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Effects of the Covid Pandemic on the Economic Vulnerability of Italian Society

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Abstract

Abstract. This paper provides some insights on the effects of the Covid pandemic, on the economic vulnerability of Italian society. Data come from the first 5 waves of a special social survey, held by Bank of Italy, to monitor the economic consequences of the Covid emergency. Economic vulnerability is assessed through a set of four ordinal variables, then condensed into a synthetic measure, by using tools from Partial Order Theory; social groups are identified based on profiling socio-economic variables. Results reveal the heavy economic impact of the pandemic and the risk of increased polarization of the Italian society.

Keywords: Covid-19, Economic vulnerability, Italy.

JEL Classification: C43, C49, C63, I32.

1. Introduction and research question

Italy was the first European country to be hardly hit by the Covid-19 pandemic, in February 2020. The virus first spread in Lombardy and Veneto and then moved to the whole country, causing a national sanitary emergency and an unsustainable pressure on the health system. In response to that, the government imposed a lockdown of most social and economic activities, starting on March 9th to May 3rd 2020. Most of the population was constrained at home, schools were closed, many work activities were performed remotely, and sport activities were banned till the end of the first dramatic pandemic wave. As in the whole Europe, however, subsequent waves have been striking the country, with different intensities, leading the government to set further and various restrictions on citizens' behaviors, limiting personal movements, imposing distance teaching, reducing the activity of some economic

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sectors (e. g., entertainment, tourism, etc.). The admittedly impressive vaccination campaign held between 2021 and 2022 progressively led the country to (almost) normal life and currently (autumn 2022) Italy can be considered as an "open" country, although the virus is still circulating and there are still some concerns about the next months. To tackle the economic consequences of the pandemic on households and workers, the Italian government spent more than 18 billion euros, to sustain those who have been most hardly hit by the restrictions, although the effectiveness of such actions has been questioned, being based on criteria and official classifications of economic activities not completely aligned with the structure and the features of the Italian economic system. Notwithstanding the great effort made by the country, in 2020 the national GDP lost about 9% over the previous year, regaining part of the loss in 2021 (+6.6% over 2020), with critical consequences on many social groups (not to mention the negative effects on young people and students, whose social and economic impact will reveal next years). Although lessened by the contrasting actions taken at European level, economic difficulties have affected the entire Italian society and, what is even more relevant from the point of view of this paper, they are likely to have increased socio-economic polarization, hitting more fragile social groups in harder ways.

The goal of this paper is thus to provide some first insights on the economic consequences and the economic vulnerability induced by the pandemic in the Italian society, based on a special social survey held in 2020 and 2021, by the Bank of Italy, and composed of five waves (up to now) designed to monitor the dynamics of the economic conditions of the Italian population. As detailed in Section 3, the survey focuses on four ordinal variables describing the economic status of the observation units, which are stratified by social attributes that identify relevant social groups; we are particularly interested in finding the structural differences in the economic vulnerability of subpopulations, identifying possible divergences and sources of potential polarization triggered, or stressed, by the pandemic.

In addition to employing a new and up-to-date dataset, the paper aims to be innovative also from a data analysis and information synthesis point of view. As already mentioned, the evaluation exercise draws upon a system of four ordinal indicators of economic condition, that get condensed into a final synthetic measure of vulnerability. Involving ordinal inputs, this synthesis process cannot be pursued using "classical" aggregative tools for dimensionality reduction, which assume a quantitative and metric nature of the data. The evaluation process, instead, requires concepts and tools from the so-called Partial Order Theory, a branch of discrete mathematics designed to deal with order relations and ordered structures, that has been recently advocated as a key tool for the construction of a synthetic indicator (Comim, 2021; Comim and Hirai, 2022; Fattore and Maggino, 2015). Later in the paper, the main features of such a "partial order" approach will be outlined, without going into too many mathematical details, still providing the main ideas and motivations behind it, and its implementation in the evaluation of vulnerability.

The paper is organized as follows. Section 2 provides the theoretical framework and presents some review of the literature; Section 3 describes the data employed in the study; Section 4 briefly introduces the so-called "posetic" approach to socio-economic evaluation with multidimensional ordinal data; Section 5 presents and analyzes the main results and provides

the due comments; Section 6 concludes. For completeness purposes, a final Appendix reports various frequency distributions related to the input data.

2. Theoretical framework and literature review

Following the Covid-19 pandemic, the lockdown measures adopted almost everywhere in the world to limit the infection had important social and economic consequences on populations and socio-economic systems. In particular, the interruption of normal social, commercial and working activities changed individuals' and households' daily life and reduced the possibility for them to maintain their standard of living, often increasing their *economic vulnerability*. The scientific literature defines vulnerability as the broad concept of "future loss of welfare below socially accepted norms caused by risky events" (Alwang *et al*., 2001), derived from the triad of risk, response, and outcome (hereafter RRO). Risks are characterized by magnitude, frequency and duration; response to risk, on the other hand, depends on formal or informal means available to individuals and households. Finally, the magnitude, timing and duration of risks, combined with household' ability to respond, lead to the vulnerability outcome (Alwang *et al*., 2001).

In practice, in the economic literature the term is usually intended as the likelihood of moving to a state of poverty or deprivation, characterising subjects undergoing a risky event. Therefore, measuring economic vulnerability means identifying indicators and evaluating outcomes, like income reduction, wages, consumption and the like. Additionally, Coudouel *et al*. (2002), referring explicitly to economic vulnerability, observe that the risk of big changes in income may force households to reduce their investments in productive assets (when households need to hold cash reserves) and in human capital. High risk can also force individuals and households to diversify their sources of income. In this sense, vulnerability takes into account both exposure to risks and defencelessness against deprivation (Kamanou and Morduch, 2002; Naudé *et al*., 2009). By adopting the RRO framework, in this paper we define the economic vulnerability as the economic outcome after the risky event of Covid-19. The outcome is measured by the combination of income reduction, financial assets use to meet essential consumption expenses and the payment of the debts, recourse to forms of institutional income support and difficulty to pay mortgages. These four variables cover the whole range of economic vulnerability, both structural (income variation) and occasional (financial asset reduction), aggravated by structural debt (mortgage pay) and the need of occasional institutional aid (forms of income support). Indeed, relative to the recourse to institutional aid, these measures are generally intended to mitigate income reduction (Brunori *et al*., 2020; Gallo and Raitano, 2020); however, as described in Section 3, the question asked in this survey refers to income including all possible forms of institutional aid, so that the meaning of recourse to aid turns into the manifestation of a need.

The literature on the economic effects of the Covid-19 pandemic and of the impact of social distancing measures is abundant. Much international research shows that the COVID-19 pandemic has different impacts on various groups within the population (Bargain and Aminjonov, 2021; Qian and Fan, 2020), with poor, ethnic minorities, and other vulnerable groups more negatively affected by the pandemic (Kumar *et al*., 2021; Long *et al*., 2021). Re-

garding Italy, some recent empirical papers examine the social and economic consequences of the Covid-19 emergency. Most of them analyze its impact on the labour market (Bonacini *et al*., 2021; Brunetti *et al*. 2021; Carbonero and Scicchitano, 2021; Colussi, 2020; Del Boca *et al*., 2020; Fana *et al*., 2020), others concentrate on the social consequences of the lockdown (Auriemma and Iannaccone, 2020; Nugraha, 2021), but only a handful of papers focuses on income reduction and inequality and the effect of the Italian tax-benefit system on income support (Aina *et al*., 2020; Figari and Florio 2020; Gallo and Raitano, 2020). This so because of data shortcomings, since representative surveys on population incomes and living conditions are usually available about two years after the data collection has been completed. These studies have investigated the effects of the COVID-19 crisis on income distribution in Italy, by using microsimulations based on pre-Covid data, as in Gallo and Raitano (2020) who sued the 2017 wave of the Italian component of the EU-SILC survey, merged with administrative data from the National Institute for Social Security (INPS). Despite some interesting findings, such as a noticeable increase in income poverty and inequality, these studies generally limit their analyses to the effect of the pandemic on the deciles of the distribution of individuals' or households' income, without considering the characteristics of the observed populations.

As far as the present study is concerned, the most pertinent paper is that of Brunori *et al*. (2020) who adopted a microsimulation model based on the 2017 EUSILC survey, merged with data from the 2018 Labour Force Survey, to estimate the effect of the first lockdown on income distribution. The authors show a strong reduction of workers' income following two months of lockdown in Italy, in the absence of corrective actions. The authors also demonstrate that the effect of the lockdown on the distribution of household disposable income is less pronounced than for the gross income of individual workers, mainly because of progressive taxation and after taking account of the household size. The reduction in income is clearly stronger among poorer households that suffer the most substantial effects, when hit by unexpected economic shocks (Franzini *et al*., 2020) and increasing inequality and poverty. Moreover, it turns out that there are both generational effects, younger households being more affected by the economic consequence of the pandemic, and household structure effects, the impact of the lockdown being harder for couples with children, single-parents, and singles under age 65 (Brunori *et al*., 2020).

As far as we know, there are no other studies relating the economic effects of Covid-19 on social groups to their characteristics, such as the size of the area of residence, the household size or the socio-economic status.

3. The data

The study employs data from the Special Survey of Italian Household (SSIH) held by the Bank of Italy in 2020-2021 (Bank of Italy, 2020), instead of the standard surveys on household conditions, usually and periodically held by the national central bank. Due to the spread of the Covid-19 pandemic, in fact, Bank of Italy launched a survey, administered by using remote devices, to gather information on the economic situation and on the expectations of households during the pandemic crisis (at the time this paper is written, the survey has been conducted in

five waves, see Table 1). The dataset comprises both panel and cross-sectional components; in this initial study, we consider just the latter, with the main goal to assess, track and compare the economic vulnerability of social groups over the time span covered by the survey.

