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Sede Legale: C/O Studio Associato Cadoni, Via Ravenna n. 34 – 00161 ROMA.
info@sieds.it, rivista@sieds.it

SIEDS
SOCIETÀ ITALIANA
DI ECONOMIA DEMOGRAFIA E STATISTICA

SEDE LEGALE:
C/O Studio Associato Cadoni, Via Ravenna n. 34 – 00161 ROMA

info@sieds.it

rivista@sieds.it

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INDICE

STATISTICS IN THE SERVICE OF REBIRTH[1]

Massimo Livi Bacci

1. Introduction

I am very grateful to the President, Salvatore Strozza, and to SIEDS for the invitation to speak at this plenary session. As my friend Salvatore knows, I accepted this invitation with some reluctance not only because the topic is complex, but also because my training and background are traditional, far from the modern algorithms and futuristic analyses made possible by big data.

This is also why I want to begin my talk by reading what Minister Manna wrote in his "Report to the King" [*Relazione al Re*] more than a century and a half ago. On March 11, 1864, he presented this large volume *in quarto* of 501 pages containing the Proceedings of the Census of 31 December 1861 and its results by municipality.

Manna wrote:

"*My Lord, I have the honor to present to your Majesty the results of the General Census of the Population, based on simultaneous surveys carried out obtained on the night of December 31, 1861, in accordance with the Royal Decree of September 8, 1861 and the Law of February 20, 1862. This survey, prepared in the short span of three months and conducted simultaneously and following a standard methodology throughout the kingdom, deserves careful evaluation, my Lord, as it was one of the first and most important administrative acts responding to the new needs of the reconstituted and unified kingdom and also one of the most undeniable manifestations of the strength and spread of the national and united concept*"[2].

[1] Talk held during the online plenary session of SIEDS Conference, May 27, 2021.

[2] Original Italian version: "Sire, ho l'onore di presentare a V.M. i risultamenti del Censo generale della popolazione, compilato sulle notificazioni simultanee ottenute nella notte del 31 dicembre 1861, in conformità al decreto reale dell'8 settembre del 1861 e alla Legge 20 febbraio 1862. Codesta operazione che, preparata nel breve giro di tre mesi, poté nondimeno compiersi in uno stesso momento e in tutto il Regno, con norme uguali, merita, Sire, un attento esame, come quella che fu uno de' primi e più importanti atti amministrativi, che rispondessero alle nuove necessità del Regno ricostituito ed unificato e nel tempo stesso una delle più innegabili manifestazioni della forza e della diffusione del concetto nazionale ed unitario"

These words need no further comment.

A century or so later, I was in Israel for a period of study and research visiting Roberto Bachi, the father of modern Israeli statistics. A professor of statistics at Hebrew University, he was placed by Ben Gurion at the head of Israel's Bureau of Statistics shortly after the proclamation of the State of Israel (May 14, 1948) and assigned the task, with the help of a few officials and trucks, of conducting the first census of the new state. Census taking began in November that same year and ended during the Arab-Israeli war, a few months later.

These are two examples—Italy, recently united, and Israel, recently born—for which statistics were placed in the service of the "birth" (rather than "rebirth") of a country. On these occasions, statistics responded quickly and efficiently, producing results that, given the times and such basic means and the rudimentary methods available, were of quite a high quality.

2. "Objective" and "subjective" statistics

Assuming that the pandemic represents a discontinuity with the past, and that there is a "before" and the "after" to think about, I confess that I am offering my remarks in a state of perplexity.

On the one hand, there are "traditional" statistics, let's call them "objective", intent on counting and analyzing empirical quantities: people, births, deaths, and other demographic events, objects, artifacts, goods (produced, purchased, or sold), money, specific activities of legal or economic-social import, and other measurable phenomena (i.e., meteorological, seismic, geological). Interesting synthetic concepts have been defined for economic issues (gross or net domestic product, etc.), but also for demographic and social phenomena (burden of disease, life expectancy in good or poor health). For all these phenomena (and their synthetic concepts), we usually try to quantify empirical indicators.

