

Multidimensional Poverty Analysis in Venezuela during 1997-2010:

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Workshop 21 – 22 November 2012



Working Papers available at:

Gallo, Cesar and José Manuel Roche (2011): Las dimensiones de la pobreza en Venezuela y sus cambios entre 1997 y 2010: propuesta de una medida multidimensional, Serie de Documentos N° 126, Caracas: Banco Central de Venezuela. <http://www.bcv.org.ve/Upload/Publicaciones/docu126.pdf>

Gallo, Cesar and José Manuel Roche (2012): Análisis multidimensional de la pobreza en Venezuela por entidades federales entre 2001 y 2010, Serie de Documentos N° 131, Caracas: Banco Central de Venezuela. <http://www.bcv.org.ve/Upload/Publicaciones/docu131.pdf>

Acknowledgment

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The project was proposed and coordinated by Dr. Cesar Gallo (retired Professor from Universidad Central de Venezuela), and was developed in technical cooperation with OPHI via the research contribution from Dr. José Manuel Roche

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Motivation

- ✓ Undertake a multidimensional poverty analysis of Venezuela during the period 1997 – 2010
- ✓ Stimulate a necessary methodological debate in Venezuela about the development of new multidimensional poverty measurement

For this presentation we shall put emphasis on...

- ✓ Dynamic comparison between Multidimensional Poverty and Monetary Poverty – Should we include income in a MD poverty?
- ✓ Exploratory techniques to inform more normative decisions on how to cluster the dimensions and assign weights

MAIN DATA SOURCE

Venezuelan Household Survey Series (1997 -2010)
conducted annually every semester (2 per years)

by

The National Institute of Statistics of Venezuela
(Sample size: approximately 40.000 households;
representative at the regional level – 23 states since 2001)

FORTH COMING:

Venezuelan Health and Demographic Household Survey (currently in fieldwork)

The normative selection of the indicators, cut-off and weights was supported by...

- National legal framework, in particular the Constitution of the Bolivarian Republic of Venezuela
- Comprehensive literature review of national and international multidimensional poverty studies
- Consultation process to national experts on poverty and wellbeing measurement
- Consultation process to national actors involved in the design of social policy
- Constrain: data availability

Available Indicators:

Education: School attendance
Adults years of schooling

Labour: **Occupation:**
Occupational status
Working hours per week
Economic sector (formal/informal)

Economic Dependency:
Total employed in the household
Total members of the household

Living Standard: **Housing conditions:**
Floor, walls, roof and type of household

Overcrowding:
Total household members
Total room for sleep

Services: Water, Sanitation, Garbage collection

Assets: Laundry machine, Fridge, T.V., Air Conditioner, Boiler, Tumble Dryer and Car

Minimum Income: Below poverty line food basket (proxy for nutrition)

We are clearly missing health indicators_specially nutrition and child mortality.

Other information could also be included, such as those related to the outcomes of the 'missions' (social programs), quality of services, quality of employment, violence, etc

Deprivation cutoffs:

School attendance: At least one children between 6 and 14 years of age is not attending school

Adults years of schooling: Not any adult member (+15) have completed primary level (9 years)

Occupation: At least one fulltime formal employee for every 3 active members

Economic dependency: More than 3 members for each employed member

Housing condition: Natural floor or inadequate materials in the floor or roof

Overcrowding: More than 3 members for each sleeping room

Improved drinking water: No aqueduct

Improved sanitation: No flush toilet

Garbage collection: No direct garbage collection

Cooking fuel: Neither electricity or gas cooking fuel

Assets: Water, Sanitation, Garbage collection
Assets: Laundry machine, Fridge, T.V., Air

Minimum Income: Below poverty line food basket (proxy for nutrition)

Over 25 set of measures tested – top 4 below

Set 1

Set 2

Set 3

Set 4

Dimensions and Indicators	Weights	Dimensions and Indicators	Weights	Dimensions and Indicators	Weights	Dimensions and Indicators	Weights
Habitat and shelter	1/3	Habitat and shelter	1/3	Habitat and shelter	1/3	Shelter	1/4
<u>Shelter</u>	<u>1/6</u>	<u>Shelter</u>	<u>1/6</u>	<u>Shelter</u>	<u>1/6</u>	Overcrowding	1/8
Overcrowding	1/12	Overcrowding	1/12	Overcrowding	1/12	Housing conditions	1/8
Housing conditions	1/12	Housing conditions	1/12	Housing conditions	1/12		
<u>Services</u>	<u>1/6</u>	<u>Services</u>	<u>1/6</u>	<u>Services</u>	<u>1/6</u>	Services	1/4
Impr. Drinking water	1/24	Impr. Drinking water	1/24	Impr. Drinking water	1/24	Impr. Drinking water	1/12
Impr. Sanitation	1/24	Impr. Sanitation	1/24	Impr. Sanitation	1/24	Impr. Sanitation	1/12
Garbage Collection	1/24	Garbage Collection	1/24	Garbage Collection	1/24	Garbage Collection	1/12
Elec. or gas cooking fuel	1/24	Elec. or gas cooking fuel	1/24	Elec. or gas cooking fuel	1/24		
Education	1/3	Education	1/3	Education	1/3	Education	1/4
School attendance	1/6	School attendance	1/6	School attendance	1/6	School attendance	1/8
Years of schooling	1/6	Years of schooling	1/6	Years of schooling	1/6	Years of schooling	1/8
Living standards	1/3	Living standards	1/3	Living standards	1/3	Living standards	1/4
<u>Assets</u>	<u>1/9</u>	<u>Assets</u>	<u>1/9</u>	<u>Assets</u>	<u>1/3</u>	<u>Assets</u>	<u>1/4</u>
Laundry machine		Laundry machine		Laundry machine		Elect. or gas cooking fuel	
Fridge		Fridge		Fridge		Laundry machine	
T.V.		T.V.		T.V.		Fridge	
Air Conditioner		Air Conditioner		Air Conditioner		T.V.	
Boiler		Boiler		Boiler		Air Conditioner	
Tumble Dryer		Tumble Dryer		Tumble Dryer		Boiler	
Car		Car		Car		Tumble Dryer	
<u>Occupation</u>	<u>1/9</u>	<u>Occupation</u>	<u>1/9</u>			Car	
<u>Minimum income</u>	<u>1/9</u>	<u>Economic dependency</u>	<u>1/9</u>				

