Methodologies to integrate subjective and objective information to build well-being indicators

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Società Italiana di Statistica

Atti della XLIV Riunione Scientifica

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Methodologies to Integrate Subjective and Objective Information to Build Well-Being Indicators

Metodologie per integrare informazione soggettiva ed oggettiva per costruire indicatori di qualità della vita

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Riassunto: Il crescente interesse per nuovi e più compositi approcci alla misura dello sviluppo richiama l'attenzione verso la necessità di disporre di misure che riguardino informazioni non solo oggettive ma anche soggettive. L'integrazione dei due tipi di informazione, richiede la definizione di (a) quadro metodologico per lo sviluppo di indicatori oggettivi e soggettivi, (b) quadro interpretativo dell'integrazione, (c) approcci analitici, coerenti con il modello concettuale definito, che tengano conto delle prospettive di analisi (per l'aggregazione e l'integrazione degli indicatori oggettivi e soggettivi) e dei livelli di analisi (micro e macro). La procedura individuata (multi-technique multi-stage) e applicata su dati europei (European Social Survey e Joint Research Centre-European Commission) ha evidenziato la sua efficacia nel mettere in evidenza relazioni complesse.

Keywords: quality of life, well-being, subjective indicators, objective indicators, integration of indicators, indicators construction

1. Objective and subjective indicators

The units on which indicators are measured can be represented by individuals, institutions, social groups, services, administrative areas, geographical areas, nations, and so on. The definition of the units needs to be carefully considered in the perspective of indicators definition. With reference to the source of information, we can distinguish between (i) *objective indicators,* constructed through information collected by observing reality, (ii) *subjective indicators*, constructed through information collected from individuals and concerning the opinions, evaluations, feelings, perceptions, attitudes, desires, values, and motivations these latter. As Michalos (1992) noticed, many indicators used to observe a reality are only apparently neutral. Actually, objective indicators represent only a "small window" through which it is possible to see only some facets of the reality; in this sense, the view is politically and socially distorted and can condition knowledge, evaluations, choices, actions, and policies. In conclusion, Michalos advocates that objective measurements and analyses constitute a premise for subsequent studies involving individuals.

2. Conceptual framework

2.1. Objective and subjective components of quality of life

In the context of *International Society of Quality-of-Life Studies* (ISQOLS), the necessity to reach a common and shared definition of "quality of life" emerged since the beginning. Among the various definitions (Cummins et al., 1998), the distinction between objective and subjective components of quality of life appeared clearly.

- Objective component at micro level (*individual living conditions*), referring to living conditions that can be taken back to widely accepted criteria and can be referred to context indicators. Its specificity is in the possibility to define and recognize an external reference.
- Objective component at macro level. referring to social, economic and health contexts (e.g. economic production, literacy rates, life expectancy). Objective indicators may be used singularly (GDP/capita) or in combination to form summary indexes, as in the UN's Human Development Index (HDI-UNDP, 2007).
- Subjective component (*subjective well-being*) referring to the way in which each individual evaluates his/her own life as a whole and/or in different specific contexts. It is assessed by individuals' or groups' responses to questions about happiness, life satisfaction, utility, or benefit. Contrarily to the objective measures at micro level, no explicit standard is defined and no external reference can be defined.

2.2. Conceptual perspectives of integration

A more realistic picture of the quality of life concept should be obtained if *subjective* and *objective* components are suitably combined. Some assumptions have to be made concerning the relationship between the two components. In broad outline, two perspectives can be alternatively defined: **(a)** objective quality of life at macro level can be considered an antecedent with respect to subjective quality of life (subjective well-being). In this case, objective indicators (input) can be interpreted in terms of contextual conditions that can explain the subjective indicators (output); **(b)** objective quality of life conditions at macro-level and subjective quality of life (perceptions) are independent; perceptions are influenced by individual characteristics and not by the objective living conditions. In this case, subjective indicators (input) can be considered as an important component driving the improvement of objective conditions.

With reference to this, Zapf (1984) proposed a model identifying the relationship between the two components, observed at two different levels. The relationship produces a category model of individual welfare, as represented in Table 1.

