



**SMALL AREA METHODS
FOR MONITORING OF POVERTY
AND LIVING CONDITIONS IN EU**



PISA, 8-10 MAY 2018

**COMPOSITE INDICATORS FOR MEASURING MULTIDIMENSIONAL
PHENOMENA OF ITALIAN MUNICIPALITIES**

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Aim of the case study

Studying a methodology – theoretical and statistical – in order to «measure» the well-being in Italy.

- Can we express the phenomenon by a mathematical function?
- Can we do it at level of municipalities?
- Can the study became an economic policy tool?



Steps of work

- Well-being in international scenario
- Theoretical Framework
- Individual indicators extracted from administrative sources a/o big data (experimental statistics)
- Composite indicator
- Case study



Well-being in international scenario

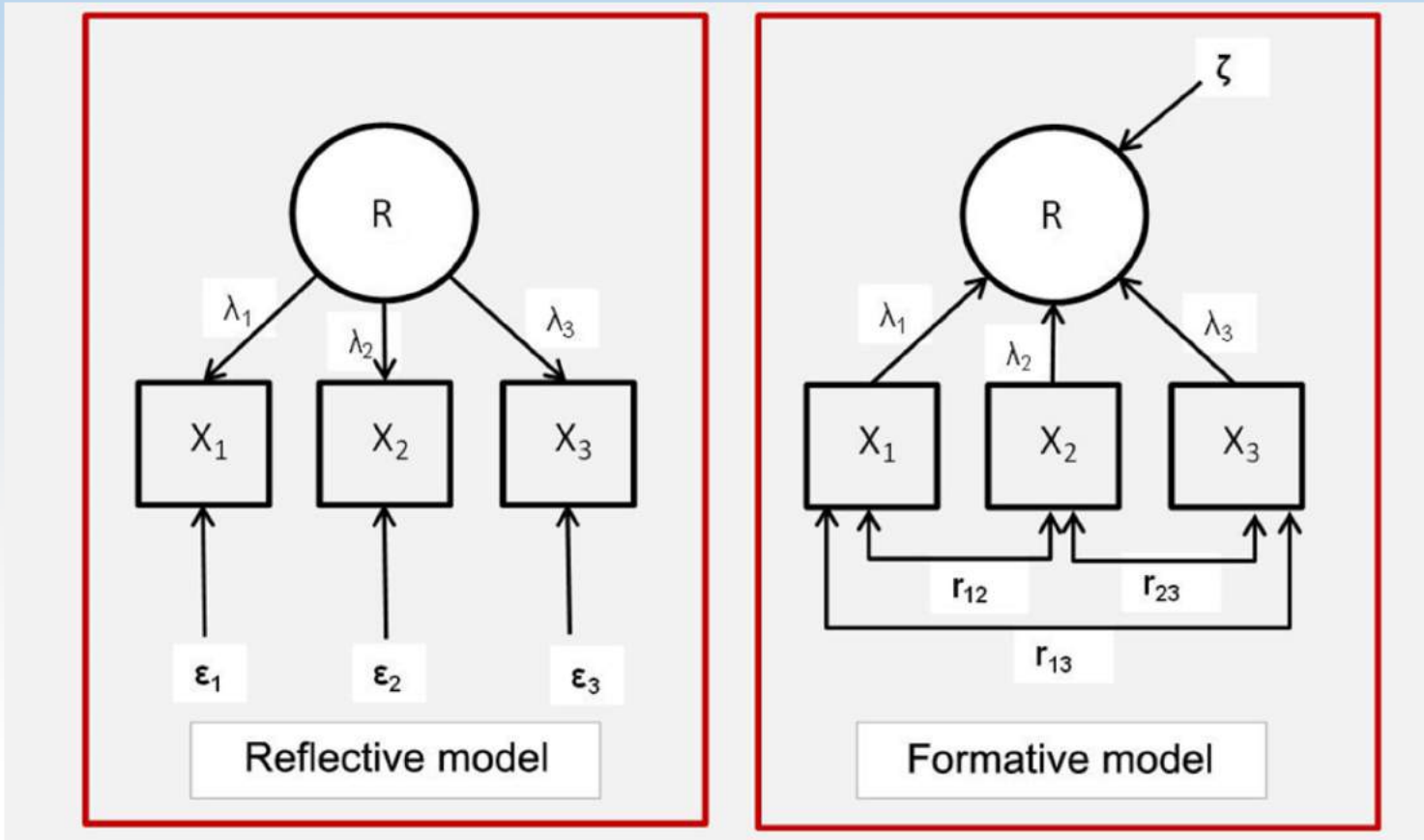


Theoretical framework

- Beyond GDP
- Status that involves all aspects of human being
- Multidimensional phenomenon
- Outcome domains
- Formative model