Over 25 set of measures test

There is also an implicit weight in how we cluster the indicators by dimension

Set 1

Set 2

Dimensions and Indicators	Weights	Dimensions and Indicators	Weights	Dimensions and Indicators	Weights	Dimensions and Indicators	Weights
Habitat and shelter	1/3	Habitat and shelter	1/3	Habitat and shelter	1/3	Shelter	1/4
Shelter	1/6	Shelter	1/6	Shelter	1/6	Overcrowding	1/8
Overcrowding	1/12	Overcrowding	1/12	Overcrowding	1/12	Housing conditions	1/8
Housing conditions	1/12	Housing conditions	1/12	Housing conditions	1/12		
Services	1/6	Services	1/6	Services	1/6	Services	1/4
Impr. Drinking water	1/24	Impr. Drinking water	1/24	Impr. Drinking water	1/24	Impr. Drinking water	1/12
Impr. Sanitation	1/24	Impr. Sanitation	1/24	Impr. Sanitation	1/24	Impr. Sanitation	1/12
Garbage Collection	1/24	Garbage Collection	1/24	Garbage Collection	1/24	Garbage Collection	1/12
Elec. or gas cooking fuel	1/24	Elec. or gas cooking fuel	1/24	Elec. or gas cooking fuel	1/24		
Education	1/3	Education	1/3	Education	1/3	Education	1/4
School attendance	1/6	School attendance	1/6	School attendance	1/6	School attendance	1/8
Years of schooling	1/6	Years of schooling	1/6	Years of schooling	1/6	Years of schooling	1/8
Living standards	1/3	Living standards	1/3	Living standards	1/3	Living standards	1/4
Assets	1/9	Assets	1/9	Assets	1/3	Assets	1/4
Laundry machine		Laundry machine		Laundry machine		Elect. or gas cooking fuel	
Fridge		Fridge		Fridge		Laundry machine	
T.V.		T.V.		T.V.		Fridge	
Air Conditioner		Air Conditioner		Air Conditioner		T.V.	
Boiler		Boiler		Boiler		Air Conditioner	
Tumble Dryer		Tumble Dryer		Tumble Dryer		Boiler	
Car		Car		Car		Tumble Dryer	
Occupation	1/9	Occupation	1/9			Car	
Minimum income	1/9	Economic dependency	1/9				

Exploratory factor analysis

- ✓ We follow a similar EFA as in Roche (2008, JHDC) to inform the normative decision regarding how to cluster the indicators
- ✓ EFA is used to reveal latent variables underlying a group of observable items. This technique is particularly useful in the early stages of scale development, when the researcher wants to see whether items from the same construct converge on the same factor. This technique can also be used to check that and that underlying factors discriminate between different measures, so that different scales are measuring distinct constructs or underlying variables. Confirmatory Factor Analysis (CFA) is normally used at an advanced stage in scale development to test the goodness of fit of a particular model and evaluate scale invariance. Below we provide a brief explanation of EFA and CFA. (Abell et al. 2009, Brown 2006)

Exploratory factor analysis

(Abell et al. 2009, Brown 2006)

The generalized function would be:

$$x_{ij} = \lambda_{1i}\xi_{1j} + \lambda_{2i}\xi_{2j} + \dots + \lambda_{di}\xi_{dj} + \delta_{ij}$$

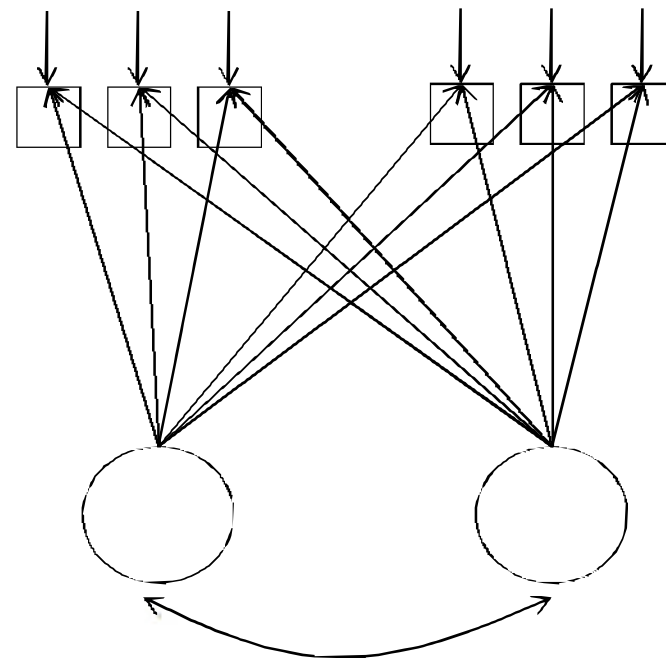
where x_{ij} is the standardized score of the i^{th} item for the person j^{th} ; ξ_{dj} is the latent variable for the person j^{th} in the factor d which normally has mean = 0 and variance = 1; λ_{id} is the factor contribution of the item i en el factor d ; and δ_{ij} is the residual portion not explained by the model.

Path diagram for the EFA?

(Two factors with oblique rotation)

A typical function for the factor analysis made up from two models:

$$x_{ij} = \lambda_{1i}\xi_{1j} + \lambda_{2i}\xi_{2j} + \delta_{ij}$$



Tetrachoric correlations

KOLENIKOV, S. and G. ANGELES (2009) 'Socioeconomic status measurement with discrete proxy variables: is principal component analysis a reliable answer?'. *Review of Income and Wealth*, 55 (1), 128-165.

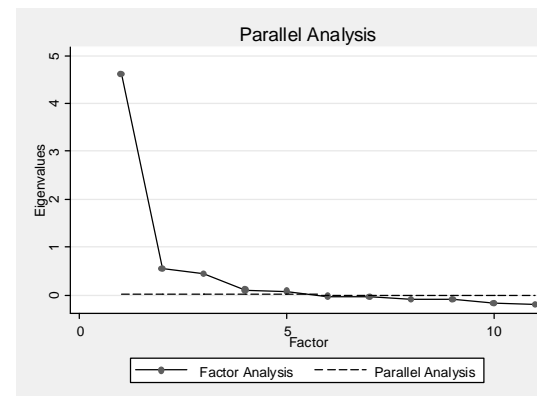
Holgado et al (2010) Polychoric versus Pearson correlation in exploratory and confirmatory factor analysis of ordinal variables. *Qual Quant* 44: 153-166.

	Overcrowding	Housing conditions	Impr. Drinking water	Impr. Sanitation	Garbage Collection	Elec. or gas cooking fuel	School attendance	Years of schooling	Occupation	Assets	Economic dependency	Minimum income
Overcrowding	1											
Housing conditions	.694	1										
Impr. Drinking water	.348	.597	1									
Impr. Sanitation	.500	.742	.711	1								
Garbage Collection	.253	.450	.561	.565	1							
Elec. or gas cooking fuel	.231	.485	.479	.573	.398	1						
School attendance	.422	.339	.296	.373	.228	.300	1					
Years of schooling	.336	.524	.474	.581	.380	.438	.407	1				
Occupation	.098	.141	.140	.168	.067	.144	.109	.254	1			
Assets	.407	.565	.470	.628	.340	.470	.342	.548	.198	1		
Economic dependency	.422	.193	.108	.176	.084	.039	.172	.155	.150	.178	1	
Minimum income	.388	.354	.306	.411	.236	.279	.308	.423	.316	.444	.580	1