On the other hand, there are statistics that aim to measure opinions, states of mind, intentions, satisfaction and dissatisfaction, aspirations, and hopes. We could call these "subjective" statistics because they try to measure attitudes, opinions, or inclinations. Scholars have tried to synthesize these too, by using abstract notions such as happiness or unhappiness, well-being or malaise, social utility, and so on.

Since the unwary organizers of this session asked me to express my views on the future perspectives of statistics, I will do so, albeit crudely perhaps, and beg your indulgence. "Objective" statistics can certainly take a large leap forward, and there is ample room for progress in the future. The speed at which data is collected, processed, and disseminated may be improved, thanks to the advances of technology. The ability to connect the ever growing number of databases may

similarly be improved, if only because we live in increasingly complex societies which require new data and information. Again, new technologies and methods are at our disposal. Access to the mass of available data can be made easier by sharing knowledge and research.

In addition to such progress, statistics must, above all, shed light on a number of black holes in our knowledge about the world. Many fields of knowledge are still shrouded in darkness.

For example, the world of "deviant behavior", a term that I use to be understood even though I do not like it, is neither well understood nor accurately described or measured. Furthermore, our "judicial" statistics are stuck in the nineteenth-century, analyzed and made available with great delays. Law enforcement certainly has a huge amount of interesting data for understanding the state of health of society. But these are largely unexplored sources of knowledge. The consumption and use of substances that alter behavior, moreover, are only known with approximation.

There is an enormous amount of data collected on the causes of death, but this is processed with delays and it is difficult to link with the individual characteristics of the deceased persons. The elderly population (aged 80 or more) will double by the middle of this century, along with the number of people with senile dementia, who now number 1.5 million. With regard to this growing population—which represents a huge public and private cost—we need to know much more: the state of health, lifestyles, living environment, etc.

Similar gaps in knowledge exist for environmental statistics, which are poorly developed, despite the obvious need to know much more about the degree of soil, water, and air pollution and their causes (industrial and agricultural activities, housing and transport, individual behavior, etc.).

Italy, a highly seismic area, has a built 30 million housing units, but we know little about the characteristics of these buildings: how many buildings are vulnerable to earthquakes? What interventions should be made to make them safer?

Going further, we know little about mobility and migration and what information we have is generally out of date. Population registers have undoubtedly improved, but have independent checks been made? Even assuming that the information is collected without errors, it represents "delayed" mobility, one might say a "replay" of it. However, cell phones and credit cards are used continuously and are geo-located, tracing our short and long-term movements.

Even population accounting is imperfect; it suffers from a discontinuity of information sources, and does not account for the people who are actually present. According to official tourist statistics, visitors from abroad spend about 220 million days in Italy in a normal year, which represents an average of 600 thousand people every day, perhaps one million, if we include those visitors who are guests of families or have other informal arrangements. Moreover, there are hundreds of

thousands of undocumented immigrants, which only a few worthy private institutions have tried to estimate. These populations are little investigated or known, yet in their own way they represent part of the society in which we live.

These few simple examples confirm the existence of numerous large, deep gaps in our knowledge about our society. Great efforts in highlighting its dimensions and characteristics would be useful for the "rebirth" of the country, making a further cognitive leap forward.

I have not spoken of what I called "subjective" statistics concerning surveys aimed at measuring well-being, satisfaction, or happiness. I believe that official statistics is already faced with a huge task if it wants to take great steps in the "objective" knowledge of the country. Analyses that rest on individual opinions remain very delicate for reasons that we are all familiar with.

I have in front of me the World Happiness Report 2020, which carries the logo of the United Nations and mostly collects the results of Gallup polls on the perceptions and opinions of respondents in different countries. For example, it asks if the respondent was more or less worried and sad on the day before the survey, and comparisons are even made with previous surveys, even though the answers may depend on circumstances (e.g., meteorology, news, victory or defeat of one's favorite team, etc.). According to the synthetic rankings of this Report, Italy would be less happy than Saudi Arabia, which has the death penalty, Sharia law, veiled women, and immigrants in a state of semi-slavery. Greece is close to Libya, and Rwanda (also called the Switzerland of sub-Saharan Africa) is in third-to-last place.