Table 1
TIME PERIOD, NUMBER OF OBSERVATIONS AND CORRESPONDING PERCENTAGES, FOR EACH SSIH WAVE

Wave	1	2	3	4	5
Period	April - May 2020	August - September 2020	November 2020	February - March 2021	April 2021
Observations	3079	2346	2077	2806	2489
Percentage	24.1%	18.3%	16,2%	21.9%	19.4%

Table 2
VARIABLES DESCRIBING THE ECONOMIC EFFECT OF THE COVID PANDEMIC ON THE RESPONDENTS

Economic variables	Description
Income variation	Due to the Covid pandemic, which has been the variation of your household income, in the last two months? 1.–Decreased more than 50%. 2.–Decreased between 25% and 50%". 3.–Decreased less than 25%". 4.–Unchanged or increased.
Income support	Did your household have access to forms of income support (CIG[a], NASpI[b], bonus for self-employed and professionals, Universal Basic Income, etc.)? 1.–Yes. 2.–No.
Mortgage	Due to the Covid- 19 emergency, is your household having difficulty paying the mortgage on your home? 1.–Yes, I have a mortgage on my home, and I am having difficulties. 2.–I don't have a mortgage on my home or I have a mortgage, but I am not having difficulties.
Precariousness	Maximum time of use of your household's financial assets (including cash, checking accounts, savings deposits, stocks and bonds and government bonds) to meet essential consumption expenses (e. g. food, heating, hygiene, etc.) and, possibly, the payment of debts: 1.–Less than 1 month. 2.–Less than 3 months. 3.–Less than 1 year. 4.–More than 1 year.

[a] Cassa Integrazione Guadagni (Earnings Redundancy Fund).

[b] Nuova Assicurazione Sociale per l'Impiego (unemployment benefit).

Economic vulnerability is measured based on four questions relative to (i) the impact on household income, (ii) the ability to meet essential consumption expenses –e. g. food, heating, hygiene...– using household's financial asset, including cash, checking accounts, savings deposits, stocks and government bonds, (iii) the need to have access to income support, and (iv) the difficulties in paying mortgage (see Table 2 for a detailed description of the variables, and Table A1 in the Appendix, for frequency distributions across the waves). In addition, as reported in full details in Table 3, statistical units are profiled in terms of various variables, which are likely to affect economic vulnerability, namely: (i) the geographic areas at the NUTS 1 (macro-regional) level, (ii) the demographic size of the municipality, (iii) the house-

hold size, (iv) the educational level of the head of the household, (v) his/her occupational status, and (vi) the economic situation before the pandemic (see Table A2 in the Appendix for frequency distributions across the waves).

Table 3
PROFILING VARIABLES EMPLOYED IN THE ANALYSIS

Profiling variable	Description
Geographic area	1.–North-West. 2.–North-East. 3.–Centre. 4.–South. 5.–Islands.
Municipality demographic size	1.–Less than 5,000 inhabitants. 2.–Between 5,000 and 10,000 inhabitants. 3.–Between 10,000 and 30,000 inhabitants. 4.–Between 30.000 and 100,000 inhabitants. 5.–More than 100,000 inhabitants.
Household size	1.–One member. 2.–Two members. 3.–Three or four members. 4.–Five or more members.
Educational level of head of household	1.–Up to lower secondary school. 2.–Upper secondary education. 3.–Tertiary education or more.
Householder's occupational status	1.–Dependent worker. 2.–Self-employed or professional. 3.–Unemployed. 4.–Retired or disabled. 5.–Student or other (e. g., housekeepers).
Pre-covid economic condition	Before the Covid-19 emergency, was the income available to your household enough to get through the month? 1.–With great difficulty. 2.–With difficulty. 3.–With some difficulty. 4.–Quite easily. 5.–Very easily.

Important remark. The first wave was somehow a "testing" step. It was carried out using three different interview techniques (Computer Assisted Telephonic Interviewing, Computer Assisted Web Interviewing, and interviews obtained through a remote connection device called "Dialogatore"), on samples of about 1,000 respondents each. In the absence of proper information for weighting data obtained with different techniques, the weight system was calibrated based on information from the National Italian Statistical Bureau (Istat) on the population classified by gender, age group, geographical area, educational qualification, and employment status. As a consequence, the reference population for the first wave is that of individuals aged 18 or over. From the second wave onward, the surveys were conducted via "Dialogatore" only, have households as statistical units and adopts a rotated sample, to ensure comparability over time from one wave to the following. The non-homogeneity of the first wave is statistically bothersome. However, this does not affect much the goal and the results of the paper, whose focus is on the different impact of the pandemic on different social groups, which can be still neatly and homogeneously identified across the waves. Therefore, we decided not to lose the information conveyed by first wave, exploiting as much as possible the cross-sectional component of the survey.

4. The posetic approach to socio-economic evaluation

In this section, we provide a brief outline of the so-called "posetic" approach to evaluation, a way of addressing the construction of synthetic indicators avoiding variable aggregation and thus particularly suitable when dealing with ordinal data. Given the applied nature of

the paper, we do not go into the mathematical and technical aspects of the approach, limiting ourselves to the very essentials; a more formal treatment of the posetic procedure can be found in Fattore *et al*. (2011), Fattore and Maggino (2015) and Fattore (2016).

4.1. Why partially ordered sets

The four variables concerning economic vulnerability considered in this paper, although numerically coded, are of an ordinal kind (see Table 2, in Section 3) and, when observed on a population, constitutes what is called an *ordinal multi-indicator system* (*ordinal MIS*, for short). Each unit in the MIS is represented by a set of four ordinal scores, i. e. by a *vulnerability profile* (see Table 4).

Table 4
FIRST 10 PROFILES OF THE ECONOMIC VULNERABILITY MULTI-INDICATOR SYSTEM (first SSIH wave)

Unit	Income variation	Income support	Mortgage	Precariousness
1	4	2	2	4
2	2	1	1	2
3	4	2	2	3
4	1	1	2	3
5	4	2	2	4
6	4	2	2	4
7	4	2	2	2
8	4	2	2	2
9	3	2	2	3
10	4	2	2	3

Although the scores of each variable carry a natural order, profiles in general cannot be ordered, due to the existence of so-called *conflicting scores*. For example, while unit 3 in Table 4 dominates (or has the same score of) unit 2 on each variable, and so can be considered as economically less vulnerable than it, unit 2 and unit 4 cannot be mutually ranked, since the first dominates the latter on "Income variation", but is dominated on "Mortgage" and "Precariousness". We thus say that unit 3 (componentwise) *dominates* unit 2 (in formulas, $u_2 < u_3$) and that unit 2 and unit 4 are *incomparable* (in formulas, $u_2 \,||\, u_4$). As a consequence, the population, i. e. the observed vulnerability profiles, can be only *partially* ordered (Davey and Priestley, 2001), resulting into a *partially ordered set*, or *poset* for short (more precisely, since the same profile can be observed more times in the population, the units constitutes a *quasi-ordered set*, but in the present informal presentation, we will not stress this mathematical distinction). Posets are thus the natural data structure associated to ordinal multi-indicator systems; they can be depicted through so called Hasse *diagrams*, as shown in Figures 1 and 2, where a small exemplificative poset and the poset associated to the set of all possible profiles built on the 4 vulnerability variables are depicted. Notice that the existence of incomparabilities between profiles should not be considered as due to a "lack of information", preventing units to be mutually ordered. Instead, it must be regarded as due to the existence of different

and intrinsically irreducible ways to be vulnerable, consistently with the nuanced and multi-faceted nature of this socio-economic construct.

In a posetic context, assessing the vulnerability degree of a statistical unit cannot be based on aggregating the scores of single profiles into some figure, e. g. using some weighted average (something that would be meaningless, in an ordinal setting); instead, vulnerability degrees must be computed taken into account the structure of the poset associated to the data, i. e. the "network" of comparabilities and incomparabilities among its elements. The following paragraph is meant to clarify and turn this statement into a concrete procedure.

4.2. The "evaluation" poset and the evaluation procedure

We now briefly illustrate the logic thread and the structure of the evaluation process, by introducing and commenting the steps that compose it. We avoid technical details, that can be found in the cited references, and focus on the essential ideas, to ease the interpretation of the application reported in Section 5.

4.2.1. *Setting the evaluation context*

The first step in view of the vulnerability evaluation is to define the *evaluation context*, i. e. the partially ordered set of profiles considered in the computations. This, in turn, requires identifying (i) the set of profiles to consider and (ii) the partial ordering criterion, that defines when two profiles can be compared. As to the second issue, as discussed in the previous paragraph, the component-wise criterion is the natural one (although other possibilities could be considered, when variables have different importance, as discussed in Fattore 2016). As to the first issue, one could naively consider just the observed profiles, i.e. the score configurations actually observed in the survey. This, however, would lose the information provided by the existence of other possible profiles that, although not observed, represent potential vulnerability configurations that "complete" the evaluation context. To realize why this completion is important for the evaluation exercise, suppose we observe just two profiles, namely $p_1 = 1112$ and $p_2 = 4221$. These profiles are incomparable and, without additional information, one cannot state whether one represents a more vulnerable configuration than the other. However, looking at the single scores, it is intuitive that p_2 is less vulnerable than p_1 so that, when a vulnerability degree $vln(\cdot)$ is finally associated to both, one expects $vln(p_2) < vln(p_1)$. Such intuition can be substantiated by noticing that when all possible vulnerability profiles are considered (see Figure 2), p_2 dominates much more profiles than p_1 and is almost at the top of the resulting poset, while p_1 is almost at the bottom. Only by considering the complete profile set, here partially ordered component-wise, it is thus possible to properly contextualize the evaluation process.

4.2.2. *From the evaluation context to the evaluation space*

Having set the evaluation context, however, is not sufficient to perform the evaluation process. As in classical procedures (e. g. poverty measurement) also in the posetic approach

the basic idea is to compare the vulnerability profiles with a "vulnerability threshold", identified as the "border" of vulnerability: profiles that are above the threshold are classified as non-vulnerable, those that are on or below it are classified as vulnerable. In a posetic context, however, the threshold need not be just a single profile (even if in the present paper it is, see Section 5), but may comprise a set of incomparable (to avoid redundancy) profiles. This is because at least in principle, in a multidimensional setting, there might be many different and incomparable ways to be vulnerable, each of which is expressed by a different profile in the threshold. When a threshold, i.e. a set of distinguished profiles, is selected, the evaluation context turns into the evaluation space and the evaluation process can be put to work.

