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Urban deprivation in Argentina: a POSET analysis

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***A*BSTRACT**

The Argentinian case offers many examples of fragmented urban reality, whose deprivation might be fruitfully analyzed by deprivation indicators, according to a current trend in literature. Non-aggregative quantitative method based on the POSET theory offers an alternative approach that may steer clear of the shortcomings of the aggregative approaches. Through our analysis we intend to propose a picture of the Argentinian material and social deprivation. Since our approach does not establish any indicator and avoids absolute hierarchy among areas, it makes a rigorous tool available to public authorities. This allows them the rational choice about where and how intervene, to focus the political action at its best. Our analysis shows that social deprivation is characterized by high variability, which makes it less comparable than material deprivation. Moreover, 72% of the statistical units considered are socially deprived.

KEYWORDS

poset, non compensatory, social deprivation, material deprivation

1 | INTRODUCTION

Over the past decades, the literature on urban social problems has repeatedly singled out the interrelated issues of segregation, inequality and living conditions in the inner city (Langlois & Kitchen 2001). The concept of urban deprivation refers to “observable and demonstrable disadvantages, relative to the local community or the wider society or nation to which an individual, family or group belongs”, as Townsend (1987) maintains in his influential paper on relative deprivation, which extends Holtermann's (1975) seminal work on urban deprivation in Great Britain using census data. In all societies, people can be considered deprived if their standard of living falls below the median, that is the standard attained by the majority of the population. These differences are not limited to the extreme ends of the social scale (Marmot, 2005), and present a big challenge (Wilkinson & Marmot, 2003; Adler & Newman, 2002).

Deprivation is a concept relative to the social context in which it applies, and refers to a condition of disadvantage that results in the impossibility of realizing functions essential to human life (Bruzzi et al., 2019). Satisfying life needs do not depend exclusively on the availability of goods and resources, but also and decisively on the availability of capacity to exploit them (Sen, 1987; Jarman, 1983, 1984;). According to Townsend, lack of availability of goods, services, resources, comforts normally enjoyed or at least widely accepted as primary goods can be identified with the concept of "material deprivation", whilst "social deprivation" implies a non-participation in the roles, relationships, customs, functions, rights and responsibilities involved in being an active member of society or group (Townsend, 1987). He distinguished also between “deprivation” and “poverty”, since the former applies to specific circumstances and physical, environmental and social conditions (Townsend, 1993).

Material deprivation refers to objective states of existence described by direct variables, which directly measure how many individuals living in a given geographical area have certain characteristics (Ivaldi et al 2016; Testi & Ivaldi, 2009). A measure of social deprivation, instead, refers to those characteristics, which do not necessarily imply negative effects in themselves, but can indirectly determine disadvantageous conditions depending on the social context, as they could make it difficult to establish relations, play roles, and exercise rights that are typical of a member of this context. Social deprivation is harder to quantify, due to its non-objective nature and the difficulty to detect it (Townsend 1987; Macintyre et al., 2002).

With the due precaution just observed, this type of analysis can help policy-makers who allocate public resources, thanks to its cost-effectiveness and flexibility (Ivaldi & Testi, 2013; Buckingham, 1997). At the same time, it provides the starting point for possible actions in

order to reduce socio-economic inequalities, which are source of costs for the entire community (Noble et al. 2003, 2010).

In the present paper, we use an approach that singles out the analogies and differences between areas, excluding any hierarchy. In other words, we want to provide a measure based on the double meaning of deprivation, in its material and in social forms. Thus, the choice about where and how intervene is completely in authorities' hand, which have available a rigorous tool to focus their political action at best. Indeed, deprivation is a multidimensional concept, attributable to several factors or aspects of life, whose quantification may be difficult, or even impossible in some cases (Ivaldi et. al 2018). It is also a concept related to the context of analysis, because it refers to aggregated data on a geographical basis, differentiated on one level but at the same time homogeneous, since they regard various environmental characters with respect to the general data (Carstairs and Morris, 1991). The intrinsic complexity linked to deprivation makes it necessary to use different indicators that favour a correct measurement. Multiple sets of indicators can be considered, in a conceptual framework that describes deprivation including its constituents and determinants, according to a top-down approach (Michalos 2008), or through the construction of synthetic indicators and comparison with measures of the state of health (Ivaldi et al 2016). We propose an intermediate approach, where we compare the indicators, but do not aggregate them in an overall indicator. Although aggregative methods are the most widely used to measure deprivation (Duran & Condorì, 2019; Atkinson et al., 2014; Ivaldi & Testi, 2011), they are not the only tools to synthesize indicators. Synthesis does not necessarily imply aggregation. In this perspective, one of the most useful references is the Partial Order Theory (Poset), a branch of discrete mathematics providing concepts and tools that fit very naturally the needs of synthesis (Alaimo et. al 2020).

The paper is divided into five parts. After the Introduction (part 1), we present the literature review and some notes on the Argentinian urban context (part 2). In part 3 the methodology is described and applied, and results are provided in part 4. Finally, part 5 presents the conclusions of the paper.

2 | LITERATURE REVIEW AND GENERAL CONTEXTUALIZATION OF THE STUDY

2.1 | Introduction

The analyses of the different socio-economic environments and their influence on health are part of the research on deprivation that began in the '80s in Great Britain with the studies of Jarman and Townsend on the state of disadvantage of the subject in relation to the life conditions of the community he/she belongs to (Townsend, 1987; Jarman, 1983).

Many subsequent surveys derived from these works; in particular, the multiple deprivation indices contained in the IMD 2000, developed by the United Kingdom's Department of the Environment, Transport and Regions (DETR, 2000), followed by the IMD 2010 and the IMD 2015 implemented for the first time by the Scottish Executive in 2003 (Noble et al., 2003) for the Department for Communities and Local Government and SIMD, and then replicated for several years until the most recent in 2016. Further experiments were conducted in Spain (Pérez-Mayo, 2002), Ireland (Kelleher et al., 2002), the Netherlands (Smits et al., 2002), Italy (Ivaldi & Testi 2011) and France (Soliani et al. 2012). In the last three decades, indicators of deprivation have been extensively developed in many countries as New Zealand (Salmond and Crampton, 2012); North America (Torsheim et al, 2004), the United States (Arcaya and Arcaya, 2015) and Canada (Pampalon et al, 2009c). Several inquiries have shown that areas with lower deprivation report better health statuses, such as improvements in infant mortality and cancer survival rates (Basta et al., 2014; Norman et al., 2008), while areas tackling persistent conditions of deprivation show the worst health and mortality outcome (Landi et al., 2018; Exeter et al., 2011; Norman, 2010; Brown and Rees, 2006).