Table 1: *Relationship between objective and subjective components in Zapf's model*

Level of ↓	→	Subjective well-being	
		high	low
Objective living conditions	high	*well-being*	*dissonance*
	low	*adaptation*	*deprivation*

Another definition of quality of life is that defined by introducing the concept of human needs (subsistence, reproduction, security, affection, etc.) and of opportunities (involving the role of policy, in terms of both input and output). In this perspective, quality of life is the extent to which objective human needs are fulfilled in relation to personal or group perceptions of subjective well-being. In other words, quality of life can be seen as an interaction of human needs and the subjective perception of their fulfilment, as mediated by the opportunities available to meet the needs (Costanza et al., 2007). A different approach to integration looks at integration between objective and subjective indicators by using the logic and the perspective of *social epidemiology* (Giovannini, 2007). This perspective can be defined as the systematic and comprehensive study of health, well-being, social conditions or problems, and their determinants.

3. Applied approach to integration

The possibility to develop an integration between objective and subjective indicators is based upon the chance to rely on organized data, observed in long-term longitudinal perspective. This is particularly true with reference to subjective indicators which are strongly dependent and linked to a great use of resources. In this perspective, a composite analytic approach should be defined. The approach is defined "composite" as carried out through subsequent steps (multi-stages) and by different analytical approaches (multi-techniques). In particular, four stages can be identified in order to complete the procedure (Table 2).

Table 2: *Integration of objective and subjective information: synthesis of the procedure*

Conceptual framework ⇨ Definition of objective and subjective components ⇨ Conceptual perspective of integration (CPI) ⇩ Integration process:				
Stage	Perspectives		Level of analysis	Analytical issues
I	Indicators aggregation	Creation of complex indicators by synthesizing elementary indicators	From elementary indicators to synthetic indicators	• Reflective indicators → scaling models • Formative indicators → composite indicators construction
⇩				
II	Integration	Understanding relationships between objective and subjective characteristics	Micro level	Different solutions (consistently with CPI)
⇩				
III	Units aggregation	Creation of macro-units by synthesizing elementary units	From micro units to macro units	Following (i) homogeneity criteria, (ii) functionality criteria
⇩				
IV	Integration	Understanding relationships between objective and subjective characteristics	Macro level	Different solutions (consistently with CPI)

3.1. Aggregation issues

Two different aggregation perspectives can be identified: **(i) Construction of complex indicators** (elementary indicators aggregation). It should be consistent with the adopted measurement model. In this context, the traditional distinction between formative and reflective is particular important since aggregation of indicators has to be consistently accomplished. In other words, indicators can be aggregated into complex structure through a consistent methodology according to two different criteria, (i) *reflective* (homogeneity among elementary indicators to be aggregated), and *formative* (heterogeneity among elementary indicators to be aggregated). In both cases, the condensation of elementary indicators, considered multiple measures, produces new synthetic values. **(ii) Definition of macro-units** (observational units aggregation). the integration, required by the multidimensional concept of quality of life, needs to take into account the different levels at which information is collected and has to be analysed (at macro level and/or micro level).

3.2. Analytical approaches to integration

A proper analytical approach should be identified according to the defined conceptual framework. The feasibility of the different statistical approaches need to be considered by taking into account their specific assumptions.

Structural models approach. It can be adopted only in presence of a strong and indubitable conceptual interpretative framework concerning the causal relationships between objective and subjective indicators. In other words, it requires a strong acceptance of the direction of the relation between objective and subjective indicators. Two possible directions can be defined in casual explanation of well-being, *bottom-up* and *top-down*, which, however, are not separately able to explain completely the relationships between the observed variables. **Multi-level approach**. It can be applied in the perspective of integrating objective and subjective indicators by assuming that people living in the same territory (e.g. city or region) share the same macro-level living conditions (objective quality of life) that contributes together with the micro-level living conditions (objective quality of live) to the subjective well-being. **Composite indicators** (Nardo, 2005). One of the possible proposal to the integration could be the construction of indicators integrating objective and subjective indicators in an unique value referring to each unit of interest (city, country, and so on). This proposal can appear attractive but does not reveal to be easy and creates conceptual, interpretative and analytical problems when the aggregation involves measures that are both subjective and objective. E.g., standardization issue: in order to create composite indicators, data need to be reduced to a common reference-metric, particularly when data are measured with different methodologies; the problem is how to face the issue without adopting sophisticated approaches. In our opinion, this approach could be considered as one of the possible solutions for integration.