Remark. As just described, the evaluation space is defined by the choice of (i) a set of profiles, (ii) a partial ordering rule and (iii) a threshold. These choices are up to the researcher and, in some sense, reflect and explicit his/her "point of view" on and the "criteria" assumed for the evaluation process.

4.2.3. *Vulnerability degree computation*

Evaluating vulnerability means attaching a vulnerability score to each profile in the evaluation space (and so to any statistical unit), so defining an evaluation function *vln*, defined on the component-wise partially ordered set of profiles, to the closed interval $[0,1]$. Function *vln* assigns vulnerability score 1 to all profiles below the threshold and score 0 to all profiles above it. In the input poset, however, there exist profiles that are incomparable with the elements of the threshold, so that they cannot be classified as below or above it. These profiles will be scored in the open interval $(0,1)$, i.e. they will be assigned a degree of vulnerability, in-between non-vulnerability (0) and full vulnerability (1). It is important to notice that here vulnerability scores do not measure vulnerability intensity, but assess to which extent profiles can be considered as vulnerable; in other words, they measure profiles' degrees of membership to the set of full vulnerable profiles (those on or below the threshold) in a fuzzy spirit, consistently with the nuanced nature of vulnerability, that hardly fits a black and white picture.

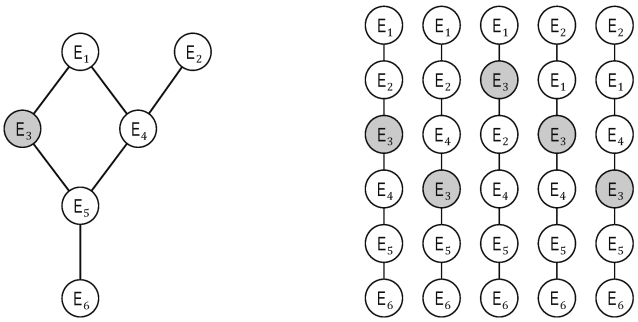
Avoiding mathematical details, that can be found in Fattore *et al*. (2011) and Fattore (2016), we now informally outline the idea behind the definition of function *vln*, which is based on the concept of *linear extensions* of a poset. The starting point is to view the evaluation poset as a partial ranking, establishing some dominances between profiles and leaving others indeterminate (incomparabilities). As a result, not all of the possible complete rankings of the profiles are "compatible" with it, but only those that "preserve" such dominances. These rankings are technically called *linear extensions*, since they are obtained from the input poset, turning incomparabilities into comparabilites, leaving the existing dominances unchanged (i.e. they are obtained by extending the set of dominances, in all possible ways, till no comparabilities are left). So, if $p_1 < p_2$ in the input poset, the same dominance holds in all of the linear extensions; if, however, $p_1 \,||\, p_2$, there are linear extensions where $p_1 < p_2$ and others where the opposite $p_2 < p_1$ is true. The fraction of linear extensions where $p_1 < p_2$ is called the *mutual ranking probability* of p_2 over $p1$ and is used as a measure of dominance

between the former and the latter. The vulnerability degree of a profile p is thus measured as the mutual ranking probability of the selected threshold over it. Notice that this definition is consistent with profiles above and below the threshold being assigned vulnerability scores equal to 0 and 1, respectively; notice also that the evaluation function is (weakly) anti-monotone, i.e. if $p_1 < p_2$ in the input poset, it holds $vln(p_2) \leq vln(p_1)$, i.e. the dominant profile cannot be scored more vulnerable than the dominated one. Finally, statistical units inherit the vulnerability score associated to their profiles and one can then proceed to compute various statistics on the surveyed sample.

4.2.4. *Toy example*

To better clarify the above concepts, we give below a toy example where computations can be illustrated graphically. The left panel in Figure 1 represents a partial order of six elements E_1,...,E_6 one of which, namely E_3, is selected as reference point, or threshold (for example, one may think of the elements as individuals partially ordered in terms of vulnerability and E_3 as a subject representing the least vulnerable among fully vulnerable individuals). On the right panel, the only five linear extensions of the poset on the left are given. These have been generated by linearly ordering in all possible ways the elements of the poset, under the constraint that if E_i is dominated by E_j in it, then E_i must be dominated by E_j also in each total order. This way, only five total orders out of $6! = 720$ permutations of the six elements are selected. As it can be directly checked, the initial dominances are all and only those common to the five linear orders, whose minimum is invariably E_6, i.e. the minimum of the poset, and whose maximum is either E_1 or E_2, i.e. the maximal elements of the poset. In all linear extensions, E_1 dominates E_3 which, in turn, always dominates E_5 and E_6; on the contrary, E_2 and E_4 dominate, or are dominated by, E_3 in some but not all the extensions. By counting the fraction of linear extensions where a given element is dominated by the threshold, the corresponding mutual ranking probability (and thus the "score") is obtained: E_1 -> 0; E_2 -> 0.2; E_3 -> 1; E_4 -> 0.6; E_5 -> 1; E_6 -> 1. Notwithstanding its simplicity, the example shows how the scoring procedure works and how it resolves the incomparabilities, differentiating the final scores.

Figure 1
LEFT PANEL: HASSE DIAGRAM OF A SIX-ELEMENT POSET, WITH THE "THRESHOLD" IN GREY; RIGHT PANEL: HASSE DIAGRAMS OF ALL OF ITS FIVE LINEAR EXTENSIONS



5. Economic vulnerability in Italy, during the pandemic

This is the core section of the paper, where the posetic approach is applied to the evaluation of vulnerability, based on the data described in Section 3. The goal is to evaluate the degrees of vulnerability of different social groups, tracking and comparing their evolution, over the first five survey waves. To this aim, we apply step by step the procedure previously outlined, enriching it with some further insights into the data, to capture other features of the impact of the Covid-19 pandemic in Italy.

5.1. Setting the evaluation space and computing the vulnerability scores

As described before, the first step of the posetic evaluation procedure is to build the evaluation context, i. e. the partially ordered set, hereafter called π, where we compare the vulnerability profiles. As reported in Table 3, two of the four economic variables used to describe the units' economic status during the pandemic are measured on a 4-degree scale (namely, "Income variation" and "Precariousness"), while the other two on a 2-degree scale (namely, "Income support" and "Mortgage"). As a consequence, π comprises $4 \times 4 \times 2 \times 2 = 64$ different profiles which are partially ordered component-wise, producing the Hasse diagram depicted in Figure 2.

The second step of the procedure is to turn the evaluation context π into the evaluation space π_τ, by specifying a vulnerability threshold τ, i. e. by selecting one (or possibly more than one) profile "on the edge" of vulnerability. Based on a preliminary analysis of the data, τ is here set to the profile 3222. Profiles dominated by τ are classified as "completely vulnerable", those dominating it as "completely non- vulnerable" and those incomparable with it as "partially vulnerable" (see Figure 3 and Table 5).

This threshold has been identified primarily based on the frequency distributions of the two variables "Income variation" and "Precariousness", by wave. Units affected by income reduction (>=25%) are 15.8%, on average, and those unable to meet essential consumption expenses within 3 months are 19.4%, on average. These results are in accordance with the latest data released by Eurostat (2022), for which the share of people at risk of poverty or social exclusion, in Italy, is 25.3% in 2020. Notice that the two other variables (referring to difficulties in paying the mortgage and to income support) enter the threshold with their maximum score, because they constitute aggravating factors for already precarious situations (notice that the income variable here considered includes any form of institutional support). As customarily in this kind of studies, the choice of the threshold is a critical step that involves some subjectivity that can be criticized by other scholars. We feel that our choice, in this evaluation exercise, is sufficiently well-grounded to be accepted as sensible. Notice that by selecting the threshold somehow based on the distribution of the input variables, we are here following a measurement approach to vulnerability evaluation which is halfway between a relative and an absolute one: the threshold is indeed relative to the population (in the spirit of relative measurement), but it is kept fixed across waves (in the spirit of absolute measurement).

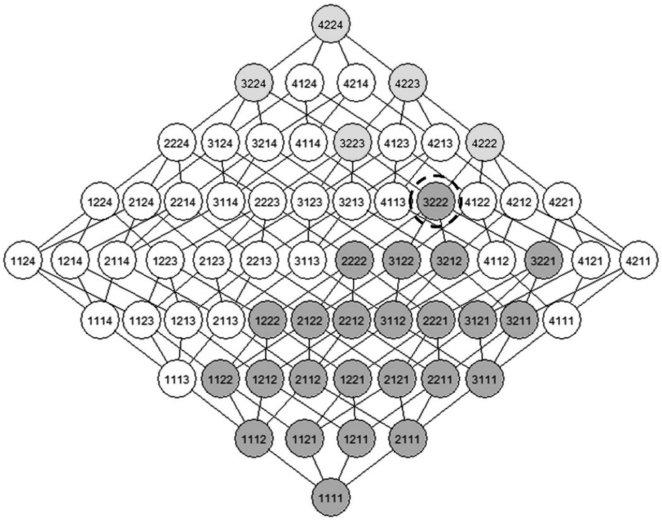
The third step in the evaluation procedure is to assign a vulnerability score to each profile in the evaluation space, i.e., by computing the *vln* function. In principle, this is achieved by the procedure described in Section 4, i.e. by computing all of the linear extensions of the input evaluation space and counting, for each profile, the fraction of linear orders where it is dominated by the threshold 3222; in formulas:

$$vln(p) = \frac{|\lambda \in \Omega: p < 3222|}{|\Omega(\pi)|} \tag{1}$$

where p is a profile of π, λ is a generic linear extension, $\Omega(\pi)$ is the set of all the linear extensions of π and $|S|$ denotes the cardinality of set S.

Figure 2
HASSE DIAGRAM OF THE EVALUATION POSET FOR THE VULNERABILITY INDICATOR SYSTEM

The diagram must be read from top to bottom, downward sequences of edges expressing the dominance between profile pairs. Profile 3222 (identified by the dotted circle) represents the vulnerability threshold; the set of completely vulnerable profiles is highlighted in dark grey; the set of completely non-vulnerable profiles is highlighted in light grey; partially vulnerable profiles are depicted in white and identify the "incomparability set" of the threshold.



