A typology for the measures using multiple deprivation indicators

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Context

• The movement towards a multidimensional approach as a response to the critiques on money metric measures

• The main concern is not multidimensionality *per se* but enhancing the validity of measurements

• Various methods for constructing summary indices using multiple deprivation indicators (e.g. Kakwani and Silber, 2008; Alkire and Foster, 2011; Betti and Lemmi, 2015)

• Various measures using multiple deprivation indicators in many different contexts (e.g. Gordon, 2000; Dewilde, 2004; Moisio, 2004; Tomlinson et al. 2008; Noble et al. 2009; Guio, 2009; McLennan et al. 2011; Alkire and Santos, 2013)
The aim

Review existing measures using multiple deprivation indicators to reach a parsimonious typology based on a coherent analytical framework
Why?

The typology based on ideal-case measurement models is useful for

• for facilitating a transparent process of operationalization
• for fostering validity testing
• for choosing measures that are best fit to the intended purposes
• as a guidance for the development of new measures based on a priori designed ideal types
How? The method

Based on the framework of measurement models

- A huge literature in psychometrics on ‘measurement theory’ with many applications in social science (e.g. Bollen 1989; Bollen and Lennox, 1991; MacCallum and Browne, 1993; Vandenberg and Lance, 2000; and Diamantopoulos and Winklhofer, 2001 among others)

- Also a literature specifically on the multidimensional constructs in management/organizational behavior (Law et al. 1998; Chan, 1998; Edwards, 2001; Jarvis et al. 2003; Wong et al. 2008; Johnson et al. 2011; Johnson et al. 2012; Polites, 2012)

- Some applications in poverty literature but no explicit focus on the fruitfulness of the framework (Dewilde, 2004; Moisio, 2004; Nolan and Whelan, 2007; Tomlinson et al. 2008; Wagle, 2009; Krishnakumar and Ballon, 2008)
What?
The analytical framework: measurement model

- Any measure using multiple indicators implicitly or explicitly assume a model of the relationships between the indicators and the overall construct
- Explicitly modelling this relationship between the construct and its multiple indicators
- Measurement model concept is constructed within Structural Equation Modelling method/approach
- SEM is a technique which combines
  - Path analysis from Sociology
  - Simultaneous equations from Economics
  - Factor analysis from Psychometrics

\[
\begin{align*}
I_1 & = \alpha + \beta_1 P + e_1 \\
I_2 & = \alpha + \beta_2 P + e_2 \\
I_3 & = \alpha + \beta_3 P + e_3
\end{align*}
\]
Utility? measurement model

- Provide a framework for constructing conceptually and statistically robust measures
- Intelligible visual representation of the overall construct, the dimensions and the indicators
  - Meaning of dimensionality; distinctions between the construct, dimensions and indicators
- Forces us to elaborate our conceptual apparatus
- Forces us to be clear about our methodological assumptions
  - E.g. trade-offs between dimensions and between indicators
- Provide a framework for validity testing
- Account for measurement error (but only in latent variable modelling frameworks – e.g. SEM, LCA)
A typology of poverty measures using multiple deprivation indicators based on the framework of measurement model

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Model 1: Latent model

Unidimensional multiple indicators

Model 2: Composite model

- Indicators are facets or manifestations of poverty - they are the outcomes of poverty
- An increase in poverty reflects in an increase in indicators
- Indicators are expected to be highly correlated to each other as they are caused by a common underlying factor - poverty
- Indicators are ideally expected to be perfectly substitutable
- Poverty = common variance of all indicators
- Method: counting approach; EFA/CFA; SEM; LCA;

- Indicators are constituent components of poverty - they define what poverty is
- An increase in indicators causes an increase in poverty
- Indicators represent distinct aspects of poverty, and thus independent from each other
- Indicators are ideally expected to be perfectly complementary
- Poverty = total variance of all indicators
- Method: counting approach; PCA; regression

Nolan and Whelan, 2011; Guio, 2009; Guio et al. 2011
Gordon, 2000; 2006
Model 3: 2nd order Latent model

- Manifest dimensions
  - D_1
  - D_2
  - D_3

- Observed manifest indicators
  - I_1
  - I_2
  - I_3

Model 4: 2nd order Composite model

- Component dimensions
  - D_1
  - D_2
  - D_3

- Observed component indicators
  - I_1
  - I_2
  - I_3

- Dewilde, 2004; Moisio, 2004; Tomlinson et al. 2008
- Wagle, 2008
- Alkire & Santos, 2010
- McLennan et al. 2011
Dimensions are the manifestations of poverty, and indicators are the manifestations of dimensions.