Traditional explorative approaches, such as clustering and mapping approaches, multidimensional analysis, correspondences analysis, should be added to the approaches presented above. The approaches are all practicable but in view of their application their capability to meet assumptions and to fit the needs of the conceptual framework need to be explored.

3.3. An example

The particular application presented here has the goal to illustrate and exemplify the *multi-technique multi-stage* characterization of the proposed approach by using subjective and objective data provided by the European Social Survey project)[*] and the Joint Research Centre (JRC – European Commission), respectively.

***I stage**: synthesis of basic indicators at individual level.* The goal of this stage is to create synthetic subjective indicators through the aggregation of elementary indicators. The aggregation procedure should be consistent to the adopted model of measurement.

[*] For data and documentation on European Social Survey refer to http://www.europeansocialsurvey.org/.

Table 3: *Variables identified for the presented example and their corresponding items*

European Social Survey – wave 1 (2002)					
Area	Variable	Items	Item number	Scaling technique	Model of measurement
Politics	Trust in	country's parliament	B7	0 (no trust at all) – 10 (complete trust)	reflective
		the legal system	B8		
		the police	B9		
		politicians	B10		
		the European Parliament	B11		
		the United Nations	B12		
	Self-placement	placement on left-right scale	B28	0 (left) – 10 (right)	
	How satisfied with	present state of economy in country	B30	0 (extremely dissatisfied) – 10 (extremely dissatisfied)	reflective
		the national government	B31		
		the way democracy works in country	B32		
		state of education in country nowadays	B33		
		state of health services in country nowadays	B34		
Subjective aspects	Happiness	how happy are you	C1	0 (extremely unhappy) – 10 (extremely happy)	
	Life satisfaction	how satisfied with life as a whole	B29	0 (extremely dissatisfied) – 10 (extremely dissatisfied)	
	Values: important in life	family	E13	0 (extremely unimportant) – 10 (extremely important)	formative
		friends	E14		
		leisure time	E15		
		politics	E16		
		work	E17		
		religion	E18		
		voluntary organizations	E19		
Immigration and asylum issues	Acceptance of immigration: allow	many/few immigrants of same race/ethnic group as majority	D4	1. allow many 2. allow some 3. allow a few 4. allow none to come and live here	reflective
		many/few immigrants of different race/ethnic group from majority	D5		
		many/few immigrants from richer countries in Europe	D6		
		many/few immigrants from poorer countries in Europe	D7		
		many/few immigrants from richer countries outside Europe	D8		
		many/few immigrants from poorer countries outside Europe	D9		
Socio-demo profile	Income	feeling about household's income nowadays	F31	1.living comfortably 3. difficult 2. coping 4. very difficult on present income	

(reflective or formative). In Table 3: variables identified from the European Social Survey data. Items referring to each variable were submitted to analysis to verify dimensionality. In case of (a) *uni-dimensional latent variable*, items aggregation was performed through a simple additive technique, (b) *multi-dimensional latent variable*: items aggregation was performed through principal component analysis to obtain scores showing normal-standardized distributions. Ten synthetic indicators were computed and then submitted to a successive level of aggregation, according to formative approach, in order to obtain a small group of meaningful and interpretable composite indicators. This aggregation was obtained by Principal Component Analysis (PCA). The outcomes obtained by the two methods turned out to be identical and show the same four dimensions, each one composed by indicators referring to trust, importance and satisfaction characteristics. A particular result has to be noticed: "importance for private life" indicator obtained significant loadings in two components in PCA. Composite scores were calculated by means of PCA according to the observed results (Table 4).

***II stage**: Understanding relationships between objective and subjective characteristics (micro level).* At this stage, a partitioning analysis were conducted (*K means method*) in order to explore the existence of homogenous group of individuals. The obtained clusters have shown quite differentiated profiles (Table 5: proposal of synthetic description of each cluster: Cluster 1 and cluster 4 groups with problematical profiles; cluster 4 composed by individual with low level of well-being and trust and importance in society dimensions, high level of non-acceptance of immigration and low, and a clear self-placement on left-right political scale). Conceptual framework should point out the integration at micro level, in order to explore and understand subjective responses in terms of individual characteristics. In this application, chosen variables are:

gender, age, and individual position with reference to vote in last political election. These indicators together with the cluster indicator were submitted to correspondence analysis, CA (30% of total inertia explained), In the final configuration (Figure 1-A) the more frequent profiles can be identified (e.g. cluster 1 is more frequent among young individuals who did not vote, while cluster 4 is more frequent among elderly persons).