2.2 |The Argentinian urban context

In the literature, the reference statistical units for deprivation analysis are the small areas, which must have territorial, historical, and cultural characteristics that differentiate them from others. Provided it is sufficiently small, the chosen area should have also groups of dwellers quite homogeneous over certain environmental characteristics and circumstances. Thus, the results of the analysis are likely to be more significant than in the case of reference to general data (Carstairs and Morris, 1991). However, a theoretical definition of the geographic area to take as the unit of study is not clearly formulated or universally accepted (Bruzzi et al., 2019; Testi & Ivaldi, 2009). Moreover, the study of small areas should eschew the so called “ecological fallacy” in the aggregation analysis (Lancaster and Green, 2002); in paragraph 5 we will return briefly on this point. The choice of indicators is often forced by the nature of available data and by the non-homogeneity of data bases, when the researcher

must collect and put together social and health information to demographic one. Indeed, also in our case the choice has been quite difficult, and, in some way, forced by data availability.
The study carried out examines 32 cities of Argentina. It covers a relevant part of the phenomenon under scrutiny, and the approach is fully consistent with the human geography of the country, where the great majority of dwellers live in these urban centres. Argentina is politically divided into twenty-three *provincias* (provinces) and one autonomous city, Ciudad Autónoma de Buenos Aires, the Federal Capital of the nation. Five different geographical regions are distinguished in its territory. The "NOA" region includes the north-western provinces: Jujuy, Salta, Tucumán, Santiago del Estero, Catamarca and La Rioja. The "NEA" region includes the north-eastern provinces of the country: Formosa, Chaco, Misiones, Corrientes and Entre Ríos. The "Cuyo" region includes the provinces located in the mountainous area in the centre-west of the country: Mendoza, San Juan and San Luis. The "Pampeana" region includes the City of Buenos Aires, and the provinces of Buenos Aires, Córdoba, Santa Fe and La Pampa. The "Patagonia" region includes the southern provinces of Argentina: Neuquén, Río Negro, Chubut, Santa Cruz and Tierra del Fuego.
A recent study, based on 2010 Argentinean census data, proposes a couple of material deprivation index (General and Emergency) for small areas, covering almost the entire territory. The authors have found different intensity and composition of the deprivation according to the different geographic areas of Argentina, mainly related to inequalities in economic growth between urban and rural spaces (Duràn & Condorì, 2019). The present paper sets in the same field of analysis, even though methodology, geographical areas and types of deprivation considered are different.

2.3 | The POSET method.

POSET (Partially Ordered Set) is a suitable instrument to study deprivation and well-being. Indeed, it allows for a realistic evaluation of the spread and depth of poverty phenomena, and provides strong support to the concepts and tools used in social studies. POSET is based on a conceptual setting non-aggregative and formative. If we start from a formative point of view, indicators are considered as "causing" the phenomenon (Alaimo & Maggino 2019; Alaimo 2018) POSET evaluation is a way to obtain a complete order out of a partial order: after assigning a value to each profile, it is possible to order each element according to the linear relationships that characterize it respect to all the other elements that make up the

ordered structure. The strengths of the "posetic" approach can be summarized as follows (Fattore, 2017a-b; Fattore, 2016):

- Partially Ordered Approach (POA) assumes a formative point of view, but is not based on the synthesis of the different indicators (it does not aggregate the attributes);
- POA can be conceived as a comparison with reference parameters; in fact, by analyzing the partially ordered structure it is possible to observe the position of the various statistical units with respect to units considered as reference parameters, as well as to evaluate the distance between them. In POA approach, the researcher chooses one or more thresholds or reference profiles;
- POA does not employ any reduction procedure, but directly performs multidimensional comparisons, between the achievement profiles and the benchmark profiles.

3 | METHODOLOGY

3.1 | *The set of indicators*

Our analysis is based on official government data, usually free and easy to find. Their geographical range allows delimiting geographical units, with homogenous social and economic characteristics (Treanor 2014; Guio, 2009; Pampalon et al., 2009a; Schuurman et al., 2007; Wong, 1997).

The data are extracted from the last quarter of 2017 Permanent Household Survey (EPH)[1], a sample survey about the characteristics of families. It covers 32 urban agglomerations with more than 100,000 inhabitants, where 70% of the urban population of Argentina lives (Pampalon et al., 2009b). Agglomerations are considered in relation to their urban areas. This specification is important because the so called "context effect" could take different meanings in different geographical stratifications. Indeed, part of literature assumes that the overall socio-economic conditions characterizing a geographical area can determine systematically different risks of deprivation, on the same level as any other condition. On the contrary, this assumption is criticized by those who consider that the context effect is

[1] The EPH, undertaken monthly by the National Institute of Statistics and Censuses (INDEC), is a continuous survey that takes place in 32 urban areas of Argentina (provincial capitals and cities above 100,000 inhabitants). The Encuesta Permanente de Hogares (EPH) is carried out in only 32 main urban areas (Aglomerados) and is representative of only 6.3 out of 10 residents

irrelevant, and in any case not quantifiable (Bertin et al., 2014; Haimovich & Winkler 2005; Macintyre et al., 2002; Slogget & Joshi, 1994). In this paper, the measure of deprivation distinguishes material and social deprivation: the former referring to the goods and convenience of everyday life and the latter to the fragility of social cohesion, from family to the community.

In our analysis we have used the POSET method, considering the indicators more common in literature (Table 1a and 1b), scored on a scale from 1 to 3 (table 1A and table 1B). We selected a set of eight indicators: four for material deprivation and four for social deprivation. The indicators selection to construct our model has happened on the basis of a literature review in a preliminary step. In a subsequent step, indicators have been chosen as a combination of the following criteria: previous use as geographic proxies (Ivaldi et al., 2020; Pampalon et al., 2009a), affinity with the material or social dimensions of deprivation respectively, and availability by EPH.

With reference to the material deprivation, low education can be considered as a proxy of social position; income as an indicator of economic security; overcrowding and buildings in mediocre or bad state are proxies of living conditions and wealth respectively (Ivaldi & Testi, 2011). In fact, low educated people who earn low income and live in poor and overcrowded houses can be considered definitely deprived in the material sense.

Social deprivation reflects the deprivation of relations among individuals in the family and in the community (Pampalon et al., 2009a). The indicators selected for this type of deprivation focus on the most vulnerable groups of people because of the weak social network in which they are placed (Eurostat, 2019). Indicators of social deprivation represent proxies of the two constitutive concepts of social capital (Wagle, 2002), i.e. social fragmentation (Congdon, 1996) and social isolation (Curtis et al., 2006). We have chosen people above sixty-four living alone; people born abroad; single-parent or single person families. We hypothesise that, generally speaking, old people should have difficulty of empowerment in fields like communication and social participation. In many cases people born abroad must fit into the local human environment and have difficulties in carrying out the administrative procedures necessary to play a role in social life; furthermore, they can be discriminated against. Single person's families, again, are likely to communicate uneasily and feel a sense of isolation, lack the opportunities offered by the social life of the sons and daughters, are at risk of emotional deficiencies, frequently build up a second life on the web; whereas, if they cannot afford a

personal computer, are likely to feel a sense of sad isolation. For mothers, or fathers, living alone with one or many dependent child/children, social life may be virtually impossible, since they must devote all time to work and breed the child/children; moreover, they might receive a social stigma for ideological or religious reasons.