An increase in poverty reflects in an increase in dimension deprivation, and also increase in the indicators.

Indicators and dimensions are expected to be highly correlated to each other as they are all cause by a common underlying factor (poverty or dimensional deprivation).

Dimensions and indicators are ideally expected to be perfectly substitutable.

Poverty = common variance of all dimensions
Dimensions = common variance of all indicators

Method: SEM; LCA; IRT

Substitutable dimensions?
Dimensions are the components of poverty, and indicators are the components of dimensions.

An increase in indicators causes an increase in dimensional deprivation, and increase in poverty.

Indicators and dimensions are expected to be highly correlated to each other as they are all cause by a common underlying factor (poverty or dimensional deprivation).

Dimensions and indicators are ideally expected to be perfectly substitutable.

Poverty = total variance of all dimensions.

Dimensions = total variance of all indicators.

Method: Alkire-Foster; SEM.
Which one to use?

It depends

i) on the definition of poverty

ii) on the purpose of measurement
... unless very careful attention is paid to one’s theoretical assumptions and conceptual apparatus, no array of statistical techniques will suffice. Nor can a series of ad hoc empirical studies produce truly cumulative knowledge, except in the sense of producing dated and situation-specific findings of immediate practical significance.

Blalock (1981:9)

*Conceptualization and Measurement in the Social Sciences*
It depends on the definition…

- Definitions precede and guide measures
- The conceptualization of the dimensions needs to be derived from the definition
- The required type of indicators also needs to be derived from the definition (and not solely determined by available data – “data revolution”)
Different conceptual models

**Townsend (1979)** – Poverty is about lack of resources, and various social and material deprivations are the manifestations of poverty.

**Mack and Lansley (1985)** – Poverty is living below a minimally accepted living standard, and what defines poverty is the lack of socially perceived necessities (due to a lack of resources).

**Sen (1993)** – Poverty is capability deprivation, what defines poverty is the capability set.
**Conceptual model**

Townsend

**Operationalization**

*e.g.* Nolan and Whelan, 1996; 2011

- Identify relevant deprivation indicators based on definition and some practical policy considerations
- Run EFA to identify dimensions
- Choose the dimensions that is most relevant to overall construct of poverty (and more closely correlated to income)
Conceptual model
Townsend

Measurement model
Nolan&Whelan

Latent model

P

D₁
Consumption deprivation

D₂
Housing deprivation

D₃
Neighborhood deprivation
**Measurement model**
Nolan & Whelan

- **Measurement model**: comes down to unidimensional manifest model
- **Assumption**: A single scale based on some key indicators is adequate to capture the multidimensional phenomenon of poverty
- **Validity assessment**: Can the index of consumption deprivation identify each set of component indicators that entails a case of poverty?
Conceptual model

Sen

Operationalization

e.g. Alkire and Santos, 2010;2013

- Identify relevant dimensions
- Identify relevant indicators (that represent the dimensional constructs and that are independent from each other – redundancy)
- Calculate the index based on Alkire-Foster counting method
Conceptual model
Sen

Measurement model
MPI

Component model

P

D₁
D₂
D₃
Dᵢ

Health
Education
Living standard
**Conceptual model**

Sen

**Measurement model**

MPI

- **Assumption**: The index captures all relevant aspects of poverty – *missing dimensions* and also *missing indicators*?

- **Validity assessment**: Can the index MPI significantly explain manifest indicators of the overall construct of poverty for different groups of the population?
Using measurement model as an analytical framework forces us to elaborate our conceptual apparatus and provide a framework for reliability and validity testing.
It depends on the purpose…

• Different purposes of measurement – identification; understanding; responding

• For identification, a unidimensional measure can be adequate if it is strongly correlated with all dimensions of poverty – it is an empirical matter (Nolan and Whelan, 2007)

• Multidimensionality is essential for an better understanding of the phenomenon

• Component indicators might directly be relevant for policy responses
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Having a typology is useful for choosing measures that are best fit to the intended purposes.
Conclusion

- Useful for identifying the “ideal case” models fitting for different conceptualizations and for different measurement purposes
- Forces us to be more elaborate and transparent in our conceptualizations and measures
- Facilitates validity testing
- Enables comparison among different models which might lead to testing existing theories and development of a new theory in poverty measurement
- Same models can be applied as conceptual models and helpful to conceptualize the meaning of multidimensionality