An EU-SILC based composite indicator for material deprivation

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Introduction

- This work shows the experience gained at ISTAT in calculating a composite indicator for material deprivation based on EU-SILC data

- In particular, we'll show:

  - ✓ the study performed at ISTAT to estimate a composite indicator based on a "core" of basic indicators for material deprivation

  - ✓ EUROSTAT approach in calculating synthetic indicators for material deprivation

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The context: EU-SILC, the European Statistics on Income and Living Conditions survey

- The Italian EU-SILC started in 2004; EU-SILC has been carried out under European Regulation with the aim to obtain estimates on income and living conditions at national and European level

- The Italian EU-SILC is based on a sample of about 21.000 households (about 53.000 people) yearly

The EU-SILC "core" of basic indicators for material deprivation

- 1 = percentage of households that can not pay unexpected expenses
- 2 = percentage of households can not afford a one-week annual holiday away from home
- 3 = percentage of households can not have a meal involving meat, chicken or fish every second day
- 4 = percentage of households can not have the adequate heating of a dwelling

- 5 = percentage of households that can not pay utility bills
- 6 = percentage of households can not pay mortgage
- 7 = percentage of households that can not pay rent
- 8 = percentage of households that can not pay other debts

- 9 = percentage of households that can not have a washing machine
- 10 = percentage of households that can not have a television
- 11 = percentage of households that can not have a telephone (including mobile phone)
- 12 = percentage of households that can not have a car

EUROSTAT approach : a synthetic indicator for deprivation

- NSIs calculate two EU-SILC based synthetic indicators for material deprivation:

the **synthetic indicator for material deprivation** and the **synthetic indicator for severe material deprivation**

- A micro approach is used; it means calculation is done on single record /unit surveyed by EU-SILC

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The events of deprivation are counted for each record/unit;
so, it's counted if the unit can not :

1) pay unexpected expenses

2) afford a one-week annual holiday away from home

3) have a meal involving meat, chicken or fish every second day

4) have the adequate heating of a dwelling

have a : 5) washing machine 6) television 7) telephon 8) car

9) pay(mortgage, rent, utility bills, other debts)

- The **synthetic deprivation indicator** is estimated as the percentage of households with at least 3 events of deprivation

- The **syinthetic indicator of severe deprivation** is estimated as the percentage of households with at least 4 events of deprivation

The macro approach

- The macro approach can be used to obtain composite indicators

Micro e Macro

A. B. Atkinson and E. Marlier “Background paper on Beyond GDP, Measuring well-being and EU-SILC”, March 2010

“The reduction of a multi-dimensional phenomenon to a single number raises a number of issues. To begin with, it is important to distinguish two different forms of aggregation. The first aggregation combines characteristics at the individual level, which are summed over individuals to form an aggregate index. The focus is then on multiple deprivation at individual (or household) level, which requires micro-datasets containing information covering the relevant domains.

Micro e Macro

The second approach does not aggregate across characteristics for an individual and then across individuals, but instead aggregates first across people and then across characteristics. This second approach is thus a combination of aggregate indicators, as with the HDI, or what we refer as a "composite index"; our focus here is on this approach….."

A composite indicator for material deprivation: ISTAT experience using a macro approach

- The idea was to combine the basic indicators to estimate a composite indicator of material deprivation

- A macro approach was used to do that;

that means the basic indicators were estimated for a geographical domain before their combination; in particular, the basic indicators were estimated for the 20 Italian regions

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- The basic indicators are highly correlated

- The Principal component analysis (PCA) was applied to the basic indicators at regional level

- The first component explains the 80% of the total variance

- The factor loadings of the basic indicators, with reference to the first component, have similar values; it means the basic indicators have the same relevance

- A first composite indicator was built as weighted mean of the basic indicators; the weight of each basic indicator is given by its factor loading on the first component

- Adding the second component, 86% of the total variance is explained

- A second composite indicator was estimated using the factor loadings of the first and second components both

- This second composite indicator was estimated as weighted mean of the basic indicators; the weight of each basic indicator is obtained weighting the factor loadings of the first and the second components proportionally with the quota of total variance explained by the first and the second component respectively

See: Paolo Giudici, Fabio Avrini “Modelli statistici per la costruzione di indicatori della qualità della vita: aspetti metodologici” Rivista di Statistica Ufficiale, 1, 2002.

