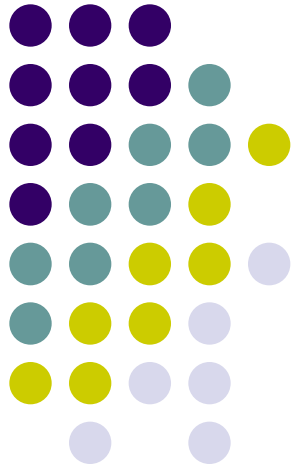
Eliciting, Applying and Exploring Multidimensional Welfare Weights: Evidence from the Field

Lucio Esposito
University of East Anglia and IUSS Pavia
lucio.esposito@uea.ac.uk

Enrica Chiappero-Martinetti
University of Pavia and IUSS Pavia
enrica.chiappero@unipv.it



Outline

- Background
- Research questions
- Dimension importance scores: their use as multiplicative weights and approaches to elicit them
- Data collection strategy
- Results
- Conclusion

Background

- Multidimensional revolution
  - A number of social outcomes or constructs increasingly understood as multidimensional phenomena
    - From 'ILO missions', to Morris' (1979) Physical Quality of Life Index,and then HDI, HPI, MPI, etc.
  - 'New' constructs such as capabilities are inherently multidimensional

- Multidimensional aggregation into a single indicator (as opposed to a 'dashboard approach') presents a number of challenges; e.g. it *requires* deciding upon dimensions' importance

- Taking dimensions as equally important is per se as arbitrary as taking any one dimension importance to be more important than another: it all depends on the motivation for doing so

Research questions

I) Given that 'multidimensionality' concerns many different constructs (e.g. poverty and wellbeing), would dimensions' relative importance be the same across different constructs?

II) Does weighing dimensions make a difference?

In particular: if we have alternative 'somehow relevant' sets of weights, does using one or another really make a difference in empirical assessments of the trend in multidimensional poverty/wellbeing?

We elicit dimensions importance scores in the Dominican Republic from 3 samples:

a. university students (N=1,089);
b. a heterogeneous sample of adults with different socio-economic and educational background (N=309);
c. development experts (N=10).

Dimensions importance scores as (multiplicative) weights

- Once we have dimensions importance scores, these can be operationalised in different ways for the incorporation of value judgements on dimensions importance within multidimensional indices
  - Create hierarchical schemes of different nature
    - E.g. lexicographic orderings
  - Simply use them as multiplicative weights in weighted averages

- We will use dimensions importance scores them as multiplicative weights

A simple example

Suppose we want to evaluate Ed's multidimensional poverty

$$p_{Ed}^{M} = \frac{1}{m}\sum_{j=1}^{m} w^{j}\, p(x_{Ed}^{j}, z^{j})$$

Suppose our dimensions are 'nutrition' (using Kcalories as an indicator) and 'hydration' (using litres of water as an indicator)

Poverty lines are, respectively: $z^{Nutr} = 2000Kcal \;\; ; \;\; z^{Hydr} = 2litres$

Ed's poverty is:

$$p_{Ed}^{M} = \frac{1}{2}\left[\underbrace{w^{Nutr}\, p(Kcal_{Ed}; 2000Kcal)}_{\text{Ed's nutrition poverty}} + \underbrace{w^{Hydr}\, p(l_{Ed}; 2l)}_{\text{Ed's hydration poverty}}\right]$$

Weight attributed to nutrition

Weight attributed to hydration

How to derive weights?

We divide existing approaches into two macro-categories:

- *Direct approaches*: in some ways respondents are directly asked a question such as "How important is dimension *j*?"
  - Categories 'Arbitrary', 'Expert opinion' and 'Self stated' in Decancq and Lugo (2013)
    - Methods: *Perceived status of necessity, Analytic Hierarchy Process, Likert Scales, Budget Allocation Technique*

- *Indirect approaches*: weights derived indirectly from other types of data
  - Categories 'Frequency-based', 'Statistical', 'Most favourable', 'Price-based' and 'Hedonic' in Decancq and Lugo (2013)

Budget Allocation Technique

- *Budget Allocation Technique*. Respondents are invited to distribute a budget of points to different dimensions according to the importance attached to them, with more points allocated to the dimensions more highly valued. Three features emerge as particularly valuable:
  - The amount of points to be allocated is fixed across subjects; this enables to circumvent the problem of individual scale biases.
  - Respondent are presented at once with the whole array of dimensions to be valuated – the attribution of importance scores takes place simultaneously.
  - Tradeoffs among dimensions are made explicit because a point allocated to a certain dimension implies that less points are available for the other dimensions.