Interestingly, minimum income is only relatively correlated to other dimensions

Exploratory Factor Analysis

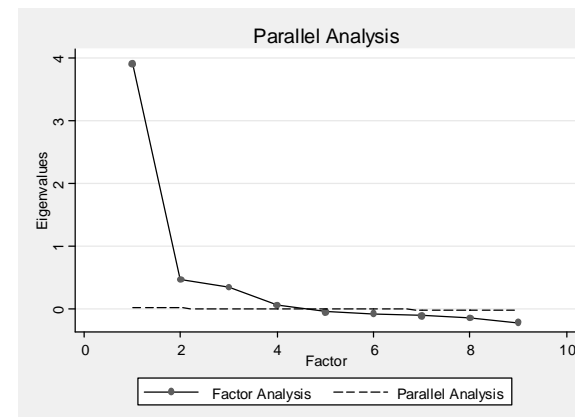
All 12 indicators



Variable	Factor1	Factor2	Factor3	Uniqueness
Overcrowding	0.037	0.047	0.759	0.353
Housing conditions	0.510	-0.045	0.543	0.227
Impr. Drinking water	0.776	-0.005	0.020	0.388
Impr. Sanitation	0.738	0.099	0.160	0.204
Garbage Collection	0.697	-0.060	-0.030	0.577
Elec. or gas cooking fuel	0.564	0.191	-0.083	0.576
School attendance	0.076	0.304	0.244	0.720
Years of schooling	0.334	0.483	-0.005	0.473
Occupation	-0.077	0.496	-0.112	0.830
Assets	0.340	0.407	0.099	0.474
Minimum income	-0.006	0.581	0.100	0.597

There seems to be two dimensions of housing/services, and one dimension on living standards with education.

Exploratory Factor Analysis

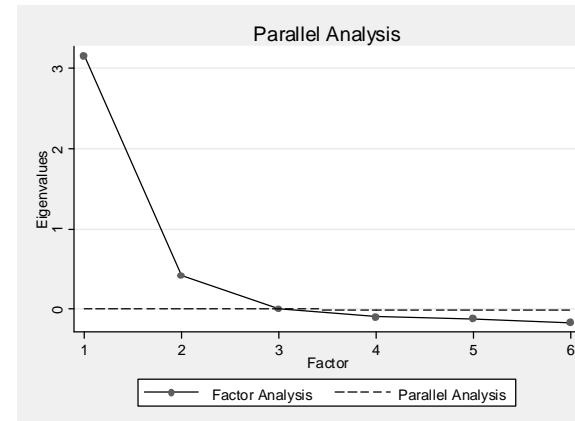


Excluding education (to assess changes)

Variable	Factor1	Factor2	Factor3	Uniqueness
Overcrowding	0.011	0.730	0.065	0.405
Housing conditions	0.434	0.602	-0.033	0.213
Impr. Drinking water	0.771	0.049	-0.025	0.386
Impr. Sanitation	0.721	0.203	0.082	0.201
Garbage Collection	0.699	-0.007	-0.089	0.575
Elec. or gas cooking fuel	0.590	-0.058	0.143	0.581
Occupation	-0.043	-0.091	0.475	0.826
Assets	0.355	0.146	0.354	0.488
Minimum income	0.035	0.114	0.546	0.601

There is enough reasons to separate education – we still get occupation together with assets and income; and two dimensions of housing/services

Factor Analysis Results (Gallo & Roche 2011)



Only housing and services

Variable	Factor1	Factor2	Uniqueness
Overcrowding	-0.0125	0.7563	0.4381
Housing conditions	0.3464	0.6552	0.2054
Impr. Drinking water	0.7376	0.0863	0.3797
Impr. Sanitation	0.6946	0.2857	0.2215
Garbage Collection	0.6568	-0.0045	0.5719
Elec. or gas cooking fuel	0.6063	0.0359	0.6076

Housing alone still distinguishes two dimensions: services and housing structure/space

Aggregation by dimension and choice of weight

The decision on clustering the dimensions and setting weights is still normatively driven but the EFA helps to support the decision

Option 1
(3 dimensions)

Dimensions and Indicators	Weights
Habitat and shelter	1/3
<u>Shelter</u>	<u>1/6</u>
Overcrowding	1/12
Housing conditions	1/12
<u>Services</u>	<u>1/6</u>
Impr. Drinking water	1/24
Impr. Sanitation	1/24
Garbage Collection	1/24
Elec. or gas cooking fuel	1/24
Education	1/3
School attendance	1/6
Years of schooling	1/6
Living standards	1/3
<u>Assets</u>	<u>1/9</u>
Laundry machine	
Fridge	
T.V.	
Air Conditioner	
Boiler	
Tumble Dryer	
Car	
<u>Occupation</u>	<u>1/9</u>
<u>Minimum income</u>	<u>1/9</u>

Choosing among different sets

Set 1

Dimensions and Indicators	Weights
Habitat and shelter	1/3
<u>Shelter</u>	<u>1/6</u>
Overcrowding	1/12
Housing conditions	1/12
<u>Services</u>	<u>1/6</u>
Impr. Drinking water	1/24
Impr. Sanitation	1/24
Garbage Collection	1/24
Elec. or gas cooking fuel	1/24
Education	1/3
School attendance	1/6
Years of schooling	1/6
Living standards	1/3
<u>Assets</u>	<u>1/3</u>
Laundry machine	
Fridge	
T.V.	
Air Conditioner	
Boiler	
Tumble Dryer	
Car	
<u>Occupation</u>	<u>1/9</u>
<u>Minimum income</u>	<u>1/9</u>

Set 3

Dimensions and Indicators	Weights
Habitat and shelter	1/3
<u>Shelter</u>	<u>1/6</u>
Overcrowding	1/12
Housing conditions	1/12
<u>Services</u>	<u>1/6</u>
Impr. Drinking water	1/24
Impr. Sanitation	1/24
Garbage Collection	1/24
Elec. or gas cooking fuel	1/24
Education	1/3
School attendance	1/6
Years of schooling	1/6
Living standards	1/3
<u>Assets</u>	<u>1/3</u>
Laundry machine	
Fridge	
T.V.	
Air Conditioner	
Boiler	
Tumble Dryer	
Car	

Still remain a conceptual question. Should we include income/occupation or not?

Pros: Below food basket could be a proxy to nutrition, occupation as we measure it can capture productive capability, assets could be a weaker indicator alone