Table 1(a): set of indicators for material deprivation

MATERIAL DEPRIVATION				
COD	**Indicators**	**Description**	**Range**	**Used By**
MD1	Low education	Percentage of people who completed just five years of school, or less, or are totally illiterate	1-3	(Pampalon et al., 2009a, 2009b; Landi et al. 2019)
MD2	Income	Average income *per capita* (reciprocal)	1-3	(Julkunen, 2002)
MD3	Overcrowding	Average people per room	1-3	(Durán & Condorí, 2019; Forrest & Gordon, 1993; Jarman, 1983; Townsend, 1987;)
MD4	Buildings in mediocre or bad state	Percentage of buildings in bad condition	1-3	(Duran & Condorí, 2017; Pérez-Mayo, 2003)

Table 1(b): set of indicators for social deprivation

SOCIAL DEPRIVATION				
COD	**Indicators**	**Description**	**Range**	**Used by**
SD1	Single elders	People above 64 years who live alone	1-3	(Forrest & Gordon, 1993; Jarman, 1983; Pampalon et al., 2009c)
SD2	Resident foreigners	Percentage of residents born abroad	1-3	(Jarman, 1983; Testi & Ivaldi 2009; Landi et al. 2019)
SD3	Single-parent families	Percentage of families composed of a single parent and dependent children	1-3	(Duran & Condorí, 2017; Forrest & Gordon, 1993; Jarman, 1983; Julkunen, 2002)
SD4	Single-person families	Percentage of families composed of a single person	1-3	(Duran & Condorí, 2017; Julkunen, 2002; Pampalon et al., 2009c)

The class split was accomplished using the cluster analysis function. We adopt the most widely used method of relocation: k-means method. The procedure follows a simple and easy

way to classify a given data set through a certain number of clusters (assume *k* clusters) fixed *a priori*. The main idea is to define k centroids, one for each cluster. The number of clusters must be specified in advance and does not change during the iteration (Hartigan 1978; MacQueen 1967). In this case we define 3 centroids in order to have a range 1-3 for each indicator. Class 3 is the best where a statistical unit can fall, and class 1 is the worst. Each statistical unit has a number sequence, that is its profile, on which POSET is built.

After determined the profile associated to each statistical unit, we calculate the average rank, that is the average position of a statistical unit when considering the different linear extensions that make up the order structure (Fattore, 2017a).

We got two charts of average rank; the first refers to material, the second to social deprivation. These results are indicators of variability. The graphs (figure 3) show the average rank associated to each agglomeration and its lower and upper limits. A wider difference between them denotes greater variability and inhomogeneous indicator's profiles. In addition, the difference between the upper and lower limits provides information about the relations among the different statistical units. Where there is high difference, there are many cases of incomparability.

The ranking procedure has developed following these steps (Fattore & Arcagni, 2018):

- We extracted all the linear extensions of a certain order structure π and create $\Omega(\pi)$;
- For each element $b \in \pi$ and for each $\ell \in \Omega(\pi)$ we assigned the rank $r_\ell(b)$ of b in ℓ, which is defined as 1 + the number of edges linking b to the maximum of ℓ;
- We calculated the average $r(b)$ of $r_\ell(b)$ over $\Omega(\pi)$ for each $b \in \pi$;
- Then we have obtained the average rank of each element of the distribution.

All the results and graphical representations were obtained through the appropriate processing with the RStudio software, using the functions offered by the PARSEC package (R Core Team, 2016; Arcagni & Fattore, 2014).

3.2 | Non-aggregative method: Partially Order Set

As mentioned, the acronym POSET stays for "Partially Ordered Set". It is a set of algebraic and combinatorial tools designed to describe and treat order relations correctly. Compared to the traditional approaches used for the evaluation of deprivations, the novelty of POSET mainly lies in the non-aggregative nature of the methodology (Fattore, 2015). The basic idea of the "posetic" approach derives from the observation that traditional compensatory aggregative

methods of analysis may blur the real complex nature of certain phenomena. Given the peculiar characteristics of each dimension, there is often too weak interdependence between the different dimensions of a specific phenomenon to be able to proceed with compensation (Sen, 1992). The approach based on POSET theory offers valid alternatives to the analysis of cases of well-being and deprivation, as it ensures the preservation of specific cases in accordance with their possible incomparability. These elements contribute to making the evaluation process more real and robust.

The POSET method is not widespread yet, but its diffusion is growing. For example, Arcagni et al. (2018) presents an analysis of the deprivation of migrants in Lombardy. Here the importance of POSET is remarked, especially with regard to the polarization and concentration of situations of poverty and fragility of the various ethnic groups. In Fattore & Arcagni (2018) the POSET method is applied to study child well-being in the different regions of the Democratic Republic of Congo. There deprivation is measured through four attributes: sanitation, water, shelter and health. Then, the results are traced back to profiles made up of four indicators of binary nature. The application allows observing, from a logical-mathematical and graphical point of view, the usefulness and perfect applicability of the method to a multidimensional complicated case study.

In Wittmann & Brüggemann (2014), the POSET method is developed with the aim of encouraging the identification of a type of car that respects, at the same time, best/optimal environmental and technical parameters. The chapter proposes a software platform that allows dealing with these conflicting parameters by individual weighting and a flexible interface for comparison.

Using the “posetic” approach, Hilckmann et al., (2017) examine relation between political parties and the sustainable development within Germany’s federal states. Through this application, they show that the POSET methodology can support the analysis of indicator systems as shown in several case studies (Bach et al., 2015; Carlsen & Bruggemann, 2013; Bruggemann et al., 2014).

Iglesias et al. (2016), which compares POSET with Alkire and Foster counting approach, measures well-being in Switzerland in its multidimensional nature. The starting data are extracted from the scheme provided in the Social Swiss Report, and the indicators are both objective and subjective.

In order to apply the analysis method based on POSET theory, it is necessary to clarify some relevant concepts.

A *partially ordered set* (or *POSET*) is a set π equipped with a partial order relation $\leq$, i.e. a binary relation satisfying the properties of *reflexivity*, *antisymmetry*, and *transitivity* (Davey and Priestley, 2002; Schröder, 2002; Neggers and Kim, 1998).

Each *element* (or *statistical unit*) forming an ordered structure is associated to a profile, i.e. a sequence of integers within a range to which all the values of the different indicators are traced.

A *range* is a set of integer values, i.e. a numerical scale, within all the values of the different indicators are contained.

In the case where there is a comparability relationship between two elements of the structure, i.e. it is possible to make a comparison between them ($b \leq a$ or $a \leq b$), statistical units are *comparable*. In this case the partial order is called *linear order* or *complete order*. Otherwise it is said that the two units are incomparable. A subset of mutually comparable elements of a POSET is called a *chain*, while a subset of mutually incomparable elements of a POSET is called *antichain* (written $b \parallel a$).

Given $b, a \in \pi$, a is said to cover b (written $b \prec a$) if $b \leq a$ and there is no other element $c \in \pi$ such that $b \leq c \leq a$. An element $b \in \pi$ such that $b \leq a$ implies $b = a$ is called *maximal;* if for each $a \in \pi$ it is $a \leq b$, then b is called *maximum* or *the greatest element* of π. An element $b \in \pi$ such that $a \leq b$ implies $b = a$ is instead called *minimal;* if for each $a \in \pi$ it is $b \leq a$, then b is called (the) *minimum* or *the least element* of π.

Given $b \in \pi$, the *down-set* of b (written $\downarrow b$) is the set of all the elements $a \in \pi$ such that $a \leq b$. Dually, the *up-set* of b (written $\uparrow b$) is the set of all the elements $a \in \pi$ such that $b \leq a$.

Given two partially ordered sets π and τ on the same set, we say that τ is an extension of π, if $b \leq_\pi a$ in π implies $b \leq_\tau a$ in τ. In other words, τ is an *extension* of π if it may be obtained from the latter turning some incomparabilities into comparabilities. An extension of a complete order is called a linear extension. The set of linear extensions of a POSET π is denoted by $\Omega(\pi)$ (Fattore, 2017a).

The concern about the Partially Order Set is connected to the need and possibility to process ordinal data without altering their nature. However, this also involves a certain change of epistemological mindset (Fattore, 2010). POSET method is appropriate to analyze complex

and multidimensional phenomena, without underestimating the different meaning that each indicator entails.