Data

Importance scores elicited for the following dimensions:

Education, *Health*, *Housing* and *Personal safety*

Three samples:

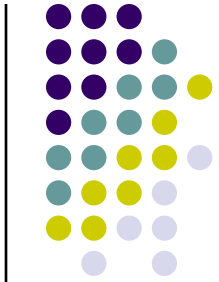
- **Students sample**: 1,083 undergraduate students in the Universidad Autònoma de Santo Domingo
  - (dimensions-related disciplines: Education, Medicine, Architecture and Law)
- **Heterogeneous sample**: 309 interviews carried out in 4 locations (2 urban, 2 rural)
- **Experts sample**: 10 local development agencies and committees, chosen among those with a general mission (i.e. not related to our disciplines – e.g. 'Association for the development of Santiago')

Flashcard used for heterogeneous sample






Question for student sample



- We would like to ask your view about the importance of the 4 dimensions mentioned above. Please assign a number from 1 to 100 to each dimension according to the importance you personally think they have, making sure that those values sum up to 100:
  - Education: ……..
  - Health: ……..
  - Housing: ……..
  - Personal Safety: ……..

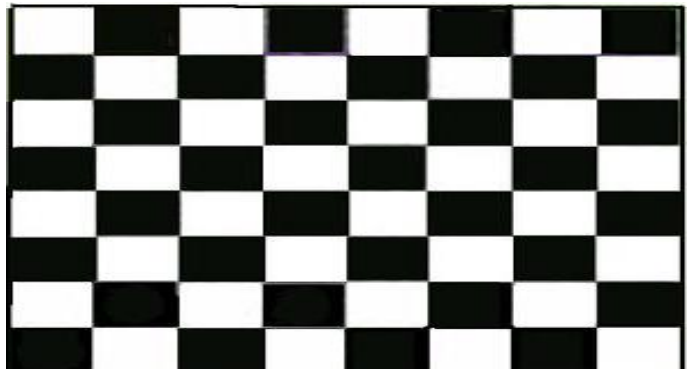
Research question 1

Given that 'multidimensionality' concerns many different constructs (e.g. poverty and wellbeing), would dimensions' relative importance be the same across different constructs?

Classroom

The 'treatment': two different questionnaire versions

Randomisation achieved through chessboard distribution (students unaware of it)



Treatment effect

Zellner's seemingly unrelated regressions

	Specification I[a]				Specification II[b]			
	(1) Edu	(2) Health	(3) Housing	(4) Joint test (chi-2)	(5) Edu	(6) Health	(7) Housing	(8) Joint test (chi-2)
Questionnaire version (treatment)								
Treatment (wellbeing version)	**-1.484****	**2.870*****	**-1.055****	**20.16*****	**-1.402****	**2.657*****	**-0.886***	**17.78*****
	(0.715)	(0.645)	(0.511)		(0.687)	(0.633)	(0.515)	
N	1,030	1,030	1,030		974	974	974	
Equation significance	0.0446	0.0000	0.0153		0.0000	0.0000	0.0001	
Breusch-Pagan test		0.0000				0.0000		

Notes.

[a]: controls for gender, age and discipline of study.

[b]: controls also for general demographics (parents' education, perceived family income and perceived relative standard on living) and dimension-specific indicators (semester of study, own and family experience of illness, whether the student's family owns their house and indicators accounting for episodes of robbery, burglary and physical threat).

A weighing paradox

Dominance principle paradox
(Brun and Tungodden, 2004)

			
Education	**8** (0.7)	**9** (0.1)	**10** (0.1)
Health	**5** (0.2)	**6** (0.5)	**10** (0.1)
Housing	**3** (0.1)	**4** (0.4)	**5** (0.8)
WB equal weights	**16**	**19**	**25**
WB average societal weights	**5.04**	**6.04**	**7.85**
WB individual weights	**6.09**	**5.5**	**4.2**

Another weighing paradox?

Multidimensional poverty and wellbeing in 2 dimensions of 2 individuals with achievements (7,9) and (8,8); Z=10 in both dimensions.

$MP=\Sigma_j w^j(10-x^j)$; $MWB=\Sigma_j w^j x^j$

Dimensions	w^j	x^j	***MP***	***MWB***	x^j	***MP***	***MWB***
Equal weighs							
Education	0.5	9	**4**	**8**	8	**4**	**8**
Health	0.5	7			8		
Unqual weighs							
Education	0.4	9	**2.2**	**7.8**	8	**3.4**	**8**
Health	0.6	7			8		

How do we make sense of the paradoxical conclusion?