III stage: *synthesis of micro units.* The clusters obtained in the previous stage were considered aggregations of subjective information (homogeneity criterion). Table 6 shows incidences of the clusters for each country. CA was performed by considering different indicators (a a causal model was applied, cluster=country). Figure 1-B shows which of the four clusters are more frequent for each different country (e.g. cluster 1 is more frequent in Poland , Israel, and Czech samples).

IV stage:*Understanding relationships between objective and subjective characteristics (macro level).* The incidence of each cluster for each country was used and related to objective indicators measured at macro level. In Figure 2 country incidences are related to inequality of income distribution of each country: a clear relationship appears between clusters incidences and the objective indicator measured at country level, especially with reference to cluster 1, the more problematic among the four observed clusters.

Table 4: *Aggregation of synthetic indicators into composite indicators*

Synthetic indicators		Item loading	Obtained component	Variance explained (%)	Aggregated score
National politics	TRUST_NP	0.8	Public & political life	18	COMPOSITE1
Active life dimension	IMP_AL	0.6			
Satisfaction for national foundations	SAT_NF	0.8			
National security	TRUST_NS	0.8	Welfare dimension	15	COMPOSITE2
Private life dimension	IMP_PL	0.4			
Satisfaction for national social services	SAT_NSS	0.7			
Caring dimension	IMP_C	0.4	Personal life principles	12	COMPOSITE3
International institutions	TRUST_II	0.6			
Private life dimension	IMP_PL	0.4			
Work dimension	IMP_W	0.6			

4. Final remarks

The main goal of this work is to illustrate the composite approach through which integration between objective and subjective information is made possible. The approach is carried out through subsequent stages. In each stage different analytical solutions can be found. The soundness of the approach and of its results relies on the defined and adopted conceptual framework assuming the correct perspective to be identified according to different objectives, (i) the aggregation of indicators and units, (ii) the integration of objective and subjective information, and (iii) the levels at which the previous objectives have to be pursued. The illustrated application, which was made possible by the contribution of the Econometrics and Applied Statistics Unit (EAS) at the Joint Research Centre of the European Commission, has the restricted goal to illustrate and exemplify the *multi-technique multi-stage* characterization of the proposed approach. Since the process of integration of subjective and objective information can have different goals (monitoring, reporting, accounting, and so on), the outcomes can provide useful solutions for the different objectives. The paper presents only the first step of our study. Our intention (together with EAS – JRC) is that to continue exploring these datasets in order to provide further results, especially in longitudinal perspective.

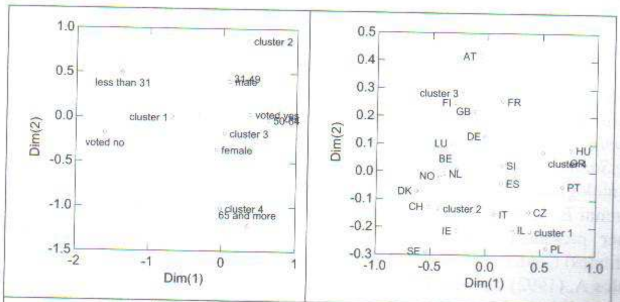
Table 5: *Profile descriptions of the obtained clusters*

		CLUSTER 1	CLUSTER 2	CLUSTER 3	CLUSTER 4
B29	life satisfaction	Medium-low	Medium-high	Medium-high	low
C1	happiness	Medium-low	Medium-high	High	low
F31	Feeling about household's income nowadays	many difficulties	Very comfortable	comfortable	Some difficulties
B28	self-placement on left-right scale	Centre-left	Centre-right	Left	Right
IMMIGR	Non-acceptance of immigration	Medium-low	Low	Medium-high	High
COMPOSITE1	Public & political life	Medium-low	High	Low	Medium-low
COMPOSITE2	Welfare dimension	Medium-low	Medium-high	High	Low
COMPOSITE3	Personal life principles	High	Medium-high	Low	Medium-low