In the POSET theory, a set is defined as ''linearly (or totally) ordered'' when all the pairs of its elements are linked by an order relation. The description of a partial relationship using the corresponding coverage has the advantage of allowing a comfortable graphical representation, known as *Hasse* diagram (figure 1). It is an acyclic oriented graph, which is drawn according to the following rules:

- If $b \leq a$, the node *b* is placed lower than the node *a;*
- If $b \prec a$, an edge is inserted between them (the edge is not graphically oriented, because the diagram naturally reads from top to bottom).

Hasse diagram is formed by nodes, connected to each other through a downward path; nodes that are not connected are incomparable (Arcagni et al., 2018; Carlsen & Bruggemann, 2017). Figure 1 represents an example of *Hasse* diagram with just six profiles: *a* covers , *c* and *b*; *c* and *b* cover *e* and *d,* respectively; *e* and *d* cover *f*. Looking at the example shown in figure 1, it is possible to see that elements *c* and *b,* as well *e* and *d*, laid on the same vertical level, are not connected by an edge. This is the way to represent incomparability in *Hasse* diagram: we know that *e* and *d* are below *c* and *b* and they are above *f* but, based on available data, we cannot establish an order among them.

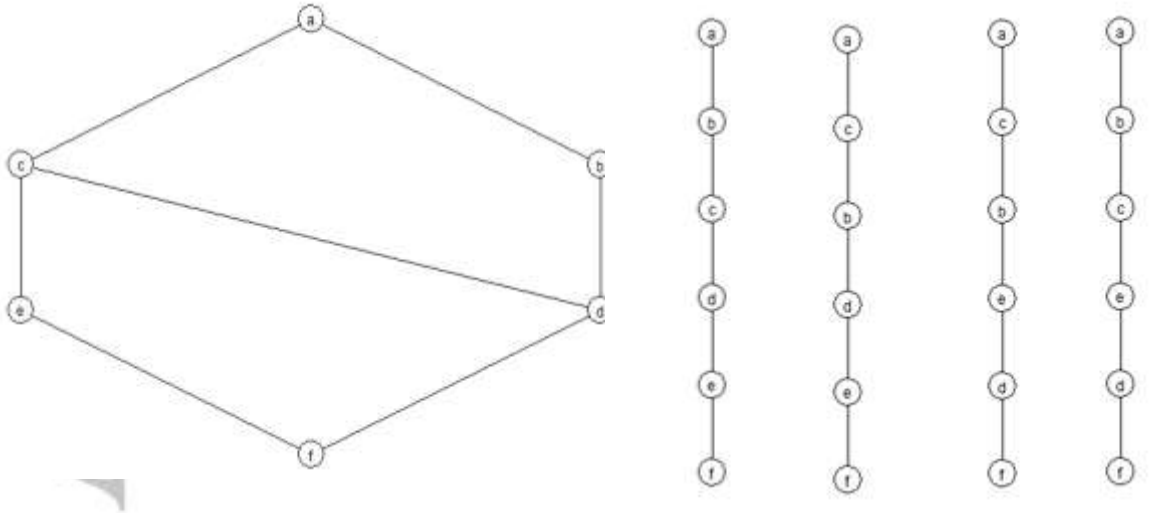
In the present paper, POSET is used to compare statistical units and analyze their possible comparability. Through the analysis of the comparative structure, we will observe the rankings of the different statistical units.

The choice of POSET method to conduct our analysis is also due to a specific feature of this methodology. Indeed, it provides synthetic indicators without attributing any aggregation; this makes it possible to treat ordinal data in a consistent way, overcoming the drawbacks of both aggregative-compensative and counting approaches. In our case, like in several others, the "posetic" approach delivers much more effective results than classical indicators, definitely supporting its use in social evaluation studies (Alaimo et al., 2020; Arcagni et al., 2018; Fattore & Maggino 2014).

Given a partially ordered structure, we can determine the linear order (linear extensions, figure 1) represented by a ranking of elements that preserves the comparability of the original POSET (Fattore & Arcagni, 2018). In this case, a linear system is determined in way that it is in

bijective relation with the original POSET and compatible with the order structure; each element of the POSET is associated to a different position (Bubley, 1999).

Figure 1: Hasse diagram composed by six profiles and corresponding set of linear extensions of a POSET



POSET, *per se*, does not require any weight and/or aggregation. However, by applying the POA one can account for attribute relevance. Indeed, it is composed of two steps. The first (identification step) singles out the subjects that, in the present analysis, enjoy well-being and leads to the definition of an identification function, based on the comparison between profiles and benchmarks; the second (intensity measurement step) aims at assessing the level of performance. In POA, the attribute relevance is not realized by assigning numerical weights, but a partial order of attributes. In doing so, it is easier to determine whether one attribute is more relevant than another, even without knowing the level of such relevance.

In the first phase, the incomparability between profiles is considered, since there is no need to rank all of the attributes by importance. However, in the evaluation process incomparability is resolved by modifying (extending) the POSET input result instead (Fattore & Maggino, 2018). The attribute relevance causes a change in the ordered structure of the POSET.

In this paper we have considered preferable to evaluate indicators on an equal footing (Nardo et al., 2005), assigning an equivalent weight to each of them. Decancq & Lugo (2013) identify equal weighting as the preferred and facilitating procedure, provided that certain conditions occur. For example, it is preferable to assign the same weight to all indicators when the

theoretical scheme assumes the adequacy of all the indicators considered for the analysis of a certain phenomenon, or statistical and empirical knowledge in relation to a given phenomenon is not so thorough as to develop a valid and universally accepted weighting system (Maggino 2009).

Here we have used two specific functions combined with the POSET method. We refer to the identification (idn) and severity (svr) functions. Both are applied in evaluation procedure.

The first function identifies deprived profiles, assigning a value in [0, 1] to each statistical unit. We begin with the selection of a deprivation threshold, to identify the unambiguously or completely deprived profiles (Fattore, 2016). In each linear extension all the threshold profiles are classified "totally deprived", so that their identification value is equal to 1. If the value is not 0 or 1, the evaluation score can be complemented with a severity score, which measures the depth of deprivation or fragility. The identification score is based on a fundamental property of finite POSET: they are "equivalent" to the set of their linear extensions, that is the linear orders obtained by resolving the incomparability of the input POSET in all the possible ways (Arcagni et al., 2018).

In each linear extension, when we count the fractions of linear extensions, classifying a given element as deprived, we get its deprivation score (Fattore, 2016). In formulas, it is possible to describe the process in this way:

$$idn(b) = \frac{1}{|\Omega(\pi)|} \sum_{\ell \in \Omega(\pi)} idn_{\ell}(b), \qquad [1]$$

where:

- $idn(b)$ is the final identification score of profile b;
- $\Omega(\pi)$ indicates the set of linear extensions of the input POSET;
- $idn_{\ell}(b)$ stands for the identification score of profile b in linear extension ℓ.

The counting of the identification function is done on the linear extensions and not on the attributes (Alkire & Foster 2011a-b; Cerioli & Zani 1990). The difference is crucial. In this terms, deprivation is not conceptualized as the ''sum'' of attribute deprivations, but as a ''global property'' of a profile, within a system of comparability and incomparability. Counting over linear extensions aims at extracting information on deprivation vagueness out of the achievement POSET structure that could not be recovered directly counting over attributes (Arcagni et al., 2018).