(i.e. Green has both more poverty and more wellbeing)

- We reject it:
  - Our respondents are wrong

  or

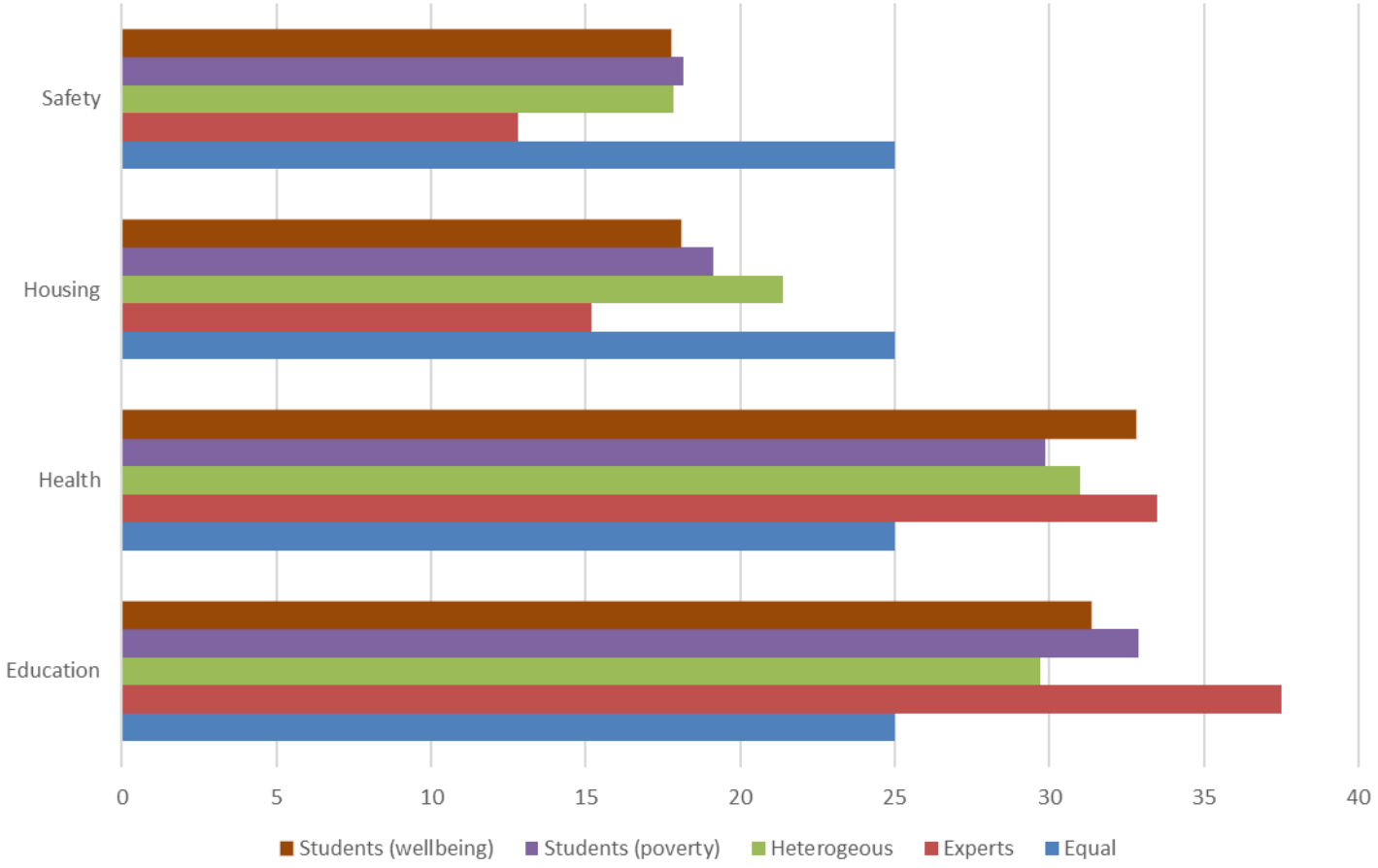
  - We hypothesise that $w^j = f(x^j)$ – i.e. the weight changes along the achievement's domain, so that our 'poverty-version' weights are in fact the weights regarding the lower part of the domain.
    - But then would the notion of WB apply at all below the poverty line?
- We accept it: the *essence* of the poverty and wellbeing concepts differs. 'Poverty' and 'wellbeing' are not two faces of the same coin but rather they are different phenomena.

Research question 2

Does weighing dimensions really make a difference in applied analysis?

In particular: if we have alternative 'somehow relevant' sets of weights, does using one or another really make a difference in empirical assessments of the trend in multidimensional poverty/wellbeing?