Table 6: *Incidence of each cluster for each country*

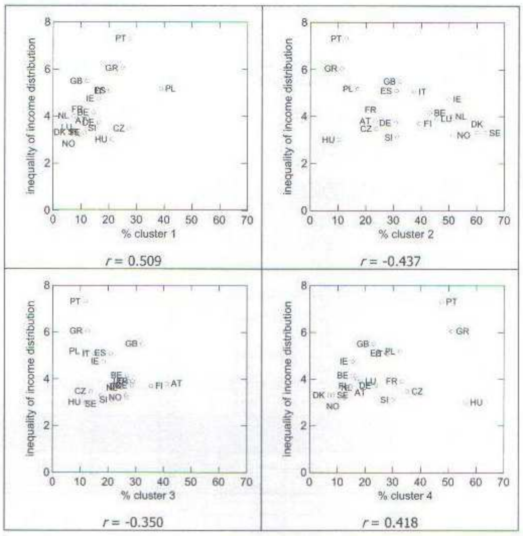
		cluster				Total	N
		1	2	3	4		
AT	Austria	13.6	23.4	41.2	21.8	100.0	2257
BE	Belgium	14.5	43.1	26.8	15.6	100.0	1897
CH	Switzerland	10.9	57.5	22.9	8.8	100.0	2040
CZ	Czech Rep.	27.4	23.8	13.8	35.1	100.0	1360
DE	Germany	16.5	30.9	28.7	23.8	100.0	2919
DK	Denmark	6.2	60.1	26.6	7.1	100.0	1500
ES	Spain	20.5	31.1	20.9	27.5	100.0	1728
FI	Finland	10.5	39.4	35.5	14.7	100.0	2000
FR	France	12.4	25.4	28.9	33.3	100.0	1503
GB	United Kingdom	12.2	32.5	32.3	23.0	100.0	2051
GR	Greece	25.0	11.4	12.5	51.1	100.0	2566
HU	Hungary	21.2	10.5	11.9	56.3	100.0	1685
IE	Ireland	16.4	49.9	18.3	15.3	100.0	2046
IL	Israel	32.6	26.1	19.0	22.3	100.0	2497
IT	Italy	19.4	37.5	15.1	28.0	100.0	1206
LU	Luxembourg	8.6	45.5	27.5	18.4	100.0	1552
NL	Netherlands	7.4	50.7	25.0	17.0	100.0	2364
NO	Norway	9.6	51.4	26.6	12.4	100.0	2036
PL	Poland	38.8	17.1	11.5	32.6	100.0	2109
PT	Portugal	27.9	12.9	11.8	47.5	100.0	1511
SE	Sweden	11.3	63.0	17.5	8.2	100.0	1999
SI	Slovenia	17.1	31.4	21.5	30.0	100.0	1519
	Total	17.4	35.1	22.9	24.6	100.0	
	N	7369	14855	9703	10418		42345

Figure 1: *Correspondence analysis: map of analysed data*



A *B*

Figure 2: *Relationships between clusters incidences and an objective indicator observed at macro level (x scales show the same range in order to preserve comparability between scatterplots)*



References

Costanza R., Fisher B., Ali S., Beer C., Bond L., et al. (2007) Quality of life: an approach integrating opportunities, human needs, and subjective well-being, *Ecological Economics*, 61, 267-276.

Cummins R.A., Andelman R., Board R., et al. (1998) *Quality Of Life Definition and Terminology: a Discussion Document From the International Society for Quality of Life Studies*, The International Society for Quality-of-Life Studies (ISQOLS).

Epidemiological Bullettin (2002) *Introduction to Social Epidemiology*, 23-1.

Giovannini E. (2007) The role of statistics in a globalised world: risks and challenges, paper presented at the DGINS (Directors-General of the National Statistical Institutes) Conference, 20–21 September 2007, Budapest, Hungary.

Michalos A. (1992) Use and abuses of social indicators, in *Sinet*, 32.

Nardo M., Saisana M., Saltelli A., Tarantola S. (EC/JRC), Hoffman A., Giovannini E. (OECD) (2005) Handbook on constructing composite indicators: methodology and userguide, *Statistics Working Paper*, OECDUN Development Programme (2007) *Human Development Report 2007*, Oxford University Press, New York.

Zapf W. (1984) Individuelle Wohlfahrt: Lebensbedingungen und Wahrgenommene Lebensqualität, in: *Lebensqualität in der Bundesrepublik*, Glatzer W. & Zapf W. (Eds.), Frankfurt a. M. – New York, Campus, 13-26.