In practice, the number of linear extensions of the poset depicted in Figure 2 is too large (indeed, it is greater than $(4! \times 8! \times 12!)^2 \times 14!$) for computations to be performed exactly and one must rely on approximations to the required mutual ranking probabilities. Here, we compute the precariousness degree on a subset of linear extensions, extracted through the algorithm of Bubley and Dyer (1999) that, to our knowledge, is the most efficient tool for sampling linear extensions, in an almost uniform way (computations have been performed using the freely available *R* package parsec, setting the "distance-to-uniformity" parameter to 10^{-3}). Table 5 reports the computed scores and Figure 3 provides a picture of the vulnera-

bility function. To get a more robust picture of the vulnerability distribution, the scores have been also divided into four intervals, from "non- or almost non-vulnerability", to "almost full or full-vulnerability", and the share of population for each interval has been computed, for the different waves (see Table 6). The share of "almost full or full vulnerable individuals" (score equal or greater than 0.9) is in accordance with the official statistics on vulnerable population (Eurostat 2020); interestingly, however, the fuzzy analysis developed with the posetic methodology shows that there are areas of partial, still non-negligible, vulnerability (e.g. with scores between 0.5 and 0.9), that are not detected by more standard crisp evaluation methodologies. For completeness's sake, Tables A4.1-A4.6 in the Appendix report the data, stratified by the socio-economic variables used in the paper.

The fourth step simply assigns vulnerability degrees to observed profiles. Notice that, considering the entire survey, all profiles in the evaluation poset get observed at least once, although in some waves a strict subset of them is recorded (wave 1: 63 profiles observed; wave 2: 62 profiles observed; wave 3: 59 profiles observed; wave 4 and 5: 64 profiles observed).

Once the datasets relative to each wave have been enriched with the vulnerability scores, one can proceed to the final synthesis, as illustrated in the next paragraph.

Table 5
VULNERABILITY SCORES OF THE UNITS' PROFILES (notice that profile 1113 and 2113 are assigned scores equal to 1, due to the approximation of the sampling procedure; indeed, the vulnerability score of 1113 is slightly higher than that of 2113, being dominated by it, and both are less than 1, although very close to it)

Units' profiles consist of the score sequence (Income variation; Income support; Mortgage; Precariousness); categories are provided by Table 3, while Table A3 in the Appendix reports the profile frequencies by waves.

Profile	1111	1112	1121	1211	2111	1113	1122	1212
Vln	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Profile	2112	1221	2121	2211	3111	1114	1123	1213
Vln	1.00	1.00	1.00	1.00	1.00	0.99	0.99	0.99
Profile	2113	1222	2122	2212	3112	2221	3121	3211
Vln	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Profile	4111	1124	1214	2114	1223	2123	2213	3113
Vln	0.99	0.95	0.95	0.98	0.92	0.97	0.97	0.99
Profile	2222	3122	3212	4112	3221	4121	4211	1224
Vln	1.00	1.00	1.00	0.99	1.00	0.96	0.96	0.47
Profile	2124	2214	3114	2223	3123	3213	4113	3222
Vln	0.64	0.64	0.82	0.50	0.72	0.72	0.82	1.00
Profile	4122	4212	4221	2224	3124	3214	4114	3223
Vln	0.65	0.65	0.47	0.07	0.20	0.20	0.34	0.00
Profile	4123	4213	4222	3224	4124	4214	4223	4224
Vln	0.20	0.19	0.00	0.00	0.02	0.02	0.00	0.00

Figure 3
GRAPH OF THE VULNERABILITY FUNCTION (profiles on the x-axis are sorted by increasing vulnerability score; profile labels have been omitted, for readability purposes)
Notice how the vulnerability scores of profiles incomparable with thethreshold are distributed in (0,1), capturing the nuances of the vulnerability construct.

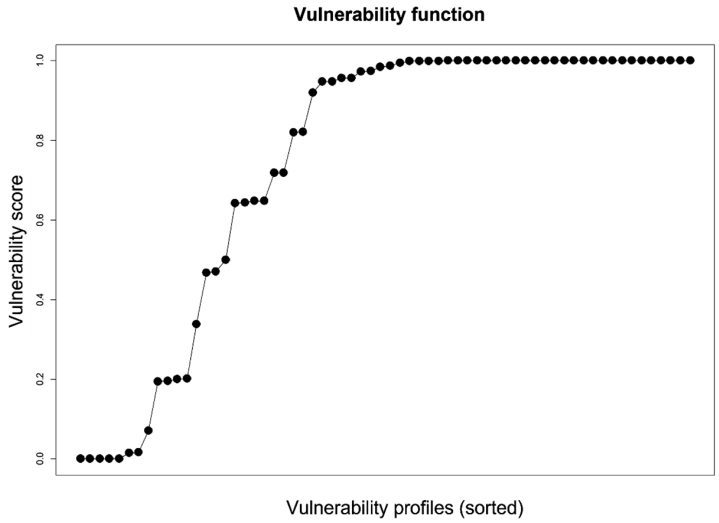


Table 6
FREQUENCY DISTRIBUTION (%) OF THE POPULATIONS ACROSS THE WAVES BY VULNERABILITY SCORE RANGES. IN WAVE 1 POPULATION REFERS TO PEOPLE AGED 18 OR OVER; FROM WAVE 2 ONWARD, IT REFERS TO HOUSEHOLDS

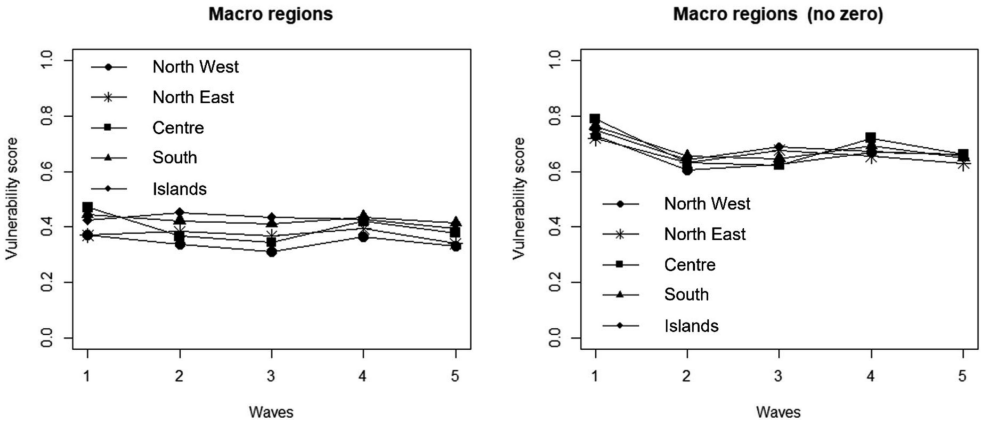
Wave	Vulnerability score				
	0.0 - 0.1[	0.1 - 0.5[	0.5 - 0.9[	0.9 - 1.0	Total
1	48.9	11.6	7.7	31.9	50,680,412
2	46.0	21.5	7.7	24.8	25,283,302
3	50.1	19.6	5.9	24.3	25,208,960
4	45.6	20.8	5.6	28.0	25,165,729
5	48.3	22.9	5.3	23.5	24,891,749

5.2. Results and interpretation

In the previous paragraph, the vulnerability map has been computed and profiles have been assigned synthetic vulnerability scores. After building the distribution of such scores over the population, obtained by assigning each statistical unit the score of the corresponding profile and taking sample weights into account, here we analyse the temporal evolution of the vulnerability of Italian social groups, over the five SSIH waves. In particular, we are interested in highlighting possible different economic impacts of the Covid-19 pandemic on different types of subjects and in checking whether the polarization of Italian society is

likely to increase, due to the different units‘ capability of resilience. To this goal, we split the statistical population into different strata, according to the variables described in Table 3, for each subgroup computing (i) the overall average vulnerability score and (ii) the average vulnerability score excluding completely non-vulnerable units (i.e., those units with score equal to 0). While the first average provides a general picture of the vulnerability level of each stratum, the second assesses to what extent units that suffer from some vulnerability issues can be classified as completely vulnerable, i.e., to what extent their vulnerability is "full". Overall, the data reveal a relevant impact of the pandemic on the economic status with a global vulnerability average of about 0.4. We also observe (see Figures 4-9) that the mean score of vulnerability, for all the adopted categorisations, is on average decreasing over time up to the third wave (November 2020), when a new increase of the scores is observed, due to the restrictive measures imposed with the Law Decree of October 7th 2020. Figure 4 splits the population by geographical areas, showing that this conditioning variable does not differentiate much the level and the dynamics of vulnerability, although the typical South-North Italian polarization somehow emerge, with greater impacts on units living in the South and in the Islands. The maximum vulnerability difference between regions is 0.124, between South and North-West (third wave); considering the mean score neat of non-vulnerable units, one notices that differences among areas are smaller and that the maximum difference (0.070) is between North-East and Centre (first wave).

Figure 4
MEAN VULNERABILITY SCORES (left panel) AND MEAN VULNERABILITY SCORES EXCLUDING COMPLETELY NON-VULNERABLE UNITS (right panel), BY MACRO REGION OF RESIDENCE, OVER THE FIVE SSIH WAVES



According to the mean score on the overall sample of Figure 5, smallest municipalities (≤ 5,000 inhabitants) report the maximum vulnerability all over the period, except for the first wave (here, some discrepancies may derive from the first wave referring to individuals and not to households). Again, the maximum distance is recorded in the third wave, between the largest municipalities (> 100,000 inhabitants) and the smallest ones. The mean score neat of zero-values shows how the maximum vulnerability is mainly found in municipalities of

≤ 5,000 and 5,000-10,000 inhabitants, while the minimum is found in municipalities either of 10,000-30,000 or of more than 100,000 inhabitants; differences among the scores are however very low, with the maximum (0.120) registered between the categories 10,000-30,000 and ≤ 5,000 in the fourth wave.