Cons: risk of double counting, there are benefits to keep them separately

How much do they overlap? – additional to the papers

Set 3 vs Income Poverty

Set 1 (which does include income & occupation) vs Income Poverty

1997

		Income Poor	
		Yes	No
MD poor?	Yes	13.13	22.86
	No	9.13	54.87

		Income Poor	
		Yes	No
MD poor?	Yes	13.13	22.86
	No	9.13	54.87

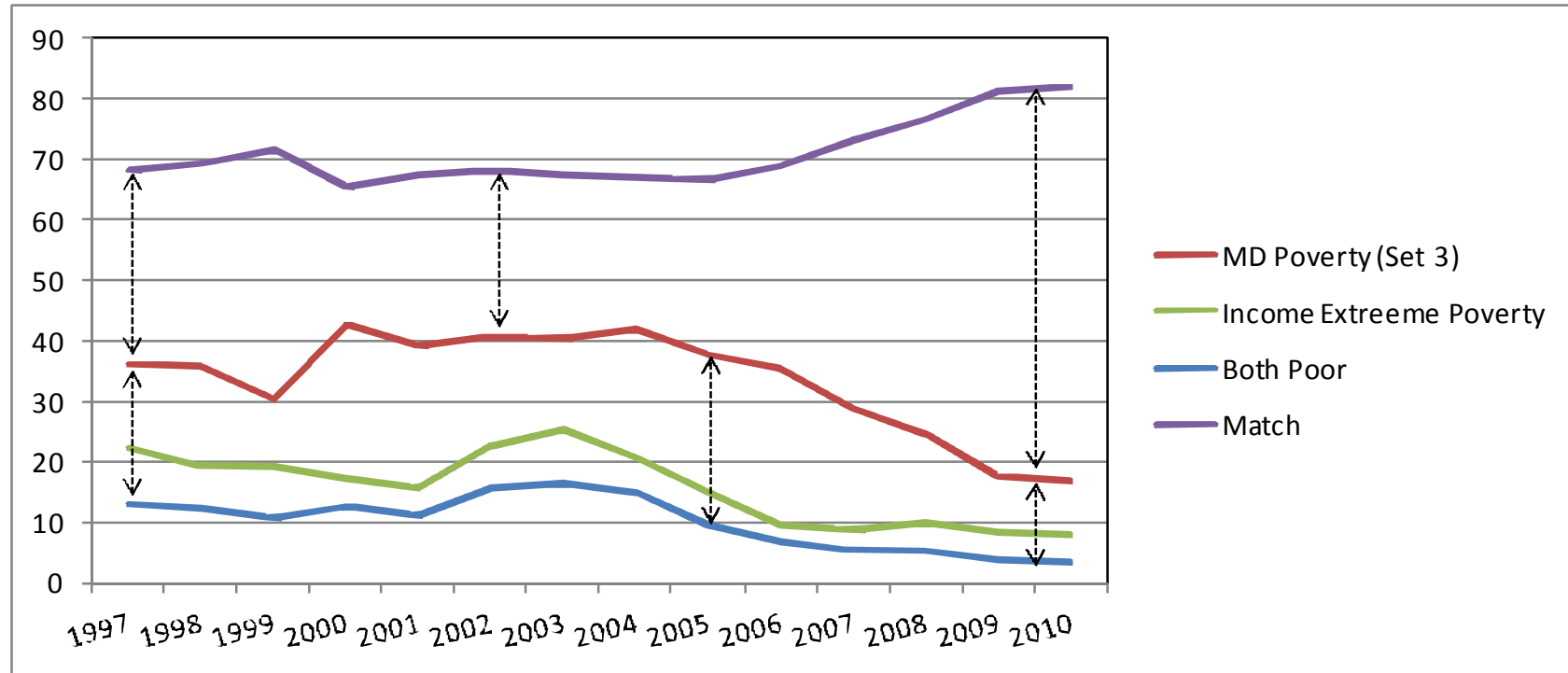
2010

		Income Poor	
		Yes	No
MD poor?	Yes	4.62	13.39
	No	3.42	78.57

		Income Poor	
		Yes	No
MD poor?	Yes	4.28	6.64
	No	3.76	85.31

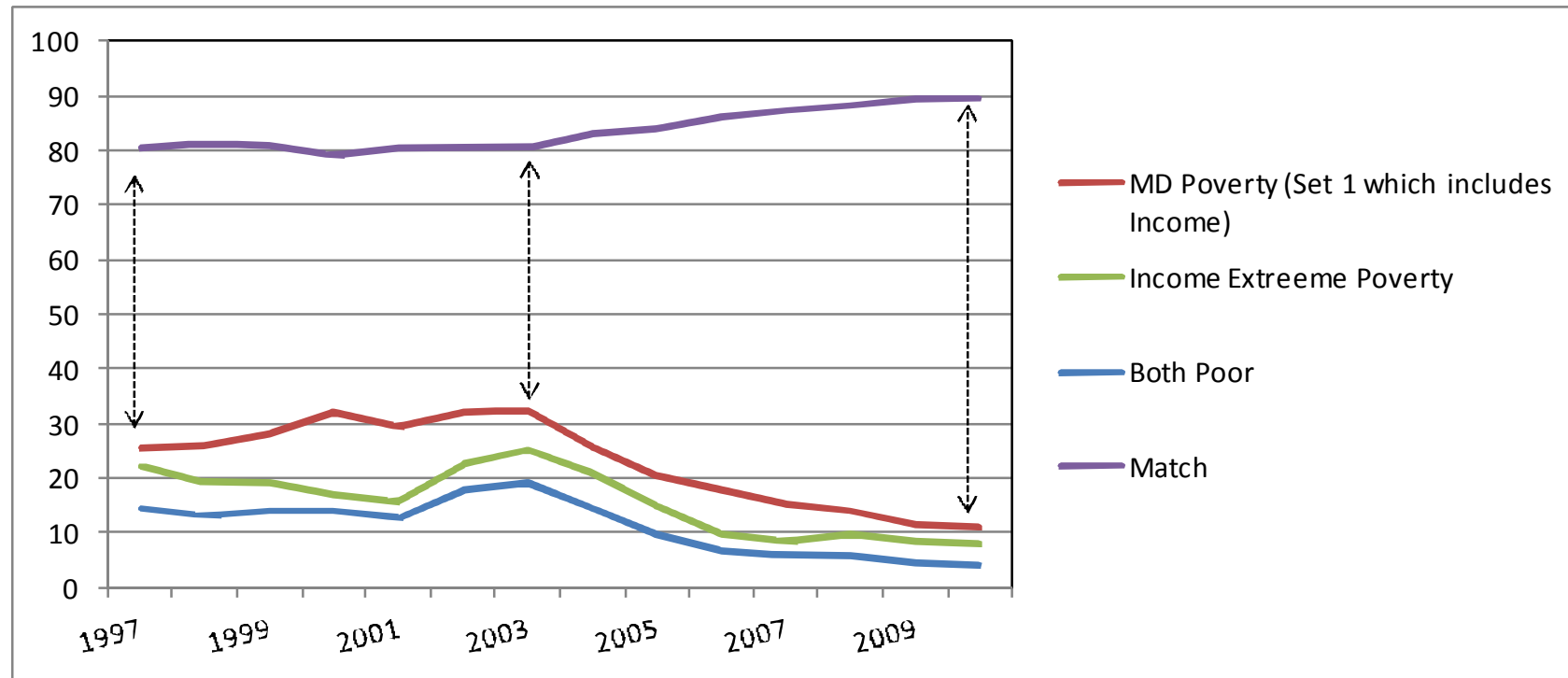
How much do they overlap? – additional to the papers

Set 3 vs Income Poverty



How much do they overlap? – additional to the papers

Set 1 (which does include income & occupation) vs Income Poverty



How much do they overlap? – additional to the papers

Set 3 vs Income Poverty

1997

		Income Poor	
		Yes	No
MD poor?	Yes	13.13	22.86
	No	9.13	54.87

$= 13.13 / (13.13 + 22.86) = 36.5\%$ of MD poor were income poor,
 and
 $= 13.13 / (13.13 + 9.19) = 60.0\%$ of income poor were MD poor

2010

		Income Poor	
		Yes	No
MD poor?	Yes	4.62	13.39
	No	3.42	78.57

$= 39.2\%$ of MD poor were income poor,
 and
 $= 53.2\%$ of income poor were MD poor

