Intergenerational mobility in developing countries: on the axiomatic foundation of persistence and other measures

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Background

– Findings from intergenerational mobility research are typically sensitive to whether income, educational or occupational mobility are considered and to the concept or measure of mobility used (Fields 2008).

– Unlike poverty and inequality measurement, which has received extensive scholarly scrutiny (early by, among others, Atkinson 1970; Cowell 1980; Foster, Greer and Thorbecke; 1984), the properties of and how well widely used social mobility measures perform, especially in the study of developing country settings, remains comparatively neglected and unchartered research terrain.

Reiterating

– The literature on theory and estimation challenges (Solon 1999; Black and Devereux 2011) has, in main, evolved around research focusing on industrial countries.

– A similar comment extends to the axiomatic literature (with early contributions from e.g. Shorrocks 1978 & 1993; Fields and Ok 1996; Fields 2008 and recent from e.g.). The focus has also and, mainly, been on income mobility.

– Empirical and axiomatic debates have thus, both taken place with a focus on industrial country settings and without sufficient engagement with whether and in what specific ways developing country settings may be **relevantly** different.

Two issues

The issues this knowledge gap raises include whether developing country settings are sufficiently different to warrant, e.g.

(1) revisiting and a rethink of the axiomatic properties a social mobility measure ought to possess.

(2) examination of whether the social mobility measures that have either been used or are considered appropriate for studying developing countries have properties or satisfy axioms that appear *essential*.

Approaches to axiomization

- Fields (2008) distinguishes between the social welfare-based (e.g. Atkinson 1980; Chakravarty, Dutta and Weymark 1985) and the descriptive approach to axiomization.

- As Cowell (2016) puts it, the descriptive approach involves the setting out and defending, on a priori grounds, a minimal set of properties a social mobility measure ought to embody.

- For a descriptive approach, the preceding issues can be addressed (1) by assessing the completeness of the axioms proposed in the literature; (2) by reflecting on other essential or desirable properties a measure of intergenerational mobility, suitable for studying developing countries, ought to possess.

- This chapter anchors reflections on properties and axiomatic propriety in examples from a nationally representative data-set from India.

Condensed & selective review: what the chapter should ideally aim for

– Condensed and selective: Shorrocks (1993) approach to assessing the Hart (1981) measure is instructive: against a set of 12 properties or axioms (satisfies nine), he compares the performance of the Hart measure to the Shorrocks and the Maasoumi-Zandvakili index.

– The good news is that the Hart measure is closely related to the measures (under different names) most widely used in the emerging literature on intergenerational mobility in developing countries.

The ideal vs the more selective route here

- The ideal would be to run through the gamut of social mobility measures and catalogue their axiomatic and other properties. The more selective approach adopted here is guided by a measure's **relevance** as captured by empirical applications using developing country data-sets.

Notation

I follow Fields and Ok and Fields (2006) and (2008) to construct simple, intuitive examples.

Notation: the starting point is population distribution vectors $\mathbf{x} = (x_1, x_2, \ldots x_n)$ and $\mathbf{y}=(y_1, y_2,\ldots y_n)$ where the same units are followed over time and where period 1 or as we interpret them here, generation 1 units, are ordered from lowest to highest: while Fields and Ok (1999) focus on income, the variable of interest may also be occupation or educational attainment.

A mobility measure that captures the transformation from generation 1 to generation 2 may now be represented as m(x,y).

Mobility concepts, properties and axioms: relative, share and flux mobility

– 'Are developing countries **relevantly** different?' Consider the following intergenerational mobility profile (example 1, which resembles Fields 2008). We set the poverty line at 1.5.

Example 1 (upward mobility)

I: $(1,2) - (1,2)$

II: $(1,2) - (2,4)$

III: $(2,4) - (4,8)$

– Example 2 (downward mobility)

– IV: (2,4) − (2,4)

– V: (2,4) − (1,2)

– VI: (4,8) − (2,4)

– **Weak relative mobility (WRM) axiom** $(m(x,y)=m(\lambda x, \lambda y)$ for $\lambda > 0$: II=III & V=VI: zero mobility, in spite of 50 % of the population moving out of poverty in II and 50 % of the population descending into poverty in V.

Observations

- **Share mobility (SM) axiom**: II=III & V=VI. Zero mobility. Similar problem as WRM.

- **Flux (F)**: III>II>I, VI>V>IV. II=V in spite of II involving 50 % poverty escapes and V involving 50 % poverty descents.