Along the different linear extensions, you can determine the distance between one deprived profile and the non-deprived profile closest to it. We can express that distance as the number of edges placed between them in the Hasse diagram. If we calculate the average of those distances on Ω, we get the severity function value of b. After this step, we just have to normalize by dividing the score by the highest severity score within the POSET (Fattore, 2017a). Formally, svr function can be defined as follows:

$$svr(b) = \frac{1}{|\Omega(\pi)|} \sum_{\ell \in \Omega(\pi)} svr_{\ell}(b), \quad [2]$$

where:

- $svr(b)$ is the final severity score of profile b;
- $svr_{\ell}(b)$ is the severity score of profile b in linear extension ℓ;
- $\Omega(\pi)$ indicates the set of linear extension of input POSET.

4 | RESULTS

4.1 | Average rank

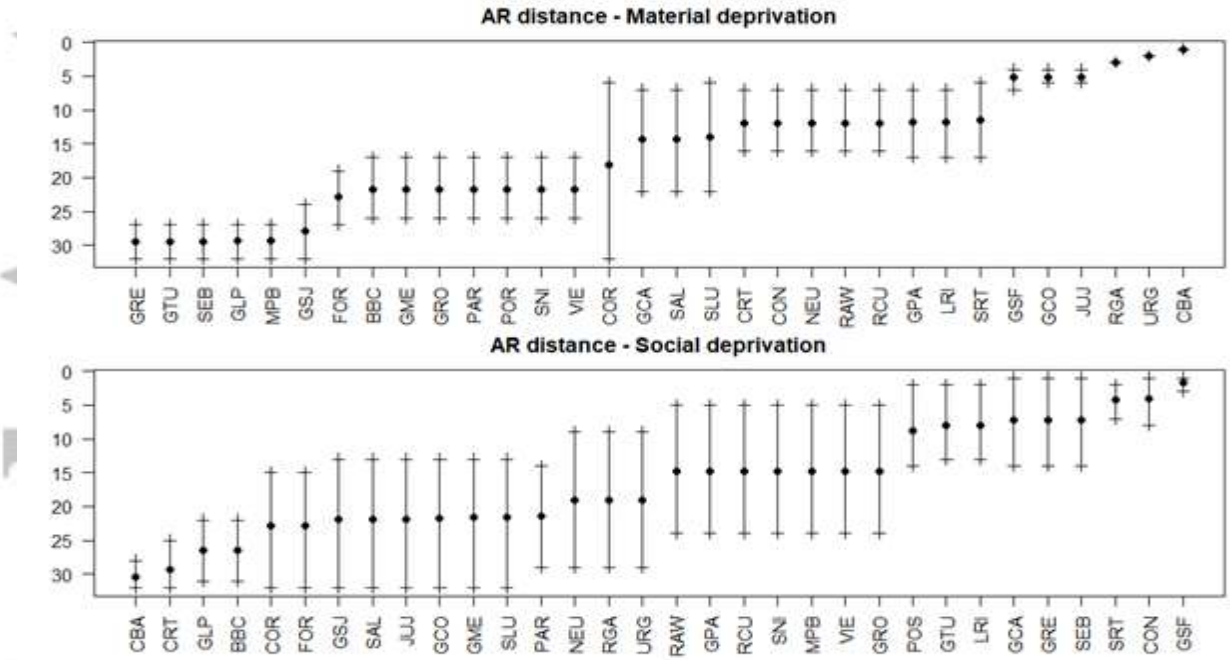
Going over the results given by the average rank distance function (see Appendix, tables 3A and 3B), we see that the average range of social deprivation is very high (24.19), and that it has a higher value than material deprivation (11.19). It means that the variability in the social sphere is significantly greater than the variability that characterizes the material dimension. The statistical units, in the social dimension, show a marked tendency to take different positions within the ordered structure. In this context, cases of incomparability emerge in large numbers, making the picture of the social dimension fuzzier.

Specifically, considering material deprivation, we can observe that 26 statistical units have a range of 15 or less; this denotes a greater tendency of units to gather within certain values (figure 2). By focusing on the individual units, it is possible to grasp some peculiarities. COR[2], characterized by the maximum range for material deprivation, has only one relationship within the POSET structure, that is the subordination ratio with respect to RGA. For COR there is a substantial incomparability COR is incomparable with any other profile with all other profiles. If we consider instead the three agglomerations whose range is 0, we note that not only are they comparable to each other, but they are also comparable to all other profiles.

[2] The different agglomerations are identified by a three-letters code. See Appendix, table 2.

When we look at social deprivation, we realize that only one statistical unit shows a range of variation less than 15; it is GSF, which ranges between a minimum value of 1 and a maximum of 12. As to the others, there are 17 elements whose range is between 25 and 28; it means that, in the distribution, there are many profiles that have different characteristics. GSF has the smallest difference between maximum and minimum value (range=11), and is comparable to 10 other profiles.

Figure 2: average ranks distance for material and social deprivation



4.2 | Material and social deprivation: analysis based on identification and severity functions

Coming back to the material deprivation, first the attention can be focused on the threshold profiles (table 4A in Appendix). We have chosen the profile "1313" as threshold. It coincides with the agglomeration "San Luis-El Chorrillo". The choice was made on the basis of a qualitative assessment of the indicators that make up the profile number sequence. We observe that San Luis-El Chorrillo has the highest degree of deprivation on indicator MD1 ("low instruction") and on indicator MD3 ("overcrowding"). Although the agglomeration shows excellent results in terms of income and a small number of buildings in mediocre condition, the balance for the serious fragility on indicators MD1 and MD3 would have been distorting and, therefore, incorrect.

Looking at the identification function values (table 2), there are six statistical units that are not deprived; the reference is to CBA, GCO, GSF, JUJ, RGA, URG. On the contrary, the highest level of deprivation is in the agglomerations of FOR, GLP, GRE, GSJ, GTU, MPB.

Furthermore, we find agglomerations that, even though not totally deprived, nevertheless lie near a state of deprivation (*idn*=0.87); BBC, GME, GRO, PAR, POR, SNI, VIE.

Examining the deprived profiles, through the severity function we can determine which of them have the greatest intensity of the deprivation phenomenon.

Indeed, *svr* achieves its higher values in the agglomerations GLP, GRE, GTU, MPB, SEB (0.85≤*svr*≤0.86) and GSJ (*svr*=0.77).

Moving on to social deprivation (table 4B in Appendix), we have adopted the same criterion to determine the threshold. GPA, RCU, SNI, MPB, VIE, GRO are the first deprived elements of the partially ordered structure. They show the highest degree of deprivation in two indicators out of four. More in detail, they are placed in the first class, the worst, in the headings “lonely elders” and “single-person families”; on the contrary, they are among the best in “resident foreigners” and “single-parent families”.

In the case of social deprivation, many criticalities emerge, more than those we have seen for the material dimension. Analyzing the results obtained by the identification function (table 2), we see that there are 10 statistical units that could be defined completely deprived; and 12 characterized by very high level of deprivation (0.93≤*idn*≤0.98), which brings them closer to almost absolute deprivation.

Among the cases in which deprivation occurs with the greatest intensity, we identify BBC, CBA, CRT and GLP, that show a severity value between 0.78 and 0.94.

There are only two cases in which there is no case of deprivation. These units are GSF and SRT (profiles “2332” and “2331”).

Our results paint a complicated picture, where many profiles are deprived. Given the high number of incomparable profiles, it is not possible to analyze the social reality of Argentine agglomerations without paying attention to the single case and the characteristics of each indicator in the areas examined.