Figure 5
MEAN VULNERABILITY SCORES (left panel) AND MEAN VULNERABILITY SCORES EXCLUDING COMPLETELY NON-VULNERABLE UNITS (right panel), BY MUNICIPALITY SIZE, OVER THE FIVE SSIH WAVES

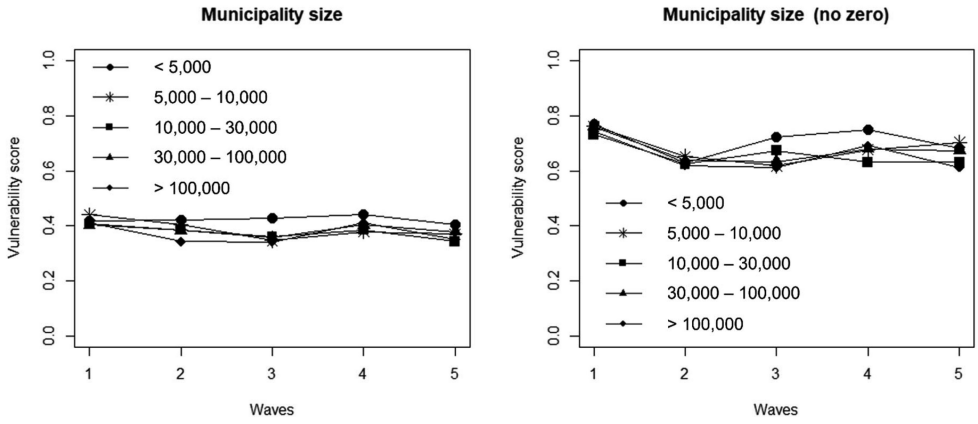
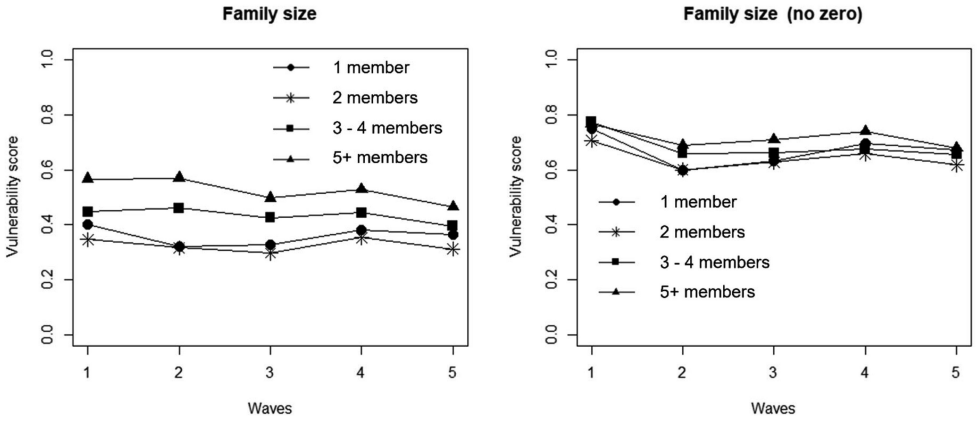


Figure 6
MEAN VULNERABILITY SCORES (left panel) AND MEAN VULNERABILITY SCORES EXCLUDING COMPLETELY NON-VULNERABLE UNITS (right panel), BY HOUSEHOLD SIZE, OVER THE FIVE SSIH WAVES

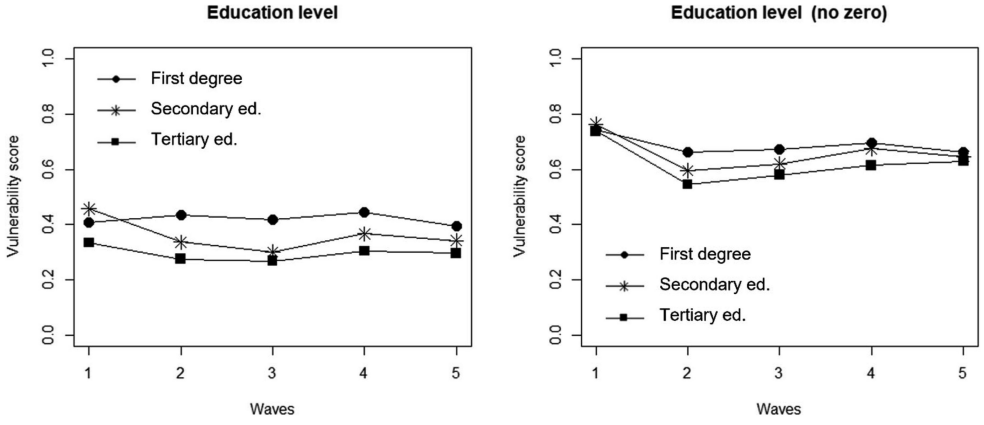


As should be clear from the above discussion and pictures, both residence area and municipality size do not split the subpopulations in a neat way. Some relevant differences first emerge when considering the dimension of the household (Figure 6). Indeed, the mean vul-

nerability score increases as household size increases, however the largest differences are observed between two-member households and the larger ones (mostly due to the presence of at least one child in the majority of cases). Households with two members report the lowest vulnerability, most probably due to two-income couples. In this regard, the analyses of Figari and Florio (2020) demonstrate the importance of the income of other household members in determining the economic resilience of those affected by the lockdown. Over time, the gap between the most vulnerable (5 members or more) and the least ones (two members) decreases. Non-zero mean vulnerability scores highlight the increase of vulnerability of singles, from the third wave on; this may be linked to the persistence of the effects of the pandemic over time on one-income households. Comparing overall and "no zero" scores shows how the temporal trajectories of the first ones are more differentiated than those of the second ones. This suggests that (mainly) two-members households tend to be strongly protected from vulnerability.

A similar differentiating effect can be seen also in Figure 7, where the population is split by educational level, that is here used as a proxy for the socio-economic status of the household, in absence of information about the educational level and occupational status of the other members. As expected, the higher the socio-economic status, the more households are protected from economic vulnerability: the largest gap between the scores is observed from the first level of education (up to lower secondary school) to secondary education. Non-zero mean scores show a certain convergence over time, mainly between the two lower levels.

Figure 7
MEAN VULNERABILITY SCORES (left panel) AND MEAN VULNERABILITY SCORES EXCLUDING COMPLETELY NON-VULNERABLE UNITS (right panel), BY EDUCATION LEVEL, OVER THE FIVE SSIH WAVES



A significantly higher polarization effect is revealed by considering the occupational status of the respondent, the lower vulnerability being recorded for retired or disabled while the highest vulnerability is that observed among unemployed and self-employed or independent workers (see Figure 8). The gap between these two categories increases over time. It is also interesting to observe an increase of all the mean scores in the fourth wave, in correspond-

ence with the tightening of the containment measures of the pandemic on early March 2021. "No-zero" mean scores highlight the vulnerability of students (or other condition), that become the most vulnerable group, together with the unoccupied, since the third wave.

Figure 8
MEAN VULNERABILITY SCORES (left panel) AND MEAN VULNERABILITY SCORES EXCLUDING COMPLETELY NON-VULNERABLE UNITS (right panel), BY OCCUPATIONAL STATUS, OVER THE FIVE SSIH WAVES

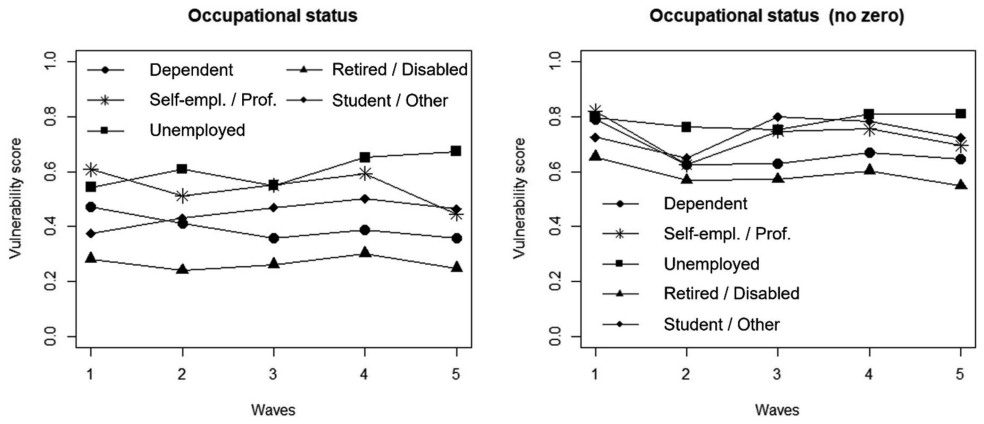
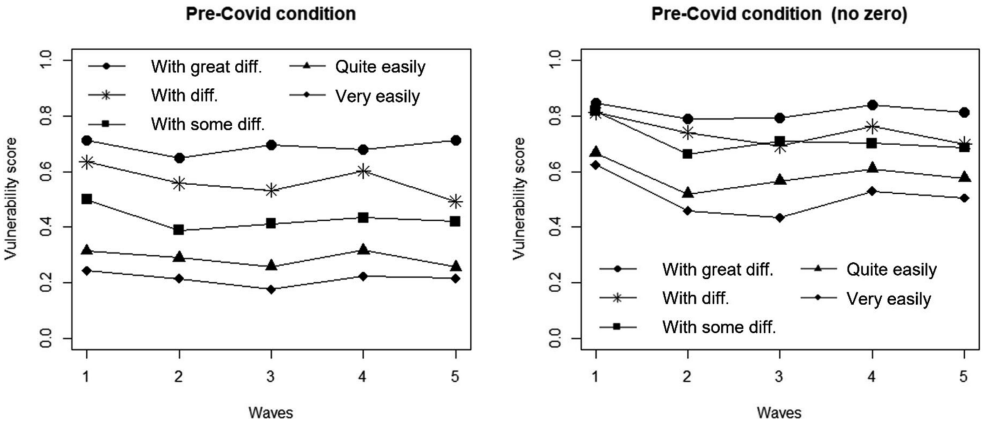


Figure 9
MEAN VULNERABILITY SCORES (left panel) AND MEAN VULNERABILITY SCORES EXCLUDING COMPLETELY NON-VULNERABLE UNITS (right panel), BY PRE-COVID CONDITION, OVER THE FIVE SSIH WAVES



Finally, we analyze vulnerability by considering the economic condition before the Covid-19 pandemic. As can be seen in Figure 9, the differentiating effect is here quite strong, even in terms of "no-zero" scores. According to both overall and "no-zero" mean scores, vulnerability is higher for those suffering economic difficulties before the Covid-19 emergency. How-

ever, the "no-zero" means show a shorter distance between the two intermediate categories, "With difficulty" and "With some difficulty".