- **Concerns**: measure indifference to poverty escapes/descents & directional neutrality (may capture genuine offspring autonomy at higher levels – i.e. industrial country settings).

- Weak relative and share mobility may register positive mobility when all mobility events are poverty descents.

Stylized examples: summing up

– These stylized examples suggest that common mobility events in developing country settings may introduce challenges to intergenerational mobility measurement and comparisons.

– How relevant is this in practice? The bulk of research on developing countries has used two variants of the IGE, either

– $Y_1 = \beta_0 + \beta_1 Y_0 + u_i$ (1)

– Where β_1 is the Intergenerational Regression Coefficient (IGRC); Y_0 and Y_1 represent parental and offspring

– The second variant, the Intergenerational Correlation Coefficient (IGC) is given by:

$$\rho = \beta_1 \left(\frac{\sigma_0}{\sigma_1} \right) \quad (2)$$

– As noted, the examination of the Hart measure by Shorrocks (1993) suggests that many axiomatic properties of the IGC are already known.

– What does the data tell us about the relevance of the concerns in the examples? Using the IHDS 2 for India, I report on occupational and educational mobility (using the
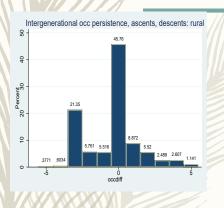
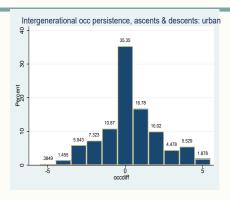**Table 1 Intergenerational occupational mobility in India: IGRC and IGC estimates for rural and urban areas**

	IGRC		IGC	
	Rural	**Urban**	**Rural**	**Urban**
Occupational mobility	0.369***	0.385***	0.312***	0.372***

Table 2 Intergenerational educational mobility in India: IGRC and IGC estimates for rural and urban areas
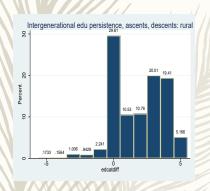
	IGRC Rural	IGRC Urban	IGC Rural	IGC Urban
Education	0.342***	0.297***	0.276***	0.371***
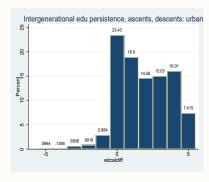
Intergenerational occupational mobility

Intergenerational occ persistence, ascents, descents: rural

Intergenerational occ persistence, ascents & descents: urban

Intergenerational educational mobility

Intergenerational edu persistence, ascents, descents: rural

Intergenerational edu persistence, ascents, descents: urban

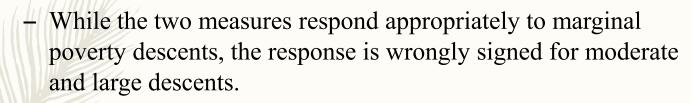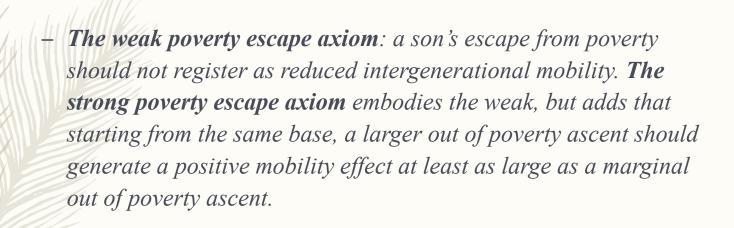|	Rural		Urban	
	Education	Occupation	Education	Occupation
IGC	1	2	3	3
IGRC	2	3	1	4
	Rural		Urban	
Father-son pairs with ascents (% of n)	65.9 (2)	20.6 (4)	71.9 (1)	38.7 (3)
Father-son pairs with descents (%)	4.5 (1)	33.6 (4)	4.7 (1)	26.0 (3)
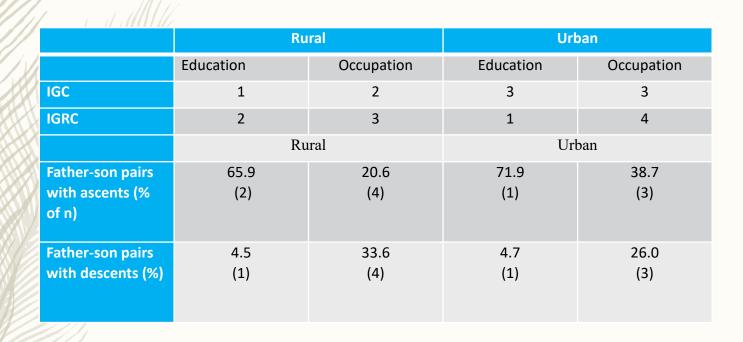
Axiomatic foundation