Let's leave the task of procuring "bread and butter" to official statistics and the "champagne and caviar" to other institutions! In other words, let's leave "subjective" statistics to specialized, secular social research institutions—those without preconceived notions about the nature of well-being or happiness—which have flexible programs and are not constrained by the rigid rules of official statistics that must be integrated with those of other EU countries.

3. Concluding remarks

Before concluding, I would like to touch on three final points.

The first concerns the need to "link" our statistics and knowledge with the rest of the world. This is already done, of course, with other European countries, but we need to go further and extend this practice to other countries around the Mediterranean, for example. This would help to extend our knowledge to larger geographical contexts and provide broader information concerning phenomena that are closely related to those in our country.

The second point concerns the need to modernize the system of statistics by opening up to external contexts. Here I would like to quote an excerpt from an article by Julia Lane published in the Royal Statistical Society's magazine. Julia Lane is a scholar whom I would call a libertarian, the author of a successful book in 2020 entitled "Democratizing our data: a Manifesto".

"*… Our economic and social data system should be democratised in terms of measurement, collection and interpretation. The choice of economic and social measures should be decided by people at the state and local level, as well as the federal level. People and institutions at all levels should collect and use the massive amounts of new data that are now available in ways that were not imagined a century ago. Valid interpretation of data is no longer the purview of a small group of highly trained federal statisticians – there are now many trained data scientists and statisticians across the USA. One immediate need is to develop new local, and timely, measures of job loss, business vulnerability, and fiscal impact. But, more fundamentally, we need an infrastructure – what I would call a 'national laboratory for community data' – that is designed to respond to changing needs. This new organisational infrastructure should be based on three core principles: great measures, great people, and great technology. …*" (Lane 2020: 42).

We need a large open-source laboratory: a place for thinking, a place for generating new ideas that is capable of joining public and private capacities, an external "engine" to push the progress of official statistics.

The third point concerns the limits that we should place on the justified needs of researchers, who are little restrained by the weak institutions defending our privacy. We are photographed, filmed, recorded, shadowed, and profiled; names can be attached to our faces and a name can even be given to our features when we walk with a hood on. Our purchases and earnings are all recorded; credit cards, telephone cells, and various chips all follow and trace us. We are "profiled" for insurance companies, employers, banks, administrators, border guards, and event organizers (think about the "green pass"). Are we entering the dangerous territory of Big Brother? Research can certainly benefit from this cloud of information that is expanding at the speed of light. However, bulimia, even data related, is dangerous and perhaps does not serve the progress of society. It seems to me that it's best to maintain a healthy, even restrained, appetite.

Reference

LANE J. 2020. After Covid-19, the US statistical system needs to change, *significancemagazine.com*, Vol. 17, No. 4, pp. 42-43, https://doi.org/10.1111/1740-9713.01428.

SUMMARY

Statistics in the service of rebirth

Massimo Livi Bacci, during the online plenary session of SIEDS Conference in May 27, 2021, dealt with future perspectives of statistics by distinguishing between "objective" and "subjective" statistics and by describing the main fields of knowledge with poor statistical reporting and/or inadequate information. The reported examples confirmed the existence of numerous, large, and deep gaps in our knowledge about Italian society. Great effort in highlighting its dimensions and characteristics would be very useful for the "rebirth" of Italy, making a further cognitive leap forward.

Massimo Livi BACCI, Università di Firenze, massimo.livibacci@unifi.it

METHODS, MEASURES AND POLICIES FOR A GENERATIVE AND RESILIENT RECOVERY

Leonardo Becchetti, Massimo Cermelli

1. Introduction

An important lesson to be learned from the emergence of the COVID-19 pandemics is that the idea that a laissez-faire world where atomistic agents and companies maximise their own utility and profit functions without concern for negative social and environmental externalities, and with a minimal role of public authorities, is enough to achieve social optimum, cannot work.

The pandemics has dramatically shown the complexity and depth of interdependences among individuals and the strong negative impact of externalities on our life in presence of a global public bad. The fight to COVID-19 has been proven to be impossible to win without complementing existing market mechanisms with: i) a strong government intervention in the definition of optimal contracts of public-private partnership with pharmaceutical companies for research, investment and distribution of vaccines; ii) responsibility of pharmaceutical companies in providing vaccines at subsidised prices in the poorest countries in order to ensure global coverage of vaccine distribution; iii) active cooperation of citizen life styles (use of face masks, respect of minimum distance and no agglomeration discipline) without which the defeat of the pandemics is impossible.