Two points should therefore be stressed. First, there is a clear impact of the three interventions of restrictions imposed by the Italian Government on the trend of both scores (overall scores and "no-zero" scores), corresponding to the first wave (which captures the effects of the lockdown established by the decrees[1] of the Italian Government, on 8-9 March 2020), the third wave (which detects the effects of the restored restrictive measures, previously relaxed by the end of April, introduced, after the rise in the contagion curve, by a new decree[2] of the Prime Minister), and the fourth wave (which captures the tightening of containment measures, namely moving between regions, implemented by the decree of the Government, on 2 March 2021). Second, the effect of zero vulnerability units appears relevant with regard to the two contextual variables, geographical area and municipality size, revealing the existence of a certain degree of spatial economic inequality among the areas (the non-zero mean scores for the Islands is in line with the value of the North-East) and municipalities (the distance between the least and the most vulnerable municipalities is greater with non-zero scores). As far as their characteristics are concerned, the impact of non-vulnerable units is visible among singles, who, from the third wave on become more vulnerable, possibly due to the persistence of the effect of the pandemic over time on the one-income households. By excluding the non-vulnerable units, the existence of a vulnerable component among students (or other status) emerges also more neatly.

Finally, concerning the polarization induces by the pandemic, it is clear, looking at the scores and the Figures, that "human capital" (measured via the educational level and the occupational status) has the strongest protective effect, together with the size of the household. This is true also for the pre-Covid condition that, however, is likely to be highly correlated with the factors previously mentioned.

6. Conclusions

In this paper, we have presented some first insights on the effects of the Covid-19 pandemic on the economic vulnerability of the Italian society, using data from the first five waves of a special survey held by Bank of Italy between April 2020 and April 2021. Data have been processed using novel statistical tools, based on Partial Order Theory and particularly suitable for treating multi-dimensional ordinal indicator systems. A synthetic indicator of economic vulnerability has been worked out and its evolution over time has been tracked, for different social groups.

Italy was the first European country to be heavily hit by the pandemic, in the 2020 winter and spring; the restriction actions taken by the government heavily affected the socio-economic life of individuals, households and workers, worsening the economic condition of a significant part of the population. More importantly, as previous literature has shown (Aina *et al*, 2021; Carta and de Filippis, 2021), the pandemic is likely to have increased the polarization of Italian society, hitting in different ways different social groups and possibly triggering divergences in their socio-economic trajectories.

As reported in the main text, subjects with a lower level of human capital, and belonging to larger households, have suffered from harder consequences, than those with higher education levels and better job positions. This could be expected, as the degree of resilience is strongly correlated with the ability to face unexpected events, in an adaptive way.

According to Carta and De Filippis (2021) lockdown measures affected most the poorer units, as members of lower income households were more likely to be employed in non-essential sectors and to have, on average, fewer possibilities to work from home. Specifically, Bonacini *et al*. (2020) show that an increase in the opportunity to work from home would favor male, older, high-educated, and high-paid employees. It is also noteworthy that retired people have been the least hit by the pandemic (from an economic point of view), their income being protected by the state. This result agrees with previous literature (Brunori *et al*., 2020), confirming that Italian society is more favourable to elderly people than not to the younger individuals.

The socio-economic consequences of the pandemic are certainly deeper than what the data used here can reveal and only when new statistical information is available, will it be possible to realize and assess them. In particular, the effects on younger people and students, who suffered from distance schooling, as well as of other social discomforts, will show up over time and could not be captured by the present analysis. This stresses the need for a continuous and reliable monitoring of socio-economic dynamics, to better evaluate the impact of the pandemic on Italian society and make relevant policy recommendations. As mentioned in the paper, of great concern is the possible increase of social polarization, given the growing fragmentation that the Italian social tissue has been showing in the last 20 years.

Appendix

Table A1
FREQUENCY DISTRIBUTION (%) OF THE ECONOMIC VARIABLES OF THE SAMPLES[a] ACROSS THE WAVES

Economic variables	Wave				
	1	2	3	4	5
Income variation					
Decreased more than 50%	14.2	5.3	5.1	5.6	5.8
Decreased between 25% and 50%	18.5	8.3	6.8	9.2	8.4
Decreased less than 25%	18.0	17.0	15.5	17.0	16.8
Unchanged or increased	49.3	69.4	72.6	68.2	69.0
Income support					
Yes	24.3	37.9	26.0	28.3	23.2
No	75.7	62.1	74.0	71.7	76.8
Mortgage					
Yes, I have a mortgage on my home, and I am having difficulties	12.8	6.3	9.3	8.5	8.6
I don't have a mortgage on my home, or I have a mortgage, but I am not having difficulties	87.2	93.7	90.7	91.5	91.4
Precariousness					
Less than 1 month	17.0	27.8	28.9	30.5	29.6
Less than 3 months	19.9	18.9	22.4	22.7	20.2
Less than 1 year	28.4	17.9	12.0	13.4	15.1
More than 1 year	34.8	35.5	36.7	33.4	35.1
Total	3,079	2,346	2,077	2,806	2,489

[a] Sample of wave 1 refers to people aged 18 or over; from wave 2 onward, sample refers to households.

Table A2
FREQUENCY DISTRIBUTION (%) OF THE PROFILING VARIABLES OF THE SAMPLES[a] EMPLOYED IN THE ANALYSIS ACROSS THE WAVES

Profiling variables	Wave				
	1	2	3	4	5
Geographical area					
North-West	27.7	28.7	28.8	28.1	28.0
North-east	19.6	18.8	18.4	18.9	19.0
Centre	19.5	19.5	19.5	19.1	19.2
South	21.9	19.2	19.5	20.5	20.4
Islands	11.3	13.9	13.8	13.4	13.3
Municipality demographic size					
Less than 5,000 inhabitants	14.1	14.3	14.3	14.6	14.3
Between 5,000 and 10,000 inh.	13.9	14.5	15.1	14.0	13.4
Between 10,000 and 30,000 inh.	22.9	25.0	25.0	24.8	25.2
Between 30.000 and 100,000 inh.	23.1	21.6	21.2	22.0	21.6
Greater than 100,000 inhabitants	26.0	24.6	24.4	24.7	25.5

(Continued)

Profiling variables	Wave				
	1	2	3	4	5
Household size					
One member	17.0	16.8	16.9	17.4	18.0
Two members	32.2	29.9	30.2	29.3	29.4
Three or four members	45.4	45.9	45.3	46.2	45.7
Five or more members	5.36	7.42	7.56	7.09	6.95
Householder's education					
Up to lower secondary school	35.8	46.7	47.2	41.2	40.7
Upper secondary education	47.2	36.5	36.1	40.4	40.7
Tertiary education or over	17.0	16.8	16.7	18.5	18.6
Householder's occupational status					
Dependent worker	36.4	44.1	43.5	47.1	51.1
Self-employed or professional	7.8	11.2	10.2	10.8	13.8
Unemployed	11.9	9.3	8.4	8.8	7.6
Retired or disabled	33.0	30.1	33.0	28.6	24.4
Student or other (e. g., housekeep.)	10.8	5.3	4.9	4.6	3.1
Pre-covid condition					
With great difficulty	3.9	7.6	6.0	5.8	5.7
With difficulty	8.9	13.0	11.3	10.3	11.4
With some difficulty	35.3	33.6	33.2	31.9	32.4
Quite easily	34.4	30.5	32.3	35.1	33.9
Very easily	17.6	15.2	17.2	16.9	16.5
Total	3,079	2,346	2,077	2,806	2,489

[a] Sample of wave 1 refers to people aged 18 or over; from wave 2 onward, sample refers to households.

Table A3
FREQUENCY DISTRIBUTION (%) OF THE PROFILES IN THE POPULATIONA ACROSS THE WAVES

Profiles	Wave				
	1	2	3	4	5
1111	0.59	0.17	0.23	0.27	0.22
1112	0.81	0.17	0.19	0.18	0.05
1113	0.86	0.08	0.00	0.04	0.26
1114	0.14	0.03	0.10	0.05	0.05
1121	0.95	0.59	0.58	0.67	1.02
1122	2.25	0.78	0.20	0.95	0.66
1123	1.81	0.57	0.09	0.10	0.13
1124	0.88	0.61	0.17	0.50	0.37
1211	0.64	0.14	0.49	0.06	0.29
1212	0.53	0.00	0.19	0.08	0.12
1213	0.36	0.16	0.16	0.16	0.05
1214	0.09	0.03	0.00	0.07	0.06
1221	0.97	0.77	1.17	1.15	1.16
1222	1.19	0.41	0.49	0.28	1.03
1223	1.78	0.29	0.26	0.28	0.11

(Continued)