How much do they overlap? – additional to the papers

Set 3 vs Income Poverty

1997

		Income Poor	
		Yes	No
MD poor?	Yes	13.13	22.86
	No	9.13	54.87

= $54.87 / (54.87 + 9.13) = 85.7\%$
of non MD poor were also non
income poor,
and
= $54.87 / (54.87 + 22.86) = 70.6\%$
of non income poor were non
MD poor

2010

		Income Poor	
		Yes	No
MD poor?	Yes	4.62	13.39
	No	3.42	78.57

= $78.57 / (78.57 + 3.42) = 95.8\%$ of non MD poor were
non income poor,
and
= $78.57 / (78.57 + 13.39) = 92\%$ of non income poor were
non MD poor

Let's compare the top 4 sets

Set 1

Set 2

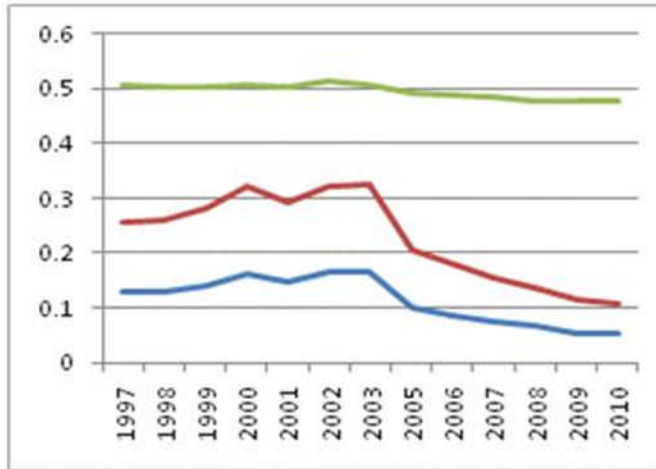
Set 3

Set 4

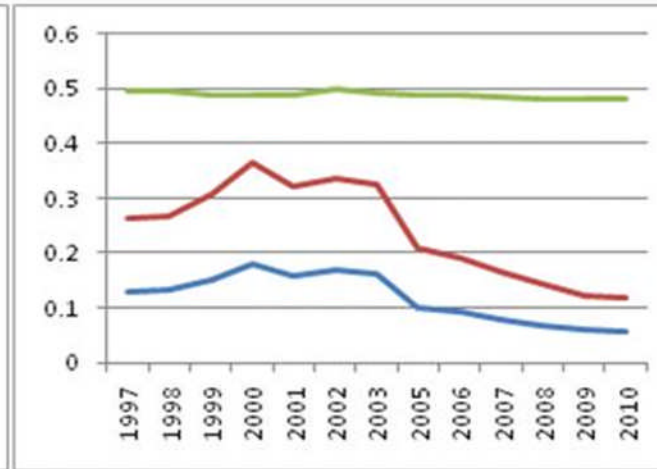
Dimensions and Indicators		Weights	Dimensions and Indicators		Weights	Dimensions and Indicators		Weights	Dimensions and Indicators		Weights
Habitat and shelter		1/3	Habitat and shelter		1/3	Habitat and shelter		1/3	Shelter		1/4
<u>Shelter</u>		<u>1/6</u>	<u>Shelter</u>		<u>1/6</u>	<u>Shelter</u>		<u>1/6</u>	Overcrowding		1/8
Overcrowding		1/12	Overcrowding		1/12	Overcrowding		1/12	Housing conditions		1/8
Housing conditions		1/12	Housing conditions		1/12	Housing conditions		1/12			
<u>Services</u>		<u>1/6</u>	<u>Services</u>		<u>1/6</u>	<u>Services</u>		<u>1/6</u>	Services		1/4
Impr. Drinking water		1/24	Impr. Drinking water		1/24	Impr. Drinking water		1/24	Impr. Drinking water		1/12
Impr. Sanitation		1/24	Impr. Sanitation		1/24	Impr. Sanitation		1/24	Impr. Sanitation		1/12
Garbage Collection		1/24	Garbage Collection		1/24	Garbage Collection		1/24	Garbage Collection		1/12
Elec. or gas cooking fuel		1/24	Elec. or gas cooking fuel		1/24	Elec. or gas cooking fuel		1/24			
Education		1/3	Education		1/3	Education		1/3	Education		1/4
School attendance		1/6	School attendance		1/6	School attendance		1/6	School attendance		1/8
Years of schooling		1/6	Years of schooling		1/6	Years of schooling		1/6	Years of schooling		1/8
Living standards		1/3	Living standards		1/3	Living standards		1/3	Living standards		1/4
<u>Assets</u>		<u>1/9</u>	<u>Assets</u>		<u>1/9</u>	<u>Assets</u>		<u>1/3</u>	<u>Assets</u>		<u>1/4</u>
Laundry machine			Laundry machine			Laundry machine			Elect. or gas cooking fuel		
Fridge			Fridge			Fridge			Laundry machine		
T.V.			T.V.			T.V.			Fridge		
Air Conditioner			Air Conditioner			Air Conditioner			T.V.		
Boiler			Boiler			Boiler			Air Conditioner		
Tumble Dryer			Tumble Dryer			Tumble Dryer			Boiler		
Car			Car			Car			Tumble Dryer		
<u>Occupation</u>		<u>1/9</u>	<u>Occupation</u>		<u>1/9</u>	<u>Occupation</u>		<u>1/9</u>	Car		
Minimum income		1/9	Economic dependency		1/9						

H, A and M₀ 1997 - 2010

Set 1

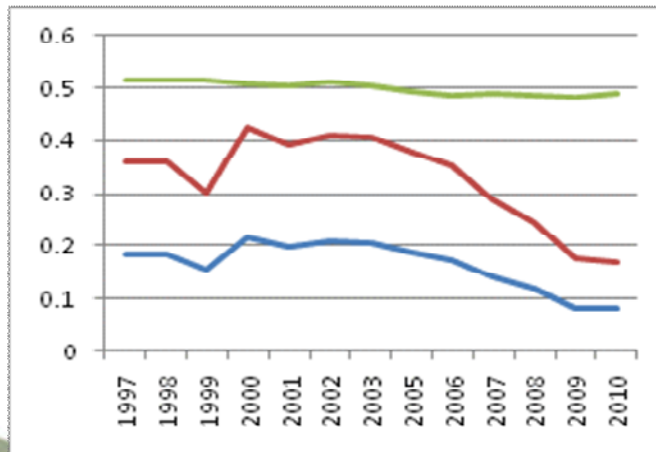


Set 2

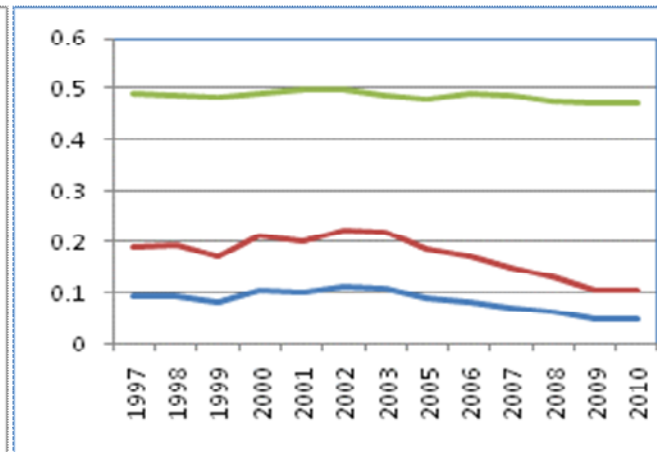


– A: Intensidad de la pobreza – H: Índice de conteo – M₀: Índice de pobreza multidimensional