– Drawing on the above, we first introduce the deprivation axiom:

– ***The deprivation axiom:*** *A son's descent into poverty should not improve intergenerational mobility.*

– In the following examples, the starting point is the social mobility measure's initial value given by $IGRC_0$ or IGC_0. In each example, we introduce a change in a son's occupational category and report the social mobility measure's response to this change.

– If we interpret the bottom occupational category – which comprises agricultural and manual labourers - as a proxy for a condition of poverty – descents from a higher to the lowest level should not, if the deprivation axiom is satisfied, improve intergenerational mobility.

The social mobility impacts of poverty descents

	Example 1	Example 2	Example 3
	Marginal descent	**Moderate descent**	Large descent
IGRC	$(x_1, 2) - (y_1, 2) \rightarrow$ $(x_1, 2) - (y_1, 1)$	**$(x_1, 4) - (y_1, 4) \rightarrow$ $(x_1, 4) - (y_1, 1)$**	$(x_1, 6) - (y_1, 6) \rightarrow$ $(x_1, 6) - (y_1, 1)$
	0.347756 ↑ 0.347866	**0.347756 ↓ 0.347407**	0.347756 ↓ 0.34604
IGC	$(x_1, 2) - (y_1, 2) \rightarrow$ $(x_1, 2) - (y_1, 1)$	**$(x_1, 4) - (y_1, 4) \rightarrow$ $(x_1, 4) - (y_1, 1)$**	$(x_1, 6) - (y_1, 6) \rightarrow$ $(x_1, 6) - (y_1, 1)$
	0.308115 ↑ 0.308184	**0.308115 ↓ 0.307801**	0.308115 ↓ 0.306724

– While the two measures respond appropriately to marginal poverty descents, the response is wrongly signed for moderate and large descents.
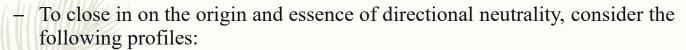
– While choosing a manual occupation may be a rational, voluntary choice in a high-income environment, a long-distance poverty descent is hard to construe as plausibly voluntary.

– We conclude, therefore, that the deprivation axiom is violated and that the IGRC and IGC have weaknesses that may undermine the meaningfulness, accuracy and comparability of mobility estimates.

– **The weak poverty escape axiom**: *a son's escape from poverty should not register as reduced intergenerational mobility.* **The strong poverty escape axiom** *embodies the weak, but adds that starting from the same base, a larger out of poverty ascent should generate a positive mobility effect at least as large as a marginal out of poverty ascent.*

– No problems here.

– **The directional asymmetry axiom**: *poverty escapes and mirror image poverty descents should not have comparable, positive effects on intergenerational mobility.*

– A fundamental frailty of both the IGRC and the IGC is their direction neutrality with respect to large ascents and large descents. While the strong poverty escape axiom is satisfied for both measures, large out of poverty ascents and poverty descents are treated proximately symmetrically. In fact, a large poverty descent registers with a more positive effect on mobility than a large out of poverty ascent.

– The chapter also discusses what I denote the monotonicity and consistency axioms. For the latter, I compare the response to type 1 ascents (positive movement away from the father's occupation) from low and high starting points on the occupational ladder. If this is a reasonable definition of consistency, it is violated by bother the IGC and the IGRC.

– To close in on the origin and essence of directional neutrality, consider the following profiles:

– VII   (3,4) – (3,3)   IX (3,4) – (3,5)

– VIII (1,2) – (1,1)   X (1,2) – (1,3)

– we think of VII and VIII as representing occupational mobility in an industrial and a developing country setting, respectively: as for income, 1 represents the lowest occupational category.

– For relativity and share axioms, the offspring generation will be relatively better positioned than the parent generation for pair 1 and relatively worse for pair 2, in both VII and VIII. For flux mobility, VII and VIII are identical.

– Weak relative and share mobility may register positive mobility when all mobility events are poverty descents.

– Directional neutrality may be a desirable property (genuine offspring autonomy) or a property to worry much less about in an industrial country setting.