Reflective Vs Formative model



ARCHIMEDE (experimental statistics)

- Integrated Archive of Economic and Demographic Micro Data
- More than 50 integrated archives about individuals and households living in Italy
- Family types, income, employment status, job security, social problems, level of education and training and other.
- Archimede + other data sources = data base



INDIVIDUAL INDICATORS

Domain and indicator	Description	Source
Education		
Persons who have obtained a university degree	Percentage of people aged 30-34 who have completed a university degree on the total number of persons aged 30-34	Istat: ARCHIMEDE project
NEET ¹	Young people who do not work and do not study (NEET): Percentage of people aged 15-29 neither occupied nor included in a course of education in the total number of persons of 15-29 years	
Labour		
Employment rate	Percentage of employed ² of 20-64 years on the population of 20-64 years	Istat: ARCHIMEDE project
Rate of job insecurity	Percentage of temporary workers over the total employment ²	
Economic well-being		
Income inequality index	Ratio of total income equivalent owned by 20% of the population with the highest income and the one owned by 20% of the population with the lowest income	Istat: ARCHIMEDE project
At risk of poverty rate	Percentage of people at risk of poverty, with an income equivalent to less or equal to 60% of the median income equivalent to the total of people living	

Notes of the table A1:

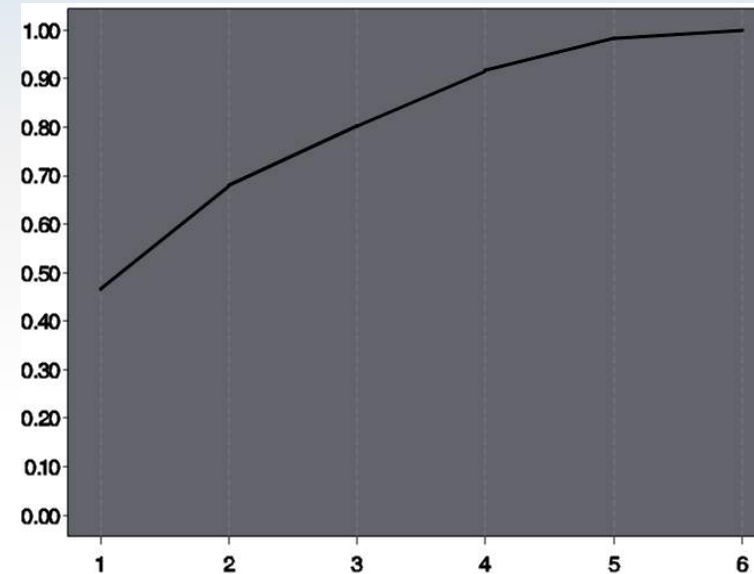
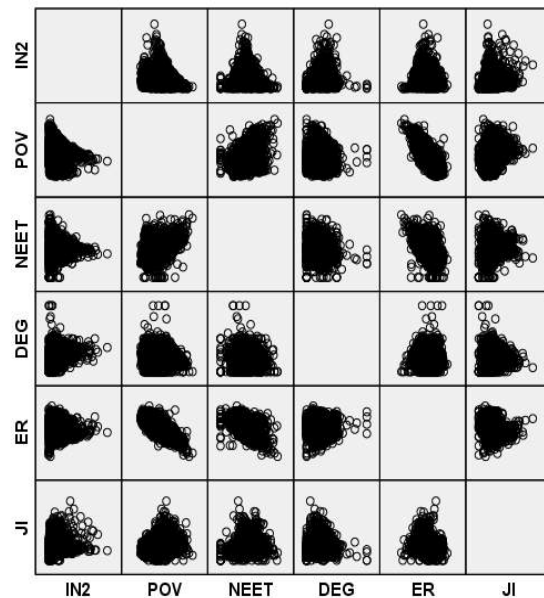
¹Currently in ARCHIMEDE there is not the information on the attendance at professional training courses, so that this indicator at municipality level is an over estimation of the phenomenon.

² In ARCHIMEDE the people who have a working signal for at least one month in the year are considered as employed.