Set 3

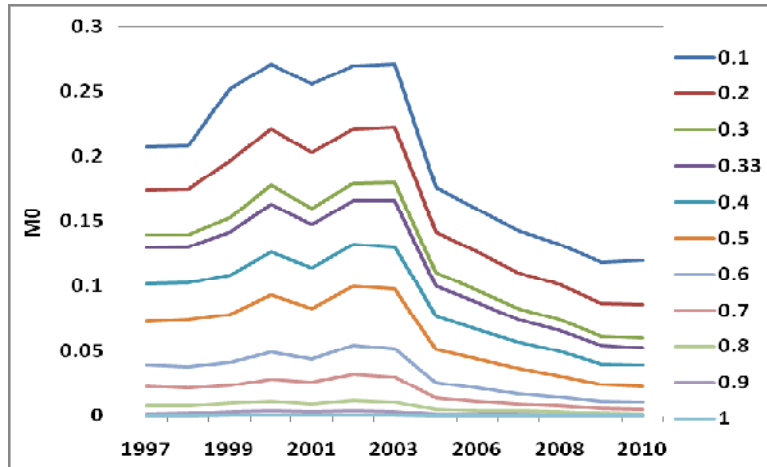


Set 4

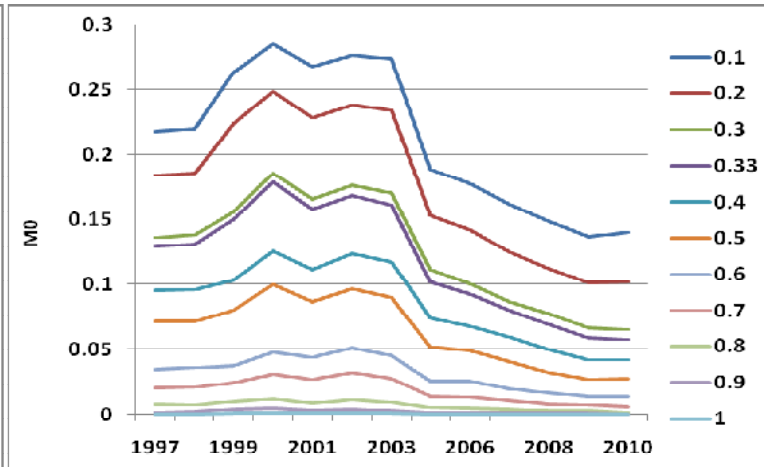


Robustness M_0 to k values

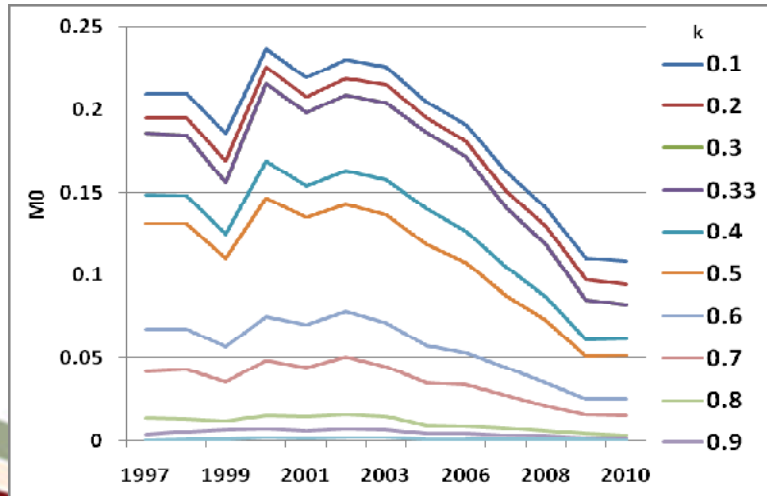
Set 1



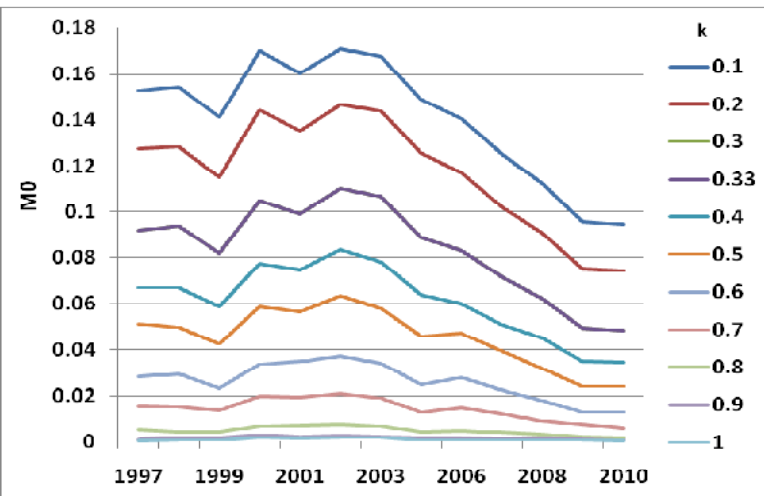
Set 2



Set 3

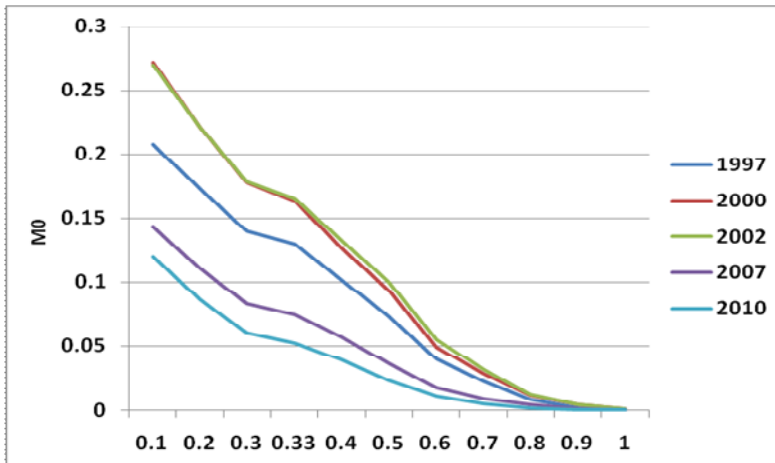


Set 4

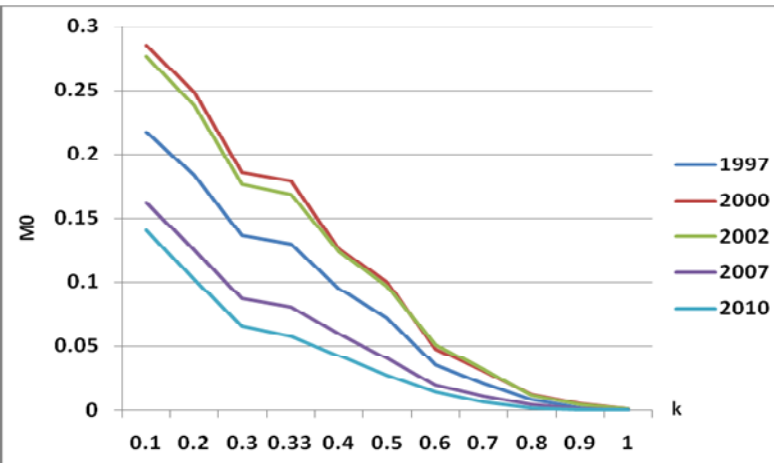


Robustness M_0 to k values

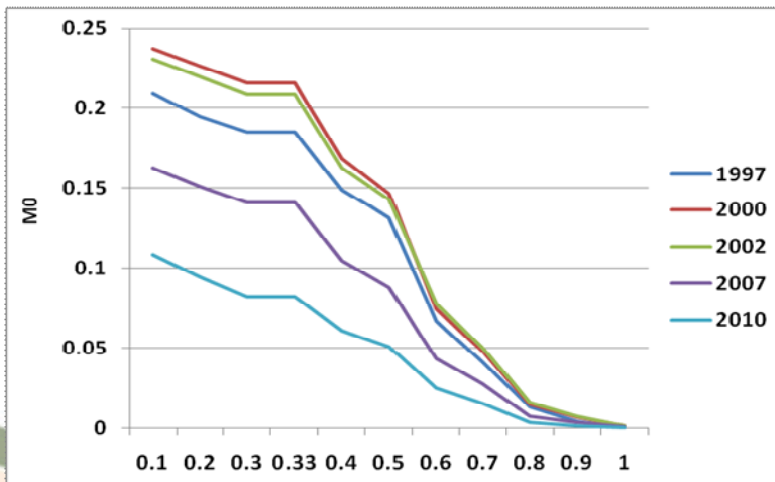
Set 1



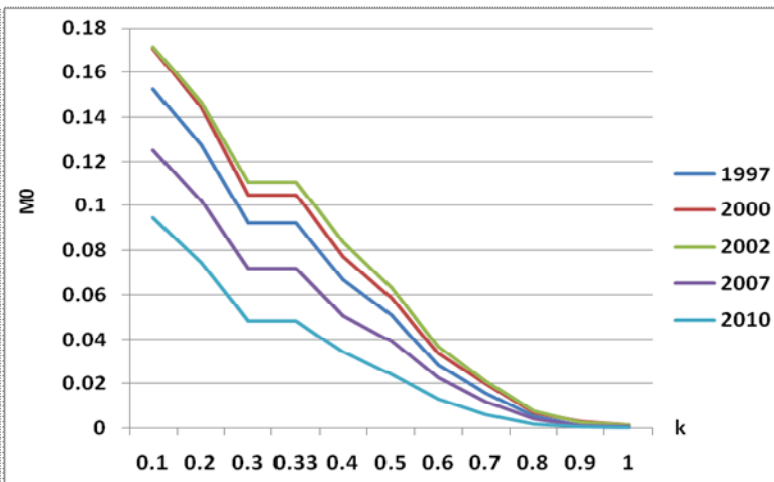
Set 2



Set 3



Set 4



Conclusion

1. Normative decisions can be informed by EFA and other similar exploratory techniques
2. Low overlap of monetary poverty and deprivation in social dimensions - they tell different stories
3. Could minimum income (below food basket) be a proxy to nutrition information? Current/past situation?
4. The measures are highly sensitive to the inclusion or not of income/occupation and the choice of weights