The lesson to be learned is that the same four-hand approach has to be used to tackle other three global problems of our society. The first is the "race to the bottom" feature of global competition where companies look for the production place where it is possible to minimize (labor, environmental, tax) production costs in order to maximise profits. Within this race to the bottom scenario different countries or regions compete with each other in a Bertrand-like model by undercutting corporate tax levels of institutional competitors so that the final equilibrium of this model risks to be a world of "wealth without nations and nations without wealth". The race to the bottom has the effect of deepening within country (skill) wage differentials and inequality (Desjonqueres *et al.*, 1999; Haskel, 1999; Burstein and Vogel, 2017; Acemoglu and Autor, 2010). Workers at the top of the "talent ladder" have skills and absorptive capacity that enables them to increase their productivity in presence of new technologies, and, for this reason, are

hardly replaceable and have bargaining power to defend themselves. This is not the case of workers at the bottom of the talent ladder that are easily replaceable and have no bargaining power. Policy solutions to tackle the race to the bottom are therefore urgently needed to promote decent wages for low skilled workers and to avoid that regions or countries are devoid of financial resources for their public policies.

The second challenge is ecological transition. As is well known, an overly ambitious goal has been established at international level in order to avoid an increase of the average earth temperature (above 1.5 C) that can trigger irreversible negative climatic effects. There is not much time left since the 2021 IPPC report registers that we are already 1.1 C above pre-industrial levels. The European Union has set the ambitious goal of net zero emissions by 2050 from the around 50 billion tons of equivalent Co2 emitted today. The goal of reaching net zero emissions by 2050 requires a thorough transformation of lifestyles and productive processes in five crucial areas such as energy production, manufacturing (especially in the hard-to-abate industries), house energy efficiency, agriculture and livestock, mobility and transportation, accompanied by the necessary pre-requisite of a strong increase in renewable energy production capacity. This is possible only through a system of regulation and tax incentives that help millions of households and firms to move toward the ecological transition path. The net zero emission challenge could be achieved only by innovating and changing deeply existing production processes and especially replacing the existing productive capital stock with more energy efficient means of production. An essential precondition to achieve this goal is also the definition of a set of green indicators that can measure simply and efficiently changes toward ecological transition and a regulatory system that enforces transparent disclosure of this information.

The third challenge is the poverty of sense problem that has led into the US to the insurgence of a "despair death crisis" determined by a sudden upsurge of deaths by opioid overdoses ultimately leading to an increase in the mortality rate of the white non-Hispanic population in the 45-55 age cohort (Case and Deaton, 2015a; Case and Deaton, 2015b; Case and Deaton, 2017). The empirical literature investigating the despair death crisis clearly shows that human beings are sense searchers before being utility maximisers and that the poverty of sense trap can be avoided only by investing on a mix of monetary and non-monetary factors.

In order to tackle the three challenges, we need to create socially and environmentally sustainable economic value. The balanced equilibrium of powers that can allow us to do so is a "four hand system" where market mechanisms (not leading per se to the goal of creation of socially and environmentally sustainable economic value) are complemented in their action by the "visible hands" of active

citizenship, responsible business and enlightened institutions that can leverage the best energies of the civil society and the productive system.

In order to do so some methodological challenges related to statistical indicators are of crucial importance.

First, we must make further progress along the path of "beyond GDP" wellbeing indicators introducing in the multidimensional approach of SDGs (and in Italy BES) indicators that can measure generativity (defined as the combination of generativity and care for others wellbeing), that is the principal component of what makes a life rich of sense and worth living.

Second, we must make progress in participatory mechanisms by which indicators are jointly defined by experts, stakeholders and companies become a benchmark in a dynamic process of learning and progress in sustainability.

Third, we need simple and easily implementable environmental indicators that can create proper incentives for household and firms along the ecological transition path.