CORRELATIONS AMONG INDIVIDUAL INDICATORS

Individual indicators	Income inequality	Poverty rate	NEET	University degree	Employ. rate	Job insecurity
Income inequality	1	0.082	0.079	0.274	-0.198	0.119
Poverty rate	0.082	1	0.635	-0.078	-0.885	0.447
NEET	0.079	0.635	1	-0.095	-0.700	0.331
University degree	0.274	-0.078	-0.095	1	0.024	-0.042
Employment rate	-0.198	-0.885	-0.700	0.024	1	-0.415
Job insecurity	0.119	0.447	0.331	-0.042	-0.415	1



Adjusted MPI (AMPI)

1) Normalization

Given the matrix $X=\{x_{ij}\}$ with n rows (units) and m columns (indicators), we calculate the normalized matrix $R=\{r_{ij}\}$ as follow:

$$r_{ij} = \frac{(x_{ij} - \text{Min}_{x_j})}{(\text{Max}_{x_j} - \text{Min}_{x_j})} 60 + 70 \quad (1)$$

where x_{ij} is the value of the indicator j for the unit i ;

Min_{x_j} and Max_{x_j} are the 'goalposts' for the indicator j .

If the indicator j has negative polarity, then the complement of (1) with respect to 200 is computed.



Adjusted MPI (AMPI)

2) Aggregation

Denoting with M_{r_i} and S_{r_i} , respectively, the mean and the standard deviation of the normalized values for the unit i , the generalized form of the adjusted MPI is given by:

$$\text{AMPI}_i^{+/-} = M_{r_i} \pm S_{r_i} \text{cv}_i$$

where $\text{cv}_i = S_{r_i}/M_{r_i}$ is the coefficient of variation for the unit i and the sign \pm depends on the kind of phenomenon to be measured.

For a positive composite index (e.g., the well-being), the MPI⁻ is used; for a negative composite index (e.g., the poverty), the MPI⁺ is used.



Adjusted MPI (AMPI)

How to set the 'goalposts'

To facilitate the interpretation of results, we suggest to choose the 'goalposts' so that 100 represents a reference value (e.g., the average in a given year).

A simple procedure for setting the 'goalposts' is the following.

Let Inf_{x_j} and Sup_{x_j} be the overall minimum and maximum of the indicator j across all units and all years. Denoting with Ref_{x_j} the reference value for the indicator j , the 'goalposts' are defined as:

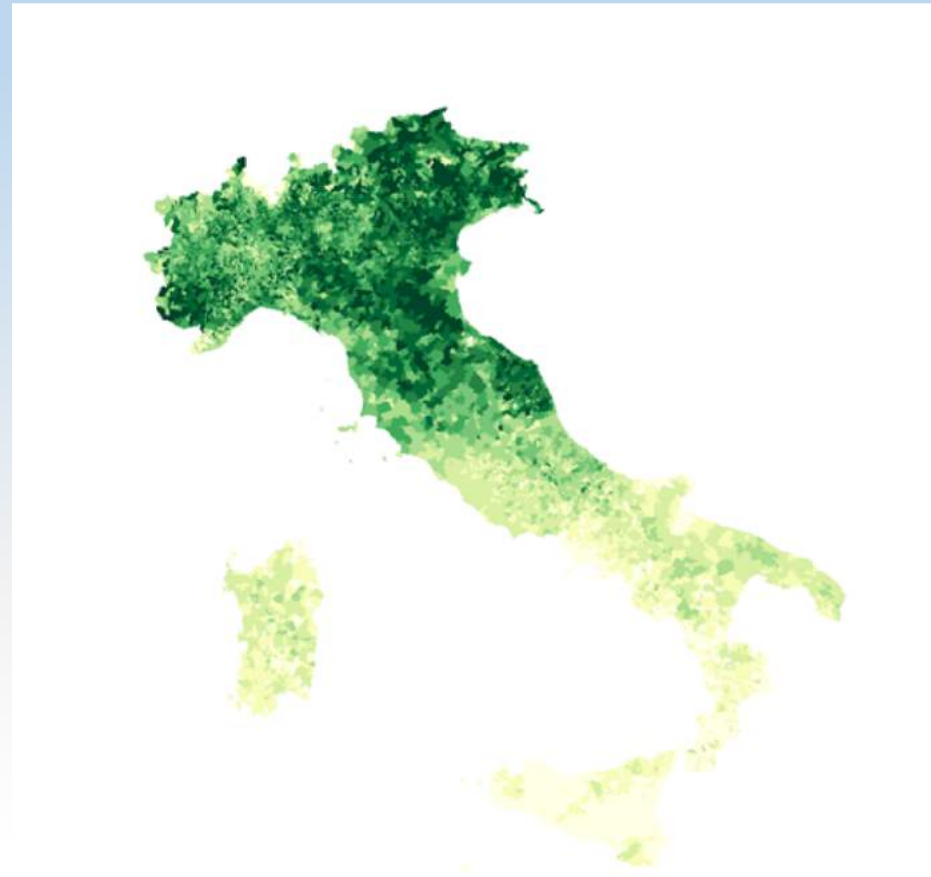
$$\begin{cases} \text{Min}_{x_j} = \text{Ref}_{x_j} - \Delta \\ \text{Max}_{x_j} = \text{Ref}_{x_j} + \Delta \end{cases}$$