5. Further public/methodological debate is still require

Appendix
(Q&A session)

Further on EFA and poverty measurement...

Monitoring Inequality between social groups

(Roche, 2008)

Example...

Unrotated, Varimax-rotated common components matrix

	Unrotated Component			VARIMAX-rotated Component		
	1	2	3	1	2	3
Sewage	0.734	0.120	-0.010	0.518	0.418	0.331
Water	0.565	0.435	0.144	0.695	0.100	0.190
Electricity	0.420	0.529	0.138	0.687	-0.014	0.061
Fuel used for cooking	0.401	0.495	-0.088	0.620	0.147	-0.087
Floors	0.752	-0.208	-0.310	0.226	0.752	0.297
Roofs	0.597	-0.312	-0.595	0.018	0.897	0.070
Walls	0.692	-0.228	0.345	0.258	0.250	0.721
Housing Overcrowding Index	0.495	-0.513	0.513	-0.064	0.101	0.870

Extraction Method: Principal Component Analysis. 3 components extracted.

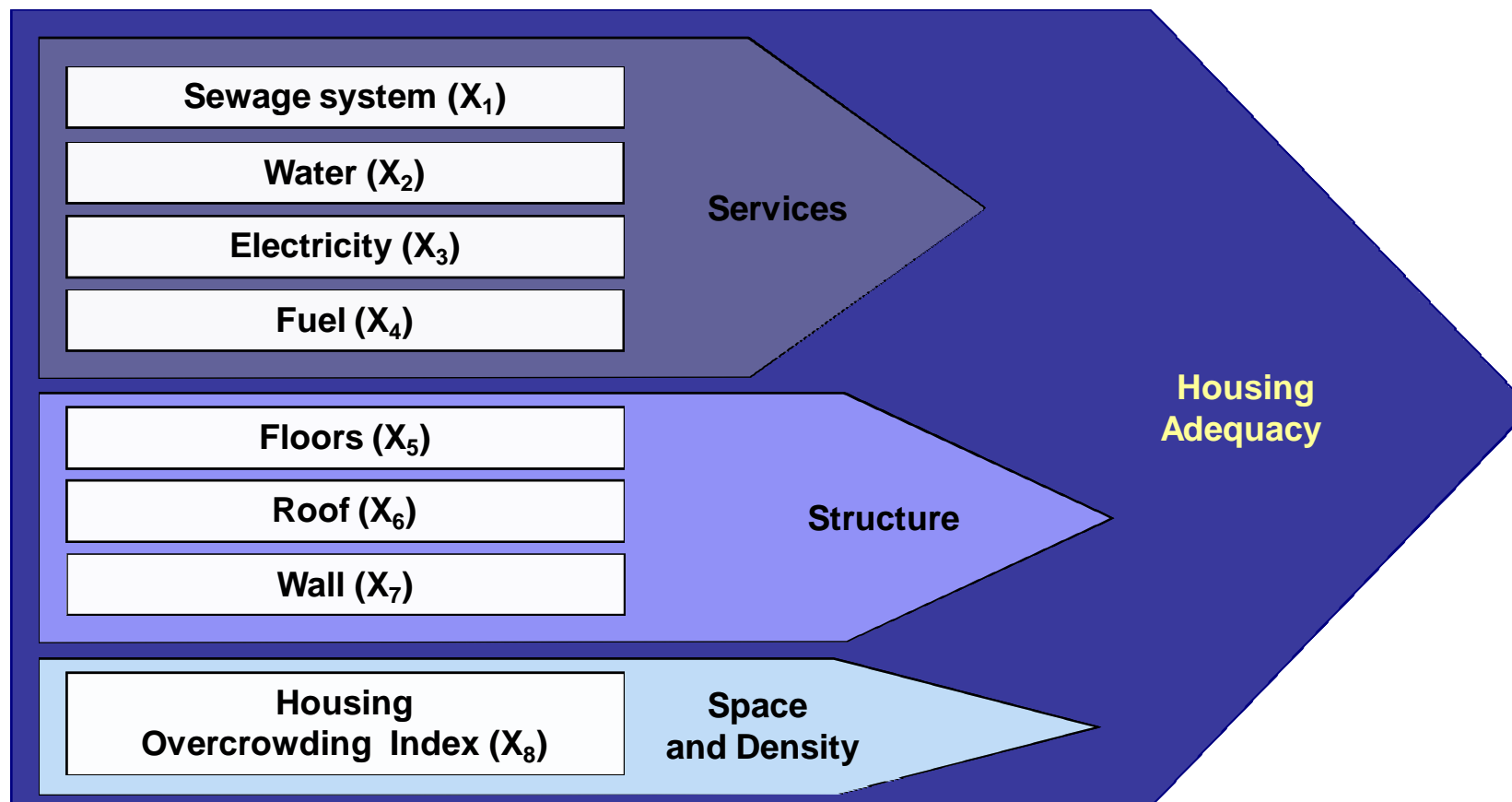
VARIMAX: Rotation converged in 4 iterations.