Importance scores across samples

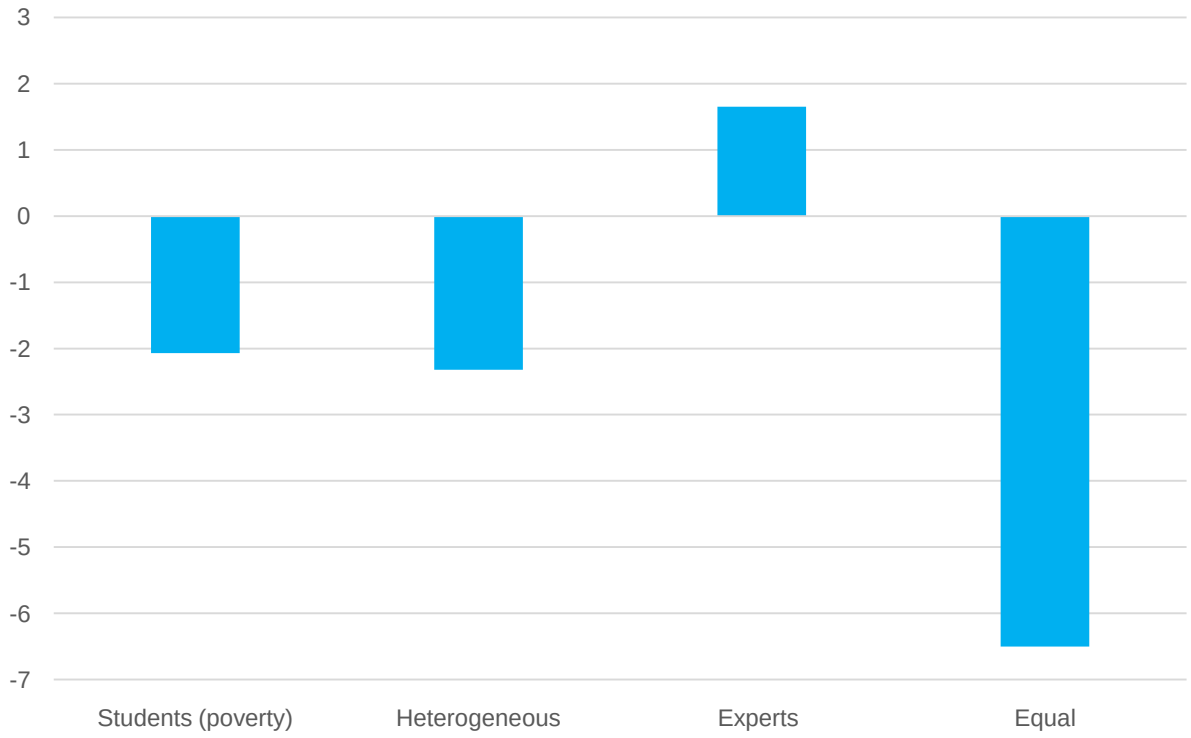


Data

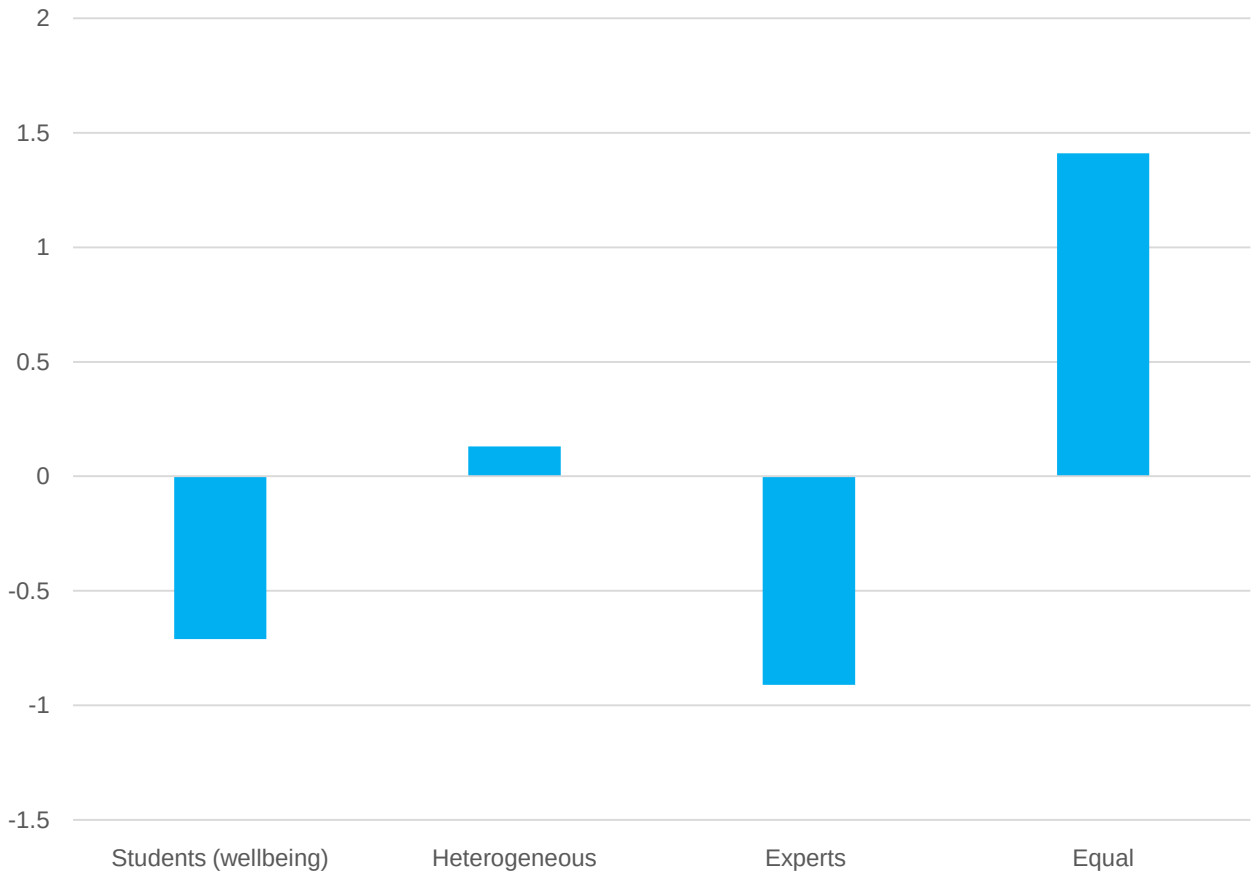
Microdata from two nationally representative household surveys, "Encuesta de hogares de propósitos múltiples (ENHOGAR)"; N=19K (1997) and 30K (2007)

DIMENSIONS	INDICATOR(S)	TYPES OF VARIABLES	DESCRIPTION	WELLBEING SCORES	POVERTY LINES (Z)
EDUCATION	Highest level of education attained	Ordinal	1. illitterate 2. read&writing but no formal edu 3. primary school (basic) 4. high school (middle) 5. univ degree or doctorate	0 (min wb) .25 .50 .75 1 (max wb)	Z ≤2
HEALTH	Presence/absence of a disease or negative health occurrences in the past month	Dichotomous	1. health problems 2. no health problems	0 (min wb) 1 (max wb)	Z=1
HOUSING	Housing conditions	Categorical	1. Type of housing 2. Walls 3. Electricity 4. Sanitation 5. Overcrowding index (no of adults/no. of bedrooms)	count # of poverty symptoms 0= 5 sympt. (min wb) .2=4 sympt. .4=3 sympt. .6=2 sympt. .8=1 sympt. 1=0 sympt. (max wb)	Indicator thresholds: Z_1=shanty or building house or house shared with workplace/shop Z_2=pasteboard or wood or palm leaf Z_3=no electricity or polluting source of energy (i.e. kerosene) Z_4=outhouse or private cesspit Z_5=1st quartile Housing poverty threshold: 3 out of 5 symptoms