where $\Delta = (\text{Sup}_{x_j} - \text{Inf}_{x_j}) / 2$.

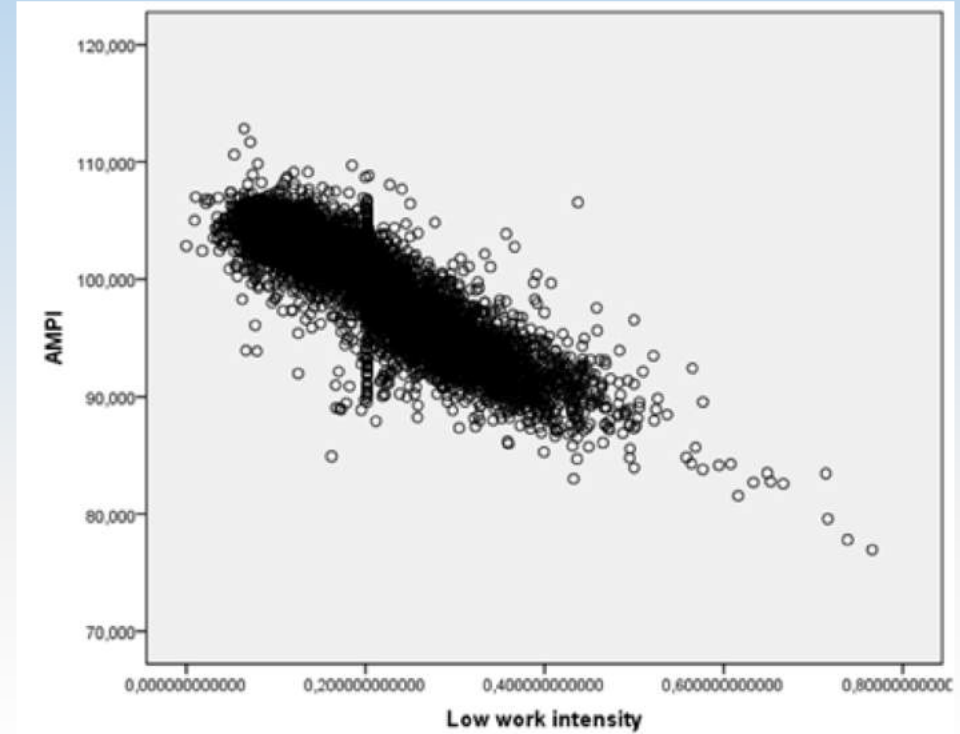
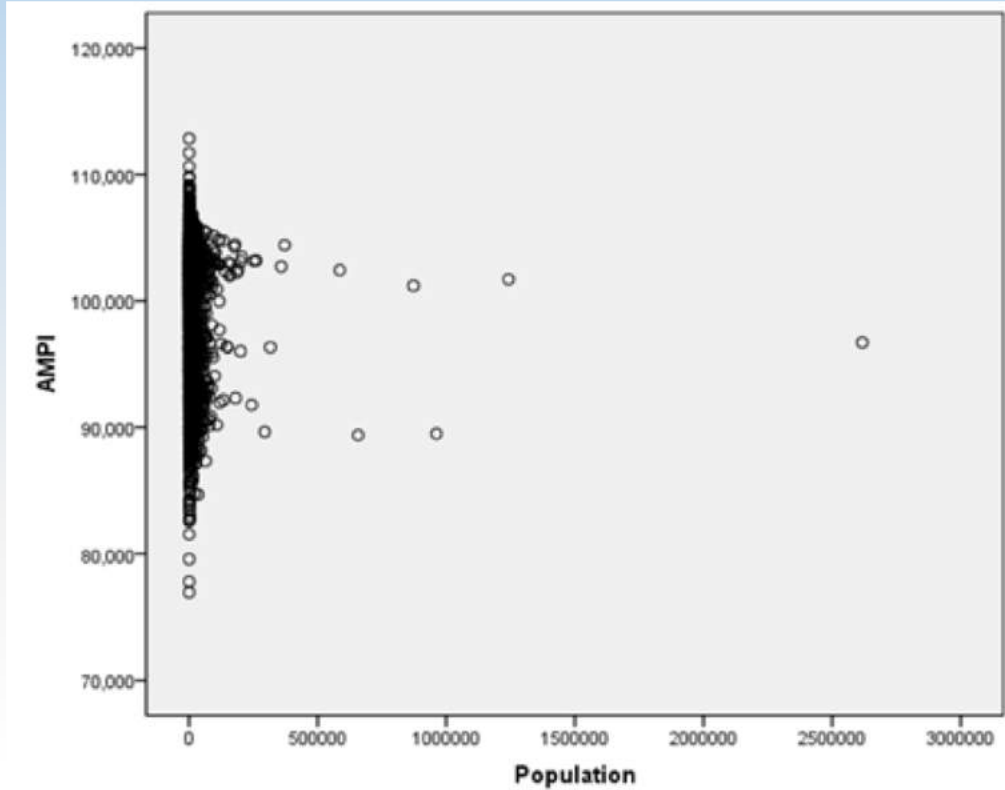
The R values will be approximately in the range (70; 130).