Profiles	Wave				
	1	2	3	4	5
1224	1.03	0.70	0.63	0.64	0.72
2111	0.45	0.29	0.30	0.23	0.28
2112	0.89	0.01	0.20	0.43	0.16
2113	1.02	0.14	0.08	0.09	0.13
2114	0.21	0.11	0.14	0.06	0.09
2121	0.66	1.30	0.44	1.01	0.79
2122	1.20	0.53	0.27	0.77	0.54
2123	1.87	1.05	0.43	0.58	0.58
2124	1.35	1.38	0.53	1.05	1.05
2211	0.26	0.10	0.19	0.49	0.19
2212	1.19	0.05	0.15	0.19	0.44
2213	0.74	0.04	0.00	0.14	0.20
2214	0.18	0.00	0.00	0.13	0.12
2221	1.16	1.17	1.50	1.42	0.90
2222	1.75	0.36	0.68	1.11	0.92
2223	2.64	0.35	0.56	0.46	0.76
2224	2.36	0.81	0.94	0.93	0.68
3111	0.09	0.38	0.41	0.33	0.17
3112	0.16	0.38	0.22	0.36	0.22
3113	0.38	0.29	0.08	0.11	0.07
3114	0.13	0.11	0.03	0.10	0.03
3121	0.49	1.66	1.27	1.65	1.11
3122	0.80	1.81	0.85	1.07	0.82
3123	1.47	1.84	0.82	0.71	0.63
3124	1.32	2.48	1.42	1.32	1.27
3211	0.32	0.30	0.41	0.33	0.55
3212	0.49	0.28	0.26	0.46	0.26
3213	0.93	0.20	0.00	0.10	0.18
3214	0.06	0.09	0.05	0.09	0.14
3221	1.42	1.75	2.94	3.07	2.82
3222	1.35	1.43	2.09	2.96	2.22
3223	3.33	1.32	1.13	1.47	1.61
3224	5.20	1.65	2.76	1.89	3.69
4111	0.08	0.10	0.31	0.30	0.17
4112	0.21	0.32	0.60	0.44	0.35
4113	0.07	0.09	0.41	0.13	0.12
4114	0.00	0.07	0.38	0.03	0.11
4121	0.50	5.43	4.83	4.75	3.34
4122	0.66	3.49	2.87	2.41	1.68
4123	0.77	2.91	1.72	1.87	1.51
4124	1.23	5.43	4.56	3.32	3.08
4211	0.33	0.71	1.31	0.80	0.65
4212	0.26	0.27	0.69	0.48	0.71
4213	0.17	0.31	0.21	0.20	0.58
4214	0.31	0.30	0.53	0.46	0.51
4221	8.23	14.94	15.23	16.69	18.57
4222	7.50	9.30	12.33	10.79	9.22
4223	11.05	6.78	5.50	5.58	7.42
4224	17.88	20.40	22.39	21.19	22.08
Total population/households	50,680,412	25,283,302	25,208,960	25,165,729	24,891,749

[a] In wave 1 population refers to people aged 18 or over; from wave 2 onward, it refers to households.

Table A4.1
FREQUENCY DISTRIBUTION (%) OF THE POPULATIONS[a] ACROSS THE WAVES BY VULNERABILITY SCORE RANGES AND STRATIFICATION VARIABLE "GEOGRAPHIC AREA"

		Wave				
		1	**2**	**3**	**4**	**5**
North-West	0.0 - 0.1[	53.9	52.0	56.8	51.1	53.6
	0.1 - 0.5[	10.5	19.6	16.6	18.7	19.6
	0.5 - 0.9[	6.7	6.8	5.9	5.1	6.0
	0.9 - 1.0	28.9	21.6	20.8	25.1	20.8
	Total	13,737,940	7,396,177	7,343,299	7,314,982	7,258,268
North-East	0.0 - 0.1[	53.2	46.4	52.1	45.6	51.3
	0.1 - 0.5[	13.1	20.1	15.3	21.9	22.3
	0.5 - 0.9[	5.3	8.9	7.2	6.4	4.1
	0.9 - 1.0	28.5	24.6	25.4	26.0	22.3
	Total	9,600,938	5,006,160	4,989,863	4,946,578	4,879,919
Centre	0.0 - 0.1[	42.8	49.5	52.6	45.4	48.7
	0.1 - 0.5[	10.2	18.0	17.7	17.5	18.5
	0.5 - 0.9[	10.8	7.2	6.6	5.3	6.8
	0.9 - 1.0	36.1	25.3	23.1	31.8	26.0
	Total	10,143,069	5,094,082	5,122,107	4,948,254	4,878,950
South	0.0 - 0.1[	45.5	39.8	41.9	41.1	40.3
	0.1 - 0.5[	11.9	25.2	26.5	21.9	28.6
	0.5 - 0.9[	8.3	8.9	5.2	6.3	5.5
	0.9 - 1.0	34.2	26.1	26.4	30.7	25.6
	Total	11,158,325	4,399,372	4,403,247	4,613,984	4,511,797
Islands	0.0 - 0.1[	47.1	35.2	39.7	40.3	42.7
	0.1 - 0.5[	13.4	28.1	26.9	27.3	29.7
	0.5 - 0.9[	7.2	7.4	4.0	4.8	2.9
	0.9 - 1.0	32.3	29.4	29.4	27.6	24.7
	Total	6,040,141	3,387,511	3,350,444	3,341,931	3,362,815
Total	0.0 - 0.1[	48.9	46.0	50.1	45.6	48.3
	0.1 - 0.5[	11.6	21.5	19.6	20.8	22.9
	0.5 - 0.9[	7.7	7.7	5.9	5.6	5.3
	0.9 - 1.0	31.9	24.8	24.3	28.0	23.5
	Total	50,680,412	25,283,302	25,208,960	25,165,729	24,891,749

[a] In wave 1 population refers to people aged 18 or over; from wave 2 onward, it refers to households.

Table A4.2
FREQUENCY DISTRIBUTION (%) OF THE POPULATIONS[a] ACROSS THE WAVES BY VULNERABILITY SCORE RANGES AND STRATIFICATION VARIABLE "MUNICIPALITY DEMOGRAPHIC SIZE"

		Wave				
		1	**2**	**3**	**4**	**5**
<= 5,000	0.0 - 0.1[	48.3	40.0	43.9	43.8	44.3
	0.1 - 0.5[	12.0	23.6	17.8	17.2	23.4
	0.5 - 0.9[	6.5	8.7	8.0	5.3	4.7
	0.9 - 1.0	33.2	27.7	30.3	33.8	27.7
	Total	7,471,574	3,643,189	3,648,825	3,737,600	3,776,171
5,000 - 10,000	0.0 - 0.1[	45.3	43.0	49.2	48.2	49.1
	0.1 - 0.5[	13.0	22.7	24.1	21.6	23.0
	0.5 - 0.9[	7.9	8.2	5.4	4.6	2.5
	0.9 - 1.0	33.8	26.1	21.2	25.6	25.4
	Total	7,318,423	3,687,332	3,671,025	3,545,878	3,470,167
10,000 - 30,000	0.0 - 0.1[	50.5	45.1	51.8	45.9	50.8
	0.1 - 0.5[	10.4	21.5	17.4	23.1	22.4
	0.5 - 0.9[	7.2	10.4	5.5	5.1	6.0
	0.9 - 1.0	31.9	23.0	25.3	25.9	20.9
	Total	11,379,304	6,124,642	6,186,155	6,052,390	6,107,189
30,000 - 100,000	0.0 - 0.1[	49.9	45.7	50.2	44.9	46.6
	0.1 - 0.5[	12.2	22.2	20.2	22.9	23.3
	0.5 - 0.9[	7.0	6.6	6.5	5.1	5.2
	0.9 - 1.0	30.9	25.5	23.1	27.2	24.8
	Total	11,338,313	5,411,435	5,304,000	5,425,759	5,245,467
> 100,000	0.0 - 0.1[	48.9	52.2	52.5	45.7	49.3
	0.1 - 0.5[	11.1	19.0	19.8	18.7	22.7
	0.5 - 0.9[	9.2	5.3	4.9	7.1	6.6
	0.9 - 1.0	30.7	23.5	22.7	28.5	21.5
	Total	13,172,797	6,416,705	6,398,955	6,404,102	6,292,754
Total	0.0 - 0.1[	48.9	46.0	50.1	45.6	48.3
	0.1 - 0.5[	11.6	21.5	19.6	20.8	22.9
	0.5 - 0.9[	7.7	7.7	5.9	5.6	5.3
	0.9 - 1.0	31.9	24.8	24.3	28.0	23.5
	Total	50,680,412	25,283,302	25,208,960	25,165,729	24,891,749

[a] In wave 1 population refers to people aged 18 or over; from wave 2 onward, it refers to households.

Table A4.3
FREQUENCY DISTRIBUTION (%) OF THE POPULATIONS[a] ACROSS THE WAVES BY VULNERABILITY SCORE RANGES AND STRATIFICATION VARIABLE "HOUSEHOLD SIZE"

		Wave				
		1	**2**	**3**	**4**	**5**
1	0.0 - 0.1[	49.9	52.1	53.4	49.0	49.5
	0.1 - 0.5[	14.6	23.1	21.4	20.4	22.0
	0.5 - 0.9[	3.9	6.4	5.5	3.6	5.0
	0.9 - 1.0	31.5	18.4	19.8	27.0	23.6
	Total	9,709,182	7,910,366	7,865,790	7,893,257	7,754,517
2	0.0 - 0.1[	56.0	53.4	57.4	50.4	53.5
	0.1 - 0.5[	12.9	21.6	19.5	22.4	24.5
	0.5 - 0.9[	5.2	5.5	4.6	4.0	3.6
	0.9 - 1.0	26.0	19.5	18.5	23.3	18.3
	Total	15,396,575	7,175,097	7,163,961	7,237,883	7,169,939
3-4	0.0 - 0.1[	45.8	38.1	43.4	40.7	44.8
	0.1 - 0.5[	9.4	19.6	19.1	20.4	22.1
	0.5 - 0.9[	9.5	10.1	7.0	7.3	7.0
	0.9 - 1.0	35.2	32.2	30.5	31.5	26.0
	Total	22,986,101	8,696,141	8,547,343	8,604,064	8,498,235
5+	0.0 - 0.1[	29.4	24.4	37.7	32.8	36.5
	0.1 - 0.5[	11.7	23.5	14.8	18.0	24.2
	0.5 - 0.9[	20.3	11.4	8.3	13.3	5.1
	0.9 - 1.0	38.6	40.8	39.2	35.9	34.3
	Total	2,588,554	1,501,698	1,631,866	1,430,525	1,469,058
Total	0.0 - 0.1[	48.9	46.0	50.1	45.6	48.3
	0.1 - 0.5[	11.6	21.5	19.6	20.8	22.9
	0.5 - 0.9[	7.7	7.7	5.9	5.6	5.3
	0.9 - 1.0	31.9	24.8	24.3	28.0	23.5
	Total	50,680,412	25,283,302	25,208,960	25,165,729	24,891,749

[a] In wave 1 population refers to people aged 18 or over; from wave 2 onward, it refers to households.