Oblimin: Rotation converged in 9 iterations.

Monitoring Inequality between social groups

(Roche 2008)

Examples...

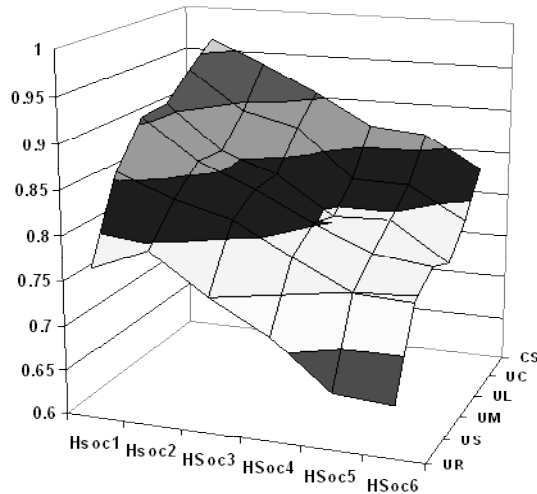


$$HAI = 1/3(X_1 + X_2 + X_3 + X_4) + 1/3(X_5 + X_6 + X_7) + 1/3(X_8)$$

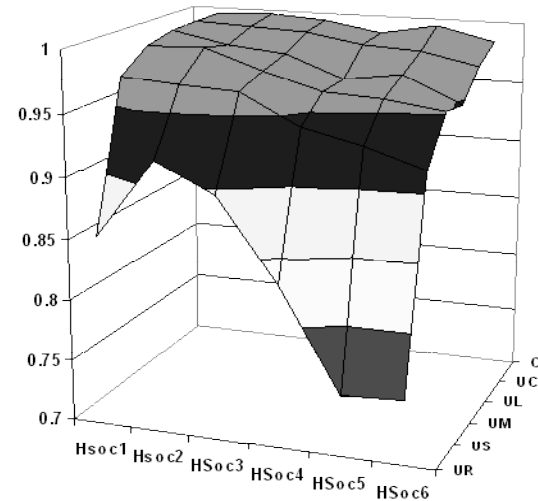
Perhaps an analysis on housing adequacy should **observe these different levels**, and not just focus on an overall housing adequacy.

Capabilities and Groups Inequalities (Roche, 2009)

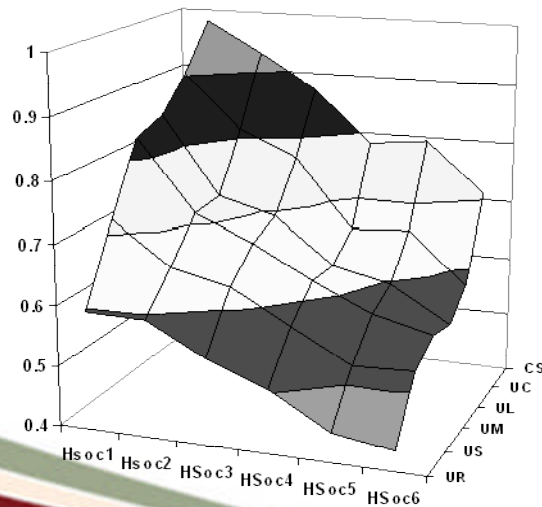
Example...



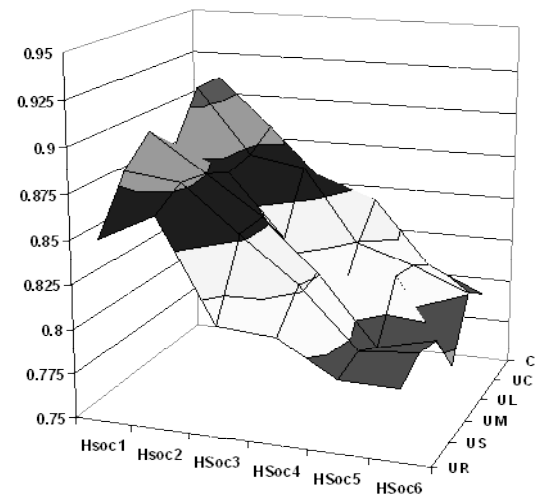
Overall housing adequacy



Housing Services



Housing structure



Space and density

Capabilities and Groups Inequalities

(Roche 2009)

Example...

Adj. R-Squared for different models

	Overall Adequacy (HAI)	Services (HSI)	Structure (HTI)	Space and Density (HDI)
Model 1: Income and constant only $Y = c + \lambda_1 X_1 + e$	15.1%	4.8%	15.1%	6.2%
Model 2: Income, demographic factors and constant $Y = c + \lambda_1 X_1 + \beta_3 Z_3 + e$	20.4%	8.5%	16.5%	19.9%
Model 3: Income, Hsoc, demographic factors and constant $Y = c + \lambda_1 X_1 + \beta_1 Z_1 + \beta_3 Z_3 + e$	25.0%	10.0%	21.7%	21.2%
Model 4: Income, Hsoc, ZXT, ZXR, demographic factors and constant $Y = c + \lambda_1 X_1 + \beta_1 Z_1 + \beta_2 Z_2 + \beta_3 Z_3 + e$	32.1%	28.8%	28.6%	21.8%
Model 5: Income, Hsoc, ZXT, ZXR, other occupational variables (EcoAct, SecInf, SecPub), demographic factors and constant $Y = c + \lambda_1 X_1 + \beta_1 Z_1 + \beta_2 Z_2 + \beta_3 Z_3 + e$	34.0%	33.6%	29.8%	22.2%