PERSONAL SAFETY	Feeling insecure in the neighborhood where people live (*)	Categorical	1. very safe 2. safe 3. quite safe 4. unsafe 5. very unsafe	0 (min security) (°) .2 .4 .6 .8 1 (max security)	Z= mean value (1997=.540) (2007=.525)

Change in multidimensional *poverty* 1997-2007 by sets of weights used (%)



Change in multidimensional wellbeing 1997-2007 by sets of weights used (%)

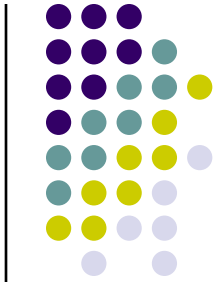


Note: in both the cases of poverty and wellbeing equal weights give the rosiest picture

Summary and conclusion

By combining primary data collected in the field and secondary nationally representative data, in this paper we have a couple of offers:

- Dimension importance scores differ depending on whether dimension *j* is presented as a 'dimension of poverty' or a 'dimension of wellbeing'
  - Another weighing paradox?
- The assessment of the trend in multidimensional poverty leads to opposite conclusions depending on the set of (contextually) 'relevant' weights used.
  - Weighing dimensions should be taken seriously



Thanks!

lucio.esposito@uea.ac.uk

enrica.chiappero@unipv.it