In principle, not all the deprivation severity values of the profiles on the deprivation threshold are equal to 1; at the same time, they may be different among threshold elements. When we look over a profile (here: an urban region), we may have each of four indicators equal, or higher, or lower than the threshold values previously established. Generally speaking, an

urban region is to be considered “deprived” when one or more indicators result(s) below the threshold and no indicator is above. Similarly, we may say that a profile (urban region) is more deprived than another if one, or more, indicator(s) is / are lower and none of them is higher than the same indicator(s) of the other region. When we compare a profile with another, or with the threshold, and find a few indicators (or just one) higher and a few indicators (or just one) lower, we may say nothing about the relative deprivation of the two profiles, or the absolute deprivation, when the comparison is carried out with respect to the benchmark, that is the set of threshold values. This happens because of the aforementioned multidimensionality and the incomparability among threshold profiles: the POSET approach excludes any hierarchy (see above, 1. Introduction). Moreover, when the threshold widens, profile severity increases and the set of non-deprived profiles narrows, then the analysis tends to indicate deprivation more frequently. Once again, we see that svr and idn are complementary, not replaceable (Alaimo et al., 2019; Fattore & Maggino, 2018; Fattore, 2017a-b; Arcagni & Fattore, 2014)

Table 2: Identification function and severity function for material and social deprivation

	Material deprivation		**Social deprivation**	
Agglomeration	***Idn* function**	***Svr* function**	***Idn* function**	***Svr* function**
BBC	0.87	0.43	1	0.78
CBA	0	0	1	0.94
CON	0.39	0.09	0.25	0.04
COR	0.64	0.35	0.98	0.64
CRT	0.39	0.09	1	0.89
FOR	1	0.49	0.98	0.64
GCA	0.52	0.16	0.48	0.11
GCO	0.04	0	0.97	0.6
GLP	1	0.85	1	0.78
GME	0.87	0.43	0.97	0.6
GPA	0.38	0.09	1	0.33
GRE	1	0.86	0.48	0.11
GRO	0.87	0.43	1	0.33
GSF	0	0	0	0
GSJ	1	0.77	0.97	0.61
GTU	1	0.86	0.53	0.11
JUJ	0.04	0	0.97	0.61
LRI	0.38	0.09	0.53	0.11
MPB	1	0.85	1	0.33
NEU	0.39	0.09	0.93	0.49
PAR	0.87	0.43	0.98	0.58

POR	0.87	0.43	0.59	0.14
RAW	0.39	0.09	0.86	0.33
RCU	0.39	0.09	1	0.33
RGA	0	0	0.93	0.49
SAL	0.52	0.16	0.97	0.6
SEB	1	0.86	0.48	0.11
SLU	1	0.06	0.97	0.6
SNI	0.87	0.43	1	0.33
SRT	0.36	0.08	0	0
URG	0	0	0.93	0.49
VIE	0.87	0.43	1	0.33

4.3 | Main findings by observing Hasse diagrams

When we compare the results obtained in the two partially ordered structures (figures 3A and 3B), it is possible to see that only one agglomeration falls into the category of units non-deprived both materially and socially; it is GSF, which shows respectively in the material and social sphere the profiles "1323" and "2332" respectively. At the opposite, two agglomerations are deprived in the material and social sense: GLP and MPB.

The remaining elements show mixed results between material and social dimension.

Figure 3(a): POSET – material deprivation

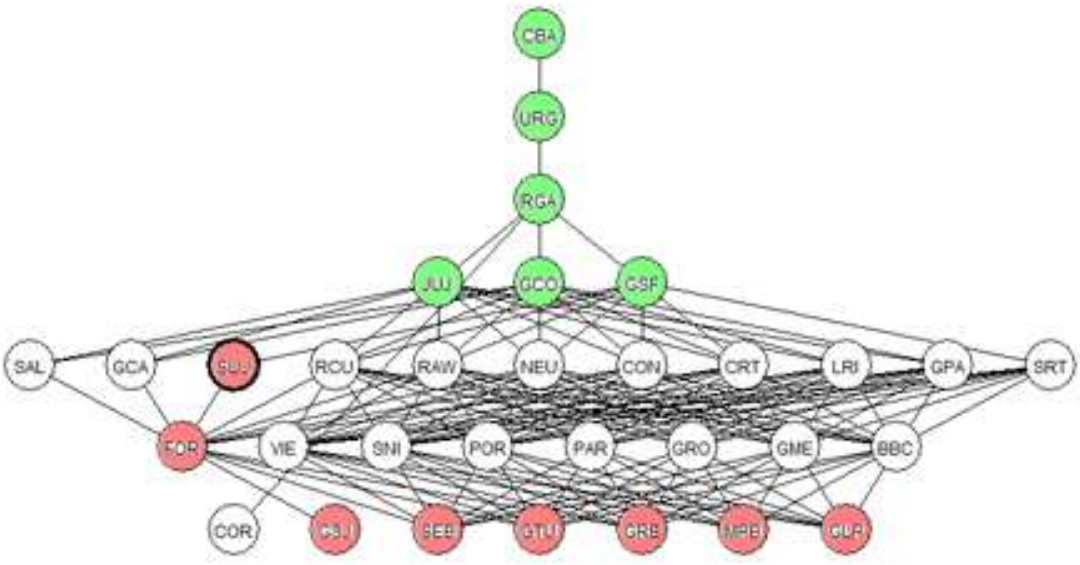
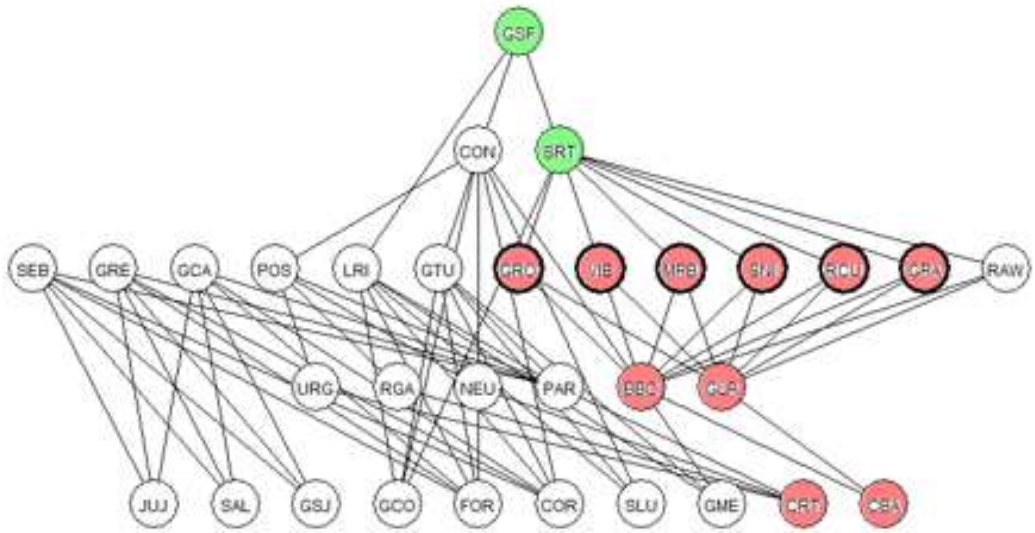


Figure 3(b): POSET – social deprivation



4.4 | Breakdown by levels of deprivation

Considering the level of deprivation of the statistical units (table 3), in the material sphere we can observe that 44% of the statistical units are less than 0.5 according to the identification value. As a result, well over half of the considered elements show an identification value greater than 0.5. The highest percentage of statistical units assumes an identification value of 1, showing absolute deprivation.

If we look at the social dimension of deprivation, we see that 72% of the statistical units point to a level of deprivation between 0.75 and 1. These results confirm the drawbacks that afflict Argentine. The critical hindrance is mainly social deprivation.