Table A4.4
FREQUENCY DISTRIBUTION (%) OF THE POPULATIONS[a] ACROSS THE WAVES BY VULNERABILITY SCORE RANGES AND STRATIFICATION VARIABLE "HOUSEHOLDER'S EDUCATIONAL LEVEL"

		Wave				
		1	**2**	**3**	**4**	**5**
Up to lower secondary school	0.0 - 0.1[	48.7	39.0	43.0	40.0	43.4
	0.1 - 0.5[	14.2	25.2	22.4	23.9	26.9
	0.5 - 0.9[	6.1	7.4	6.0	5.2	4.5
	0.9 - 1.0	31.0	28.3	28.6	30.9	25.2
	Total	24,520,516	14,272,915	14,220,980	14,274,834	14,107,833
Secondary education	0.0 - 0.1[	44.5	53.2	57.5	50.6	52.9
	0.1 - 0.5[	10.3	16.5	17.0	17.4	18.1
	0.5 - 0.9[	9.6	8.0	5.9	6.6	6.5
	0.9 - 1.0	35.6	22.4	19.5	25.5	22.5
	Total	18,276,164	7,446,569	7,442,394	7,399,209	7,342,884
Tertiary ed. or over	0.0 - 0.1[	59.4	58.9	63.2	58.1	58.7
	0.1 - 0.5[	6.6	17.2	13.9	15.7	16.8
	0.5 - 0.9[	8.0	8.3	5.7	5.0	5.7
	0.9 - 1.0	26.0	15.6	17.2	21.2	18.9
	Total	7,883,732	3,563,818	3,545,586	3,491,687	3,441,032
Total	0.0 - 0.1[	48.9	46.0	50.1	45.6	48.3
	0.1 - 0.5[	11.6	21.5	19.6	20.8	22.9
	0.5 - 0.9[	7.7	7.7	5.9	5.6	5.3
	0.9 - 1.0	31.9	24.8	24.3	28.0	23.5
	Total	50,680,412	25,283,302	25,208,960	25,165,729	24,891,749

[a] In wave 1 population refers to people aged 18 or over; from wave 2 onward, it refers to households.

Table A4.5
FREQUENCY DISTRIBUTION (%) OF THE POPULATIONS[a] ACROSS THE WAVES BY VULNERABILITY SCORE RANGES AND STRATIFICATION VARIABLE "HOUSEHOLDER'S OCCUPATIONAL STATUS"

		Wave				
		1	**2**	**3**	**4**	**5**
Dependent worker	0.0 - 0.1[	44.0	42.3	50.7	47.0	49.5
	0.1 - 0.5[	9.2	20.8	17.6	19.7	21.0
	0.5 - 0.9[	8.4	9.7	7.7	7.1	6.9
	0.9 - 1.0	38.4	27.2	24.0	26.1	22.6
	Total	18,048,000	10,118,608	10,158,863	9,996,552	10,050,380
Self-employed/ Professional	0.0 - 0.1[	29.2	31.3	34.9	28.2	40.6
	0.1 - 0.5[	8.5	16.8	11.0	14.7	19.8
	0.5 - 0.9[	11.6	17.5	8.3	8.3	8.0
	0.9 - 1.0	50.7	34.3	45.8	48.8	31.6
	Total	5,312,000	2,496,029	2,307,356	2,314,348	2,937,915
Unemployed	0.0 - 0.1[	36.1	25.2	33.3	23.8	22.7
	0.1 - 0.5[	11.6	16.6	16.4	12.2	12.5
	0.5 - 0.9[	6.7	10.0	6.0	9.6	5.3
	0.9 - 1.0	45.6	48.1	44.3	54.5	59.5
	Total	2,582,000	2,491,212	2,237,134	2,269,810	2,429,458
Retired/Disabled	0.0 - 0.1[	61.7	61.3	58.4	54.4	58.1
	0.1 - 0.5[	15.4	24.1	26.1	26.6	29.5
	0.5 - 0.9[	4.2	2.8	2.1	2.3	1.7
	0.9 - 1.0	18.8	11.7	13.3	16.8	10.7
	Total	15,554,259	8,721,664	9,213,166	9,440,344	8,461,793
Student/Other	0.0 - 0.1[	51.6	40.7	42.6	40.1	38.1
	0.1 - 0.5[	11.7	26.7	10.9	12.2	20.0
	0.5 - 0.9[	10.2	3.0	14.7	5.8	11.0
	0.9 - 1.0	26.4	29.6	31.7	41.9	30.9
	Total	9,184,153	1,455,789	1,292,442	1,144,675	1,012,203
Total	0.0 - 0.1[	48.9	46.0	50.1	45.6	48.3
	0.1 - 0.5[	11.6	21.5	19.6	20.8	22.9
	0.5 - 0.9[	7.7	7.7	5.9	5.6	5.3
	0.9 - 1.0	31.9	24.8	24.3	28.0	23.5
	Total	50,680,412	25,283,302	25,208,960	25,165,729	24,891,749

[a] In wave 1 population refers to people aged 18 or over; from wave 2 onward, it refers to households.

Table A4.6
FREQUENCY DISTRIBUTION (%) OF THE POPULATIONS[a] ACROSS THE WAVES BY VULNERABILITY SCORE RANGES AND STRATIFICATION VARIABLE "PRE-COVID ECONOMIC CONDITION"

		Wave				
		1	**2**	**3**	**4**	**5**
With great difficulty	0.0 - 0.1[	20.1	19.8	14.5	20.3	14.9
	0.1 - 0.5[	13.1	21.1	25.0	17.2	22.2
	0.5 - 0.9[	2.9	9.8	4.5	3.9	4.3
	0.9 - 1.0	63.8	49.2	56.0	58.6	58.5
	Total	1,938,800	2,148,036	1,815,515	1,852,862	1,698,178
With difficulty	0.0 - 0.1[	24.0	27.6	28.2	23.0	34.1
	0.1 - 0.5[	18.8	20.4	25.2	26.3	22.6
	0.5 - 0.9[	4.4	10.8	10.5	5.9	8.6
	0.9 - 1.0	52.8	41.2	36.1	44.8	34.6
	Total	5,287,319	3,665,389	2,921,014	3,151,504	3,213,998
With some difficulty	0.0 - 0.1[	41.4	45.5	45.2	41.4	41.3
	0.1 - 0.5[	10.1	21.0	19.7	22.8	25.7
	0.5 - 0.9[	7.7	8.3	6.8	6.0	5.2
	0.9 - 1.0	40.7	25.2	28.2	29.9	27.8
	Total	17,445,526	8,553,943	8,843,431	8,164,449	8,193,237
Quite easily	0.0 - 0.1[	57.4	53.6	61.9	54.4	60.7
	0.1 - 0.5[	12.0	24.2	17.6	20.0	20.8
	0.5 - 0.9[	10.2	6.7	4.6	5.8	5.1
	0.9 - 1.0	20.4	15.5	15.9	19.8	13.4
	Total	16,750,674	7,450,449	7,686,145	8,160,538	8,243,996
Very easily	0.0 - 0.1[	67.8	66.5	70.8	66.9	64.4
	0.1 - 0.5[	9.2	18.3	17.0	15.7	21.9
	0.5 - 0.9[	5.9	4.0	3.6	4.7	3.3
	0.9 - 1.0	17.1	11.2	8.6	12.7	10.4
	Total	9,258,094	3,465,486	3,942,856	3,836,376	3,542,339
Total	0.0 - 0.1[	48.9	46.0	50.1	45.6	48.3
	0.1 - 0.5[	11.6	21.5	19.6	20.8	22.9
	0.5 - 0.9[	7.7	7.7	5.9	5.6	5.3
	0.9 - 1.0	31.9	24.8	24.3	28.0	23.5
	Total	50,680,412	25,283,302	25,208,960	25,165,729	24,891,749

[a] In wave 1 population refers to people aged 18 or over; from wave 2 onward, it refers to households.

Notes

1. DPCM 8 March 2020; DPCM 9 March2020.

2. The DPCM 7 October 2020 introduces more restrictive measures than the previous ones: it reaffirms the prohibition of gathering outdoors and indoors; allows public events to be held only in static form; sets the number of spectators for nationally and internationally recognized sporting events and competitions at 1,000 outdoors and 200 indoors, as well as for theatrical performances, concerts and movie screenings; prohibits amateur contact sports; sets the maximum number of participants for celebrations resulting from civil or religious ceremonies at 30; suspends educational trips, exchanges and twinning, guided visits and school outings; restricts the access of relatives and visitors to hospitality facilities such as nursing homes; allows the attendance of the catering services only until 9.00 p.m. without consumption at the table, and until 12.00 p.m. with consumption at the table; it encourages smart working, holidays and paid leave. It also recommends compliance with safety measures even in private homes in the presence of non-cohabiting people, and also strongly recommends avoiding parties and not hosting more than 6 non-cohabiting people at home.

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Resumen

Este artículo ofrece algunas ideas sobre el impacto de la pandemia del Covid en la vulnerabilidad económica de la sociedad italiana. Los datos proceden de las 5 primeras oleadas de una encuesta social especial, realizada por el Banco de Italia, para supervisar las consecuencias económicas de la emergencia del Covid. Para valorar la vulnerabilidad económica se utilizan cuatro variables ordinales, que también se analizan utilizando un índice sintético que las agrupa, mediante el uso de herramientas de la Teoría de Orden Parcial; los grupos sociales se identifican en función de variables socioeconómicas de perfil. Los resultados revelan el fuerte impacto económico de la pandemia y el riesgo de una mayor polarización de la sociedad italiana.

Palabras clave: Covid-19, vulnerabilidad económica, Italia.

Clasificación JEL: C43, C49, C63, I32.