach, define
 - *G*^{**} : A normalized gap matrix, such that

$$g_{nd}^{**} = \frac{z_j - h_{nd}^{**}}{z_j}$$

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Framework 0000000 Classes of Poverty Measures Four Classes of Poverty Measures

- Based on the two identification approaches and two aggregation methods, we classify the indices into four classes
 - ASPL and directly based on achievements - $P^A_{ASPL}: H^* \to \mathbb{R}$

 - ASPL and based on normalized gaps $-P_{ASPL}^{G}: G^* \to \mathbb{R}$ APL and directly based on achievements $-P_{APL}^{A}: H^{**} \to \mathbb{R}$ APL and based on normalized gaps $-P_{APL}^{G}: G^{**} \to \mathbb{R}$

Introduction Framework Common Axioms Differences 0000000 Common Basic Axioms Common Basic Axioms

- *Anonymity* Ethically, all individuals should receive equal importance
- *Population Replication Invariance* If the entire population of the society is replicated more than once keeping the attributes unchanged, poverty should not change
- *Scale Invariance* If all poverty lines and attributes are changed by the same proportion, then the poverty should not change
- *Normalization P*(*H*; **z**) = 0 if and only if no one in the society is poor
- Continuity

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Introduction Framework Common Axioms Differences 0000 000 000 00000000 Common Basic Axioms Focus Axioms Differences

- Strong Focus (SFOC): If the achievement of a non-deprived attribute changes, then the overall poverty should not change
 - Deprivation focus of Alkire and Foster (2007)
 - ASPL
- Weak Focus (WFOC): If the achievement of a non-poor changes, then the overall poverty should not change
 - Poverty focus of Alkire and Foster (2007)
 - APL

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Introduction Framework Common Axioms Differences 00000000 Common Basic Axioms Other Common Axioms

- *Monotonicity* If there is a decrease in any attribute of a poor person, poverty should not fall
- *Multiattribute Transfer* If there is an averaging of achievements among the poor, poverty should not increase
- *Subgroup Consistency* If poverty increases in one population subgroup and remains unchanged in others, overall poverty should increase.
- *Subgroup Decomposability* Overall poverty can be expressed as the weighted average of subgroup poverty, where the weights are the population shares.

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Introduction Framework Common Axioms Differences 0000 000 000 000 Differences Between Multidimensional and Intertemporal Poverty Measures Identification Strategy

- ASPL should be more appropriate in the Multidimensional Framework
 - Dimensions are intrinsically important
 - Aggregate poverty line may not be intuitive
 - Many variables are ordinal

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Introduction Framework Common Axioms Differences 0000 Differences Between Multidimensional and Intertemporal Poverty Measures Differences 0000000 Identification Strategy Identification Strategy Identification Strategy Identification Strategy

- In the Intertemporal framework, there are arguments for both identification strategies
 - The variable under analysis is cardinal and homogeneous
 - Poverty that does not last long should not be considered as chronic (Hulme et al., 2001)
 - Emphasis on spells (ASPL)
 - Even if imperfect, there can be substitution of incomes across periods (Rodgers and Rodgers, 1993)
 - Emphasis on depth (APL)

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Introduction 0000	Framework 000000	Common Axioms 000	Differences 00●00000		
Differences Between Multidimensional and Intertemporal Poverty Measures					
Classification of Indices					

Poverty Measurement	P ^A ASPL	P ^G _{ASPL}	P ^A _{APL}	P ^G _{APL}
	Tsui (2002)	Bourguignon and Chakravarty (2003)		
Multidimensional Poverty	Maasoumi and Lugo i (2008)	Alkire and Foster (2007)	Maasoumi and Lugo II (2008)	
		Bossert, Chakravarty, and D'Ambrosio (2009)		
		Foster (2007)	Rodgers and Rodgers (1993)	Porter and Quinn (2008)
Intertemporal Poverty		Bossert, Chakravarty and D'Ambrosio (2008)	Jalan and Ravallion (2000)	
		Duclos, Araar, and Giles (2010)	Foster and Santos (2006)	
			Cruces and Wodon (2007)	

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Differences Between Multidimensional and Intertemporal Poverty Measures				
Weighting				

- Reasons & meaning in *multidimensional framework*
 - Dimensions may have different relative importance
 - Weights affect the marginal rates of substitution between attribues
 - Methods (Decancq and Lugo, 2010):
 - Data-driven, Normative, Hybrid
- Reasons & meaning in *intertemporal poverty framework*
 - Discounting of incomes (Calvo and Dercon, 2007)
 - Sequencing of Poverty Periods consecutive poverty episodes can be seen as worse than non-consecutive ones (Bossert Chakravarty and D'Ambrosio, 2008)

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Introduction Framework Common Axioms Differences 0000 0000000 0

- Association among attributes is related to substitutability or complementarity across attributes (Bourguignon and Chakravarty, 2003)
 - In *multidimensional analysis* both substitutability or complementarity are prevalent
 - In *intertemporal poverty analysis* substitutability is more prevalent than complementarity

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Introduction Framework Common Axioms Differences 000000 Differences Between Multidimensional and Intertemporal Poverty Measures Inter-Attribute Transfers

- If there is a progressive transfer between attributes for a poor person, poverty should not increase
 - More important in *intertemporal poverty* framework
 - Less appealing in *multidimensional framework*

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Differences Between Multidimensional and Intertemporal Poverty Measures				
Intermediate Subgroups				

- Transient poor vs. Chronic poor
- Deprived vs. multidimensionally poor
- May serve to better poverty reduction policy design

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Differences Between Multidimensional and Intertemporal Poverty Measures					
Thank you					

The paper is at its early stage. Feedback and commets are extremely welcome.

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