This could be linked to the particular attention that Argentine central and local governments have paid to material well-being rather than to the reduction of inequalities and the social well-being, and also to the scarce effectiveness of the public social policies (Duran & Condorì, 2017).

Table 3: percentage of deprived statistical units in the material and social spheres

	Deprivation degree (%)	
Levels of deprivation	**Material deprivation**	**Social deprivation**
0	13	6
]0; 0,25[	6	3,1
[0,25; 0,5[	25	0
[0,5; 0,75[	9	6
[0,75; 1[	22	41
1	25	31

4.5 | Additional remarks

The results confirm that the material dimension should be considered distinctly from the social dimension, since they refer to different phenomena and have different priorities (Ciacci & Tagliafico, 2020; Philibert et al. 2017; Bellani & D'Ambrosio 2011; Mabughi & Selim, 2006; Duffy, 1998; Chambers, 1995; Room, 1995; Walker, 1995; Williams, 1986).

A very low positive correlation between the ranking of material and social deprivation emerges. The value of Kendall correlation indicator is equal to 0.13. The data gives us further evidence that the phenomena of material and social deprivation must be considered distinctly, as stand-alone phenomena.

The geographical location of the urban communities does not show any clear link with the respective POSET ranking. CBA is a unique case in our framework. Materially, CBA is the only statistical unit that ranks in the top class (class 3) for all the indicators considered. On the contrary, if we look at the social sphere, CBA shows a very serious deprivation on the indicators SD1-SD2-SD4. CBA provides the classical example of a urban reality excellently developed from a material point of view, but very weak if we consider social indicators (Duràn & Condorì, 2017; Cao & Vaca, 2006; Broadway & Jesty, 1998; Knox, 1995; Pacione, 1995; Townsend, 1993; Broadway, 1992, 1989; Bourne, 1989) The process of industrialization produces economic and material development in urban areas, but it may cause drawbacks in the social sphere; for example, the increasing difficulties that residents have in relating each other. In recent decades, the number of elderly people forced to live alone has grown dramatically: old communitarian relations are disappearing, and no new establishment of social cohesion is visible (Atkinson et al., 2014; Bodner, 2009; Pampalon et al., 2009; Gordon, 2007; Bytheway, 2005; Hagestad & Uhlenberg, 2005; Langlois & Kitchen, 2001). Many people are at risk of social exclusion because of their ethnic origins and their belonging to racial minorities (Fu et al., 2015; Robson et al., 2010; Bhopal, 2006; Harris & Longley, 2002; Kitchen, 2001; Ley & Smith, 2000; Salmond & Crampton, 2000). The apparently paradoxical data of Ciudad de Buenos Aires, with the top profile in material deprivation and the lowest profile in social deprivation, suggests that in the capital income and education are good, and the condition of households as well, in comparison with the rest of urban communities; this is a magnet for immigration and young seeking job and, in general, opportunities to ameliorate their standard of living; on the other hand, the social indicators, in particular SD2 (resident foreigners) and SD4 (single-person families) show bad scores, which could be linked each other, since frequently immigrants and young give birth to single-person families. As to

material deprivation, we have in the highest sector of the table (that is, urban communities better off) also two communities in the Central – South Argentina, and two near Buenos Aires. We can guess that the economic spillover of the capital influences the latter, while probably Ushuaia has a good position thanks to tourism and the large electronic factory. Gran Santa Fé is very well placed in both tables: here the influence of Buenos Aires is positive also with regard to social standard. Other urban communities (Batàn, Gran la Plata, Mar del Plata) are not far from the capital, but they receive the negative consequences of that: they are in the lowest sector of both tables. Gran San Juan, in the western part of the country, has the economy based on agriculture and mining, with negative effects on both type of deprivation.

5 | CONCLUSIONS

The deprivation concept has broadened the studies on poverty and inequality, fostering new research about the social and material inequality and its consequences. In general, each Argentinean urban area shows different levels of social and material deprivation, but, as seen in the last paragraph, areas particularly deprived from the material point of view may present low level of social deprivation, or vice-versa (Landi et al., 2018; Testi & Ivaldi, 2009; Mabughi & Selim, 2006). This gives rise to interlaced realities, where we can find different combination between “material” and “social” (Landi et al. 2018).

In this work we want to provide a picture, based on a non-aggregative approach, of the analysis of material and social deprivation that detects the disadvantages cases in the different areas of the country. Many agglomerations suffer from intense social, rather than material, deprivation. Observing the material dimension, in fact, the number of statistical units placed in a class that denotes severe deprivation is reduced. Without comparing the two types of deprivation, we can maintain that this finding urges on public authorities the implementation of public policies oriented to improve the social, rather than material, urban life. The difference between the level of material and social deprivation may be related to the economic cyclical growth occurred over time. In particular: the rise of industrial production, which boosted the growth of population in the big urban centres; the comparatively higher attention paid by many governments to material deprivation and their undervaluation of social issues; the public encouragement to economic performance, rather than to social well-being; the characteristics of economic growth in market economies, where economic progress does not always result in social progress (Ivaldi et al., 2018; Maggino, 2017; Yuan &

Wu, 2014; Schuurman et al., 2007; Stiglitz, 2007, 2012, 2015; Staford et al., 2003). A recent inquiry into poverty in urban Argentina in 2010-16[3]puts in evidence the social and material aspects of deprivation, in order to contribute to a wider political-academic debate on the importance of deepening the definition and measurement of poverty and inequality in the country (Salvia et al. 2017). The research group agrees on the importance of both monetary and non-monetary dimension. This intertemporal analysis is consistent with our explanation. Indeed, it reveals that an improvement took place in a set of structural dimensions and indicators, particularly in the access to basic services. The dimensions with more favourable evolution are deemed to be associated with the effects of countercyclical policies that became effective, among other aspects, in public investment in infrastructure and in the expansion of consumer-oriented credit. The investigators observe the necessity of establishing a multi-faceted typology of deprivation, which recognizes different levels of vulnerability and poverty, also expressed in the depth in which the poor experience the situation of poverty in the area of empowerment and rights.

To narrow the gap between the different areas, public authorities must profoundly change the priority's order in their agenda, putting at the first place the social issues, which need resolution very soon (Maggino 2015a-b; Salvia, 2015; Oxoby, 2009; Madge & Brown, 1982). In fact, hardly can the central and local authorities influence the indicators that define social deprivation; but this does not mean that the public sector must dismiss any possibility of intervention. In the different settlements, fine-tuning policies should be implemented to facilitate the participation of foreigners and lone and/or elder people to the social life. Public support to single-parent families should be provided, together with a set of policies to create opportunity of education in disadvantaged quarters and towns. Not only would these policies better the standard of living, but they would enhance also the quality of human capital and productivity. This feat is even more difficult since each statistical unit is connected to profiles that differ sharply from those associated with the other units. As a result, we deduce that deprivation is inherently different. The numerous cases of incomparability between statistical

[3] Documento de Investigaciòn POBREZA MULTIDIMENSIONAL EN LA ARGENTINA URBANA 2010-2016, Un ejercicio de aplicación de los métodos OPHI y CONEVAL al caso argentino, by Agustín Salvia, Juan Ignacio Bonfiglio, Julieta Vera, Fundación Universidad Católica Argentina, 2017. The investigators considered seven variables: 1) Sufficient feeding; 2) Health Coverage; 3) Basic Services; 4) Decent Housing; 5) Educational resources; 6) Affiliation to the social security system; and 7) Information resources. Interestingly, four variables out of seven (sufficient feeding; health coverage; decent housing; educational resources) are very near our choice.

units are due to the differences among the agglomerations; but, thanks to the identification and the severity function, it is possible to overcome this difficulty by acting directly on the linear extensions that are generated. This step allows us to determine the degree and deprivation intensity of each statistical unit, bypassing the previous standstill. However, most of the studies on deprivation, based on various statistical tools, consider no more than five, or six, indicators for each aspect (Arcagni et al., 2018; Fattore & Arcagni, 2018; Beycan & Suter, 2017; Della Queva, 2017; Annoni et al., 2017).