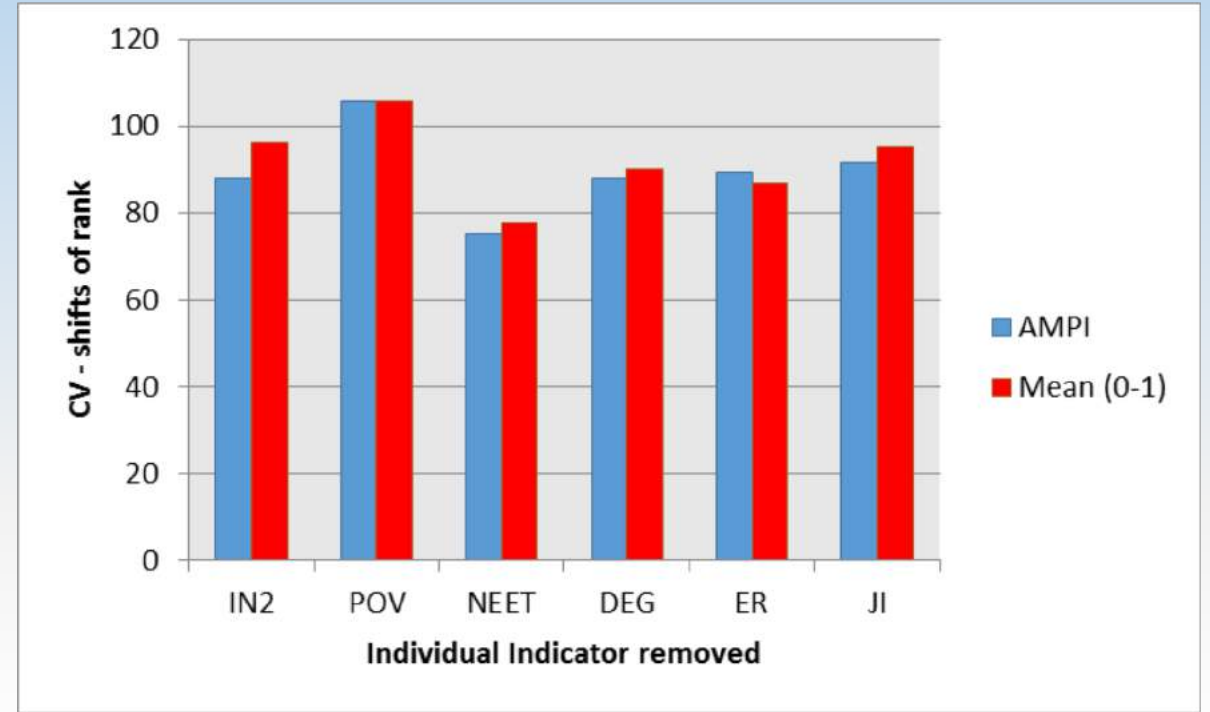
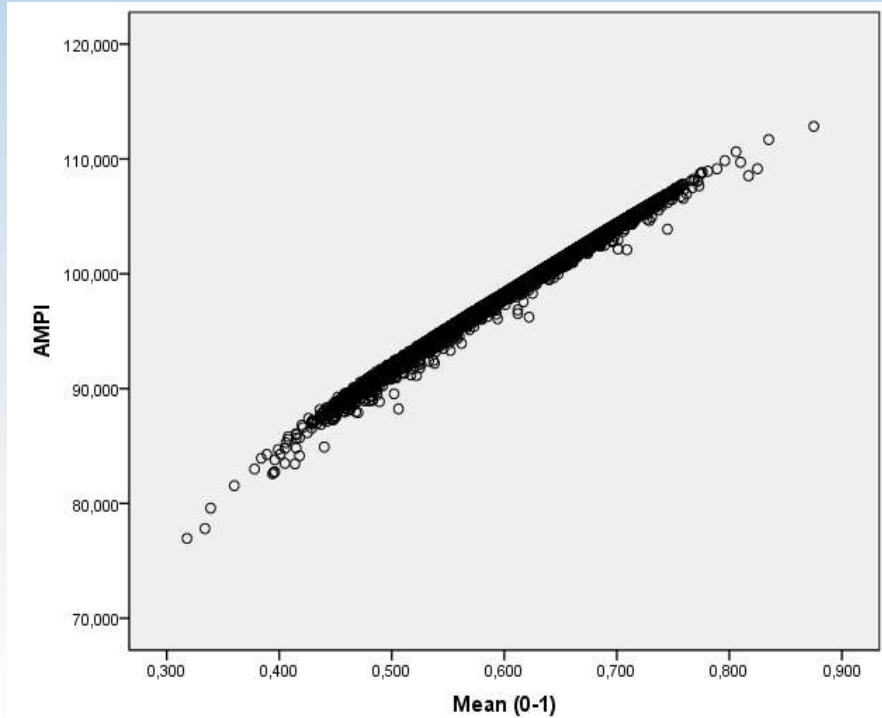
Composite Indicator of Italian Socio-Economic conditions