YEAR 2008

	A	B	C
Piemonte	10.0	9.9	9.5
Valle A.	8.0	7.9	7.6
Lombardia	8.4	8.3	8.0
Trentino AA	7.3	7.2	6.9
Veneto	10.0	9.8	9.5
Friuli VG	10.2	10.0	9.6
Liguria	10.1	10.0	9.6
Emilia R.	8.9	8.7	8.4
Toscana	10.1	9.9	9.5
Umbria	11.4	11.2	10.8
Marche	12.2	12.0	11.6
Lazio	12.6	12.4	12.0
Abruzzo	13.5	13.2	12.8
Molise	12.9	12.6	12.2
Campania	19.8	19.6	18.8
Puglia	19.5	19.2	18.5
Basilicata	17.4	17.2	16.6
Calabria	18.8	18.4	17.8
Sicilia	21.6	21.2	20.4
Sardegna	17.6	17.3	16.6
ITALIA	**12.9**	**12.7**	**12.2**

A=first composite indicator, B=second composite indicator, C=equal weighting

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Respect to time

- PCA was applied to EU-SILC data for different years

- It was showed that :

- a) the first component explains the most part of the total variance;
- b) the factor loadings of the basic indicators (on the first component) are very similar

	2008		2007		2006	
Piemonte	9.9	**6**	9.3	**10**	8.1	**8**
Valle A.	7.9	**2**	5.6	**1**	5.1	**1**
Lombardia	8.3	**3**	7.3	**3**	6.3	**3**
Trentino AA	7.2	**1**	5.8	**2**	6.0	**2**
Veneto	9.8	**5**	8.9	**7**	7.9	**7**
Friuli VG	10.0	**8**	9.3	**8**	7.9	**7**
Liguria	10.0	**9**	8.8	**6**	8.2	**9**
Emilia R.	8.7	**4**	8.2	**4**	6.9	**4**
Toscana	9.9	**7**	8.5	**5**	7.0	**5**
Umbria	11.2	**10**	9.3	**9**	8.5	**10**
Marche	12.0	**11**	10.9	**11**	9.8	**13**
Lazio	12.4	**12**	12.0	**12**	9.5	**11**
Abruzzo	13.2	**14**	12.7	**13**	9.7	**12**
Molise	12.6	**13**	13.9	**14**	10.6	**14**
Campania	19.6	**19**	17.3	**17**	17.1	**18**
Puglia	19.2	**18**	19.0	**18**	16.7	**17**
Basilicata	17.2	**15**	14.9	**15**	14.3	**15**
Calabria	18.4	**17**	19.2	**19**	17.3	**19**
Sicilia	21.2	**20**	19.8	**20**	18.8	**20**
Sardegna	17.3	**16**	16.0	**16**	14.6	**16**

Second composite indicator

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Respect to space

- PCA was applied to the basic indicators estimated for geographical domains smaller then the regions

- the Italian provinces were used in order to check the behaviour of PCA at this level. Very similar results to those obtained at regional level, were showed by this application (the first component explains the most part of the total variance; the factor loadings of the basic indicators on the first component are very similar)

The composite indicator for the EU-SILC countries

- The macro approach was used to estimate the composite indicator of material deprivation for the EU-SILC countries

  - PCA was applied to the basic indicators for material deprivation estimated by the EU-SILC countries

- Very similar results were showed by this application (the first component explains the most part of the total variance; the factor loadings of the basic indicators on the first component are very similar)

	2008		2007	
LU-Luxemburg	4.0	1	4.3	1
NO-Norwey	4.5	2	4.8	2
IS-Islanda	4.8	3	7.8	6
SE-Sweden	5.1	4	5.8	3
NL-Netherlands	5.8	5	6.5	4
DK-Denmark	6.5	6	7.4	5
UK-Un.Kindom	7.9	7	7.8	6
ES-Spain	8.6	8	10.1	12
FI-Finland	9.0	9	9.3	8
BE-Belgium	9.0	10	9.7	10
DE-Germany	9.1	11	9.9	11
FR-France	9.6	12	10.5	13
AT-Austria	10.3	13	9.1	7
IE-Irland	10.7	14	9.6	9
EE-Estonia	12.1	15	15.6	16
IT-Italy	11.7	16	12.0	14
CZ-Cec.Republic	12.7	17	13.3	15
GR-Greece	15.6	18	16.4	17
CY-Cyprum	15.2	19	19.1	19
PT-Portugal	17.5	20	18.2	18
SK-Slov.Republic	18.4	21	20.7	20
LT-Lituania	20.0	22	22.2	21
PL-Poland	20.8	23	24.3	22
HU-Hungary	22.8	24	24.4	23
LV-Lettonia	23.3	25	28.5	24
RO-Romania	30.2	26	--	--
BG-Bulgary	31.2	27	--	--