The methodology based on the construction of order structures reduce significantly the loss of information, keeping the focus on the primordial nature of the phenomena. For this reason, it is very useful when complex multidimensional analyses are to be carried out. The analysis shows the full compatibility between the methodology adopted and the phenomenon investigated. Even considering delicate case studies that require particular accuracy, the analysis through the "posetic" approach is robust and helps to give credibility to the entire system on which the research is based.

However, this study is not free from limitations. First, it must be paid attention to the mentioned ecological fallacy: in this case, urban communities are not representative of Argentinian population and, in general, urban and rural economic and social conditions are very different (Carr et al. 2002); moreover, we must take into account that most of native people live in the countryside, then they are excluded from all analyses centred on urban communities (Salvia et al., 2017). A few researches have shown that not only does area-level deprivation serve as an individual-level proxy when data are unavailable, but it has also its own impact (Hagedorn et al. 2016). Furthermore, the proposed methodology applies solely to the metropolitan urban case, particularly with regard to the choice of the indicators. In fact, some of them refer to social or economic conditions that are negative in an urban context, but not in a rural one (Bertin et al. 2014; Senior et al 2002;). Future works should concern the methodological and dynamic aspects of the indicators, to turn them into more and more helpful tools, go into the two domains (material and social) separately and expound the relation between them over time (Landi et al 2017; Norman 2010).

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APPENDIX

Table A1: the summary statistics of the basic indicators

Statistic COD	N	Mean	St. Dev.	Min	1st qu.	3rd qu.	Max
MD1	32	0,22	0,05	0.11	0.19	0.26	0.30
MD2	32	0,05	0.02	0.02	0.04	0.05	0.09
MD3	32	3,05	0.35	2.13	2.90	3.35	3.48
MD4	32	0,03	0.03	0.00	0.01	0.04	0.16
SD1	32	0,12	0.03	0.06	0.10	0.14	0.18
SD2	32	0,03	0.04	0.00	0.01	0.04	0.12
SD3	32	0,61	0.07	0.45	0.54	0.66	0.74
SD4	32	0,20	0.05	0.09	0.16	0.24	0.31

Table A2: coding of Argentina's urban agglomerations

COD	AGGLOMERATION
BBC	Bahía Blanca - Cerri
CBA	Ciudad de Bs As
CON	Concordia
COR	Corrientes
CRT	Cdro. Rivadavia - R.Tilly
FOR	Formosa
GCA	Gran Catamarca
GCO	Gran Córdoba
GLP	Gran La Plata
GME	Gran Mendoza
GPA	Gran Paraná
GRE	Gran Resistencia
GRO	Gran Rosario
GSF	Gran Santa Fé
GSJ	Gran San Juan
GTU	Gran Tucumán - T. Viejo
JUJ	Jujuy - Palpalá
LRI	La Rioja
MPB	Mar del Plata - Batán
NEU	Neuquén – Plottier
PAR	Partidos del GBA
POS	Posadas
RAW	Rawson – Trelew
RCU	Río Cuarto
RGA	Río Gallegos
SAL	Salta
SEB	S.del Estero - La Banda
SLU	San Luis - El Chorrillo
SNI	San Nicolás – Villa Constitución
SRT	Santa Rosa - Toay
URG	Ushuaia - Río Grande
VIE	Viedma – Carmen de Patagones

Table A3(a): average rank of material deprivation dimension

Material deprivation				
Agglomeration	**Average rank**	**Min**	**Max**	**Range**
BBC	21,74	27	15	12
CBA	1	1	1	0
CON	11,99	18	7	11
COR	18,09	32	4	28
CRT	11,99	18	7	11
FOR	22,88	28	15	13
GCA	14,36	27	6	21
GCO	5,17	9	4	5
GLP	29,38	32	22	10
GME	21,74	27	15	12
GPA	11,82	20	6	14
GRE	29,56	32	26	6
GRO	21,74	27	15	12
GSF	5,23	11	4	7
GSJ	27,95	32	16	16
GTU	29,56	32	26	6
JUJ	5,17	9	4	5
LRI	11,82	20	6	14
MPB	29,38	32	22	10
NEU	11,99	18	7	11
PAR	21,74	27	15	12
POR	21,74	27	15	12
RAW	11,99	18	7	11
RCU	11,99	18	7	11
RGA	3	3	3	0
SAL	14,36	27	6	21
SEB	29,56	32	26	6
SLU	14,09	27	5	22
SNI	21,74	27	15	12
SRT	11,46	20	5	15
URG	2	2	2	0
VIE	21,74	27	15	12
Average				11,1875

Table A3(b): average rank of social deprivation dimension

Social deprivation				
Agglomeration	**Average rank**	**Min**	**Max**	**Range**
GSF	1,72	12	1	11
CON	4,12	21	1	20
SRT	4,28	21	2	19

GCA	7,3	25	1	24
GRE	7,3	25	1	24
SEB	7,3	25	1	24
GTU	8	25	2	23
LRI	8	25	2	23
POS	8,76	27	2	25
RAW	14,71	29	3	26
GPA	14,71	29	3	26
RCU	14,71	29	3	26
SNI	14,71	29	3	26
MPB	14,71	29	3	26
VIE	14,71	29	3	26
GRO	14,71	29	3	26
NEU	19,03	31	3	28
RGA	19,03	31	3	28
URG	19,03	31	3	28
PAR	21,43	31	9	22
GME	21,71	32	5	27
SLU	21,71	32	5	27
GCO	21,83	32	6	26
GSJ	22,01	32	4	28
SAL	22,01	32	4	28
JUJ	22,01	32	4	28
COR	22,9	32	8	24
FOR	22,9	32	8	24
GLP	26,48	31	10	21
BBC	26,48	31	10	21
CRT	29,31	32	13	19
CBA	30,39	32	12	20
Average				24,19

Table A4: profiles

Material deprivation (a)		
Profile	**COD**	**Total units**
3333	CBA	1
3323	URG	1
2323	RGA	1
2322	GCO, JUJ	2
1323	GSF	1
2312	GCA, SAL	2
1322	CRT, CON, NEU, RAW, RCU	5
1223	SRT	1
2222	GPA, LRI	2
2113	COR	1

1222	BBC, GME, GRO, PAR, POR, SNI, VIE	7
1313	**SLU**	1
1312	FOR	1
1311	GSJ	1
1212	GRE, GTU, SEB	3
1122	GLP, MPB	2

Social deprivation (b)		
Profile	**COD**	**Total units**
2332	GSF	1
2331	SRT	1
3313	GCA, GRE, SEB	3
3322	CON	1
3222	POS	1
2322	GTU, LRI	2
3213	SAL, JUJ	2
2222	PAR	1
2231	RAW	1
3122	NEU, RGA, URG	3
2321	GCO	1
2312	COR, FOR	2
1322	GME, SLU	2
2122	CRT	1
1331	**GPA, RCU, SNI, MPB, VIE, GRO**	**6**
1313	GSJ	1
1231	GLP, BBC	2
1131	CBA	1