Scatter plots between AMPI and Population AMPI and Low work intensity



Uncertainty analysis between AMPI and Mean (0-1)



Conclusions and **next steps**

- Composite indicators can synthesize well-being, as multidimensional phenomenon, appropriately defined by a theoretical framework.
- New scenarios of statistics (official and not), as administrative data & big data, allow to have information at very small territorial level.
Increasing number of individual indicators. Measuring well-being for all Italian municipalities over time!
- **The well-being indicators have to be a tool to address the economic policies (national and local): how?**



References

- De Muro, Pasquale, Matteo Mazziotta, and Adriano Pareto. 2011. "Composite Indices of Development and Poverty: An Application to MDGs". *Social Indicators Research* 104: 1-18.
- Garofalo, Giuseppe. 2014. "Il progetto ARCHIMEDE: obiettivi e risultati sperimentali." Istat Working Paper 9. Rome: Istat.
- Mazziotta, Matteo, Adriano Pareto. (2017). "Synthesis of indicators: the composite indicators approach". In: "Complexity in Society: From Indicators Construction to their Synthesis", Filomena Maggino Editors. *Social Indicators Research Series*: 159-191. Springer.
- Mazziotta, Matteo. 2017. "Well-Being Composite Indicators for Italian Municipalities: Case Study of Basilicata". Working papers Series n.1/2017. Department of Social Sciences and Economics, Sapienza University of Rome.
- Mazziotta, Matteo and Adriano Pareto. 2011. "Un indice sintetico non compensativo per la misura della dotazione infrastrutturale: un'applicazione in ambito sanitario". *Rivista di Statistica Ufficiale* 1: 63-79.
- Mazziotta, Matteo and Adriano Pareto. 2013. "Methods for Constructing Composite Indices: One for all or all for one" in *Rivista Italiana di Economia Demografia e Statistica* LXVII (2): 67-80.
- Mazziotta, Matteo and Adriano Pareto. 2016. "On a Generalized Non-compensatory Composite Index for Measuring Socio-economic Phenomena". *Social Indicators Research* 127 (3): 983-1003.
- OECD, 2008. *Handbook on Constructing Composite Indicators. Methodology and user guide*. Paris: OECD Publications.