The rest of the paper will discuss these three challenges in terms of methodologies and indicators. The paper is divided into five sections including introduction and conclusions. In the second section we go further in depth on the relatively less explored poverty of sense problem by discussing the COVID-19 Easterlin paradox. In section three we explain in detail what we intend for generativity, while in section four we present and discuss the three methodological challenges. Section five concludes.

2. The COVID-19 Easterlin paradox

The COVID-19 pandemics has also revealed another paradox in the relationship between monetary and non-monetary factors affecting subjective wellbeing. As is well known the Easterlin paradox showed a decoupling between per capita GDP and the share of very happy people in the US that opened the way to the literature investigating drivers of subjective wellbeing and combining traditional economic factors (such as income, inflation, unemployment) and non-monetary factors (such as relational goods, the gap between expectations and realisations) (Easterlin and Angelescu, 2009). The psychological and sociological angle also helped us to understand how monetary and non-monetary factors can mix when comparing life outcomes with those of the reference group (Ferrer-i-Carbonell, 2005; Clark, 2008) or with one's own achievement of the past in hedonic adaptation mechanisms.

The novel "income-life satisfaction" paradox of the pandemics lies in the relationship between the economic shock that it generated and the contemporary dynamics of subjective wellbeing. In the year of COVID-19 BES-ISTAT data

show that, in spite of the severe drop in GDP occurred in Italy (-7.8 percent), the share of the very happy people in the same country (those reporting a level of life satisfaction between 8 and 10 on a 0-10 scale) grew by slightly more than one percent (from 43.2 to 44.5 percent). This finding is impressive if compared with the around 10 percent fall of the share of very happy people in Italy in 2013, the year of the BTP-Bund spread crisis. The Italian COVID-19 paradox finds close correspondence in the evidence provided by the World Happiness Report where in a longitudinal estimate on the drivers of life satisfaction the 2020 dummy is positive and significant, or not significant for 77 of the 88 countries (that is we register an increase or a non-decrease in life satisfaction for two third of world countries) (Helliwell et al. 2020). This puzzle has at least three concurring potential explanations. First, lockdown measures have created a massive forced smart work experiment that improved work-life balance of many workers. In addition to it, the COVID-19 pandemics had deep distributive effects hitting some groups while producing even economic benefits on others that can have reported higher nor not lower life satisfaction levels. More specifically, this occurred for public employees and workers in non-face-to-face intensive industries not hit by the distancing measures, who maintained jobs and wages and could save money in transportation meanwhile enjoying higher work-life balance. A second interpretation looks at the re-evaluation of the value of life when surrounded by severe health problems of one's own peers. A last and final interpretation looks at the increased sense of living given that the COVID-19 created a clear life plot where all members of the community had a common goal of fighting the pandemics.

Whatever the relative weight of each of these rationales, the lesson taught concerns the importance of looking at the complex interaction between monetary and non-monetary factors affecting wellbeing. Human beings are sense searcher before being utility maximisers and we should consider with more care this in our positive and normative analyses. Consequently, we should never forget the third challenge (poverty of sense crisis) outlined in the introduction when discussing strategies to tackle the first two (climate warming and race to the bottom led inequality) and its opposite, generativity, that is recently going to be often more acknowledged as one of the main drivers of life satisfaction and as an antidote to the poverty of sense crisis.

3. The value of generality

"Those only are happy, I thought, who have their minds fixed on some object other than their own happiness, on the happiness of others, on the improvement of

mankind, even on some art or pursuit, followed not as a means, but as itself an ideal end. Aiming thus at something else, they find happiness by the way."
John Stuart Mill, Principles of Political Economy, 1893: p.117

Work hard for your own interest, no man could do otherwise, as he would be less human by not doing so: but do not work for the misery of others and, if possible, work out how to make them happy. The more you are self-interested, the more you must be virtuous if you are not fool. Is a natural law that you cannot make your own happiness without making that of other human beings"
Antonio Genovesi, Autobiografia e lettere, p. 449

"Ask not what your country can do for you – ask what you can do for your country,"
John F. Kennedy's inaugural address

The concept of generativity was first introduced in social sciences by the social psychologist Erikson identifying it as one of the fundamental steps of development in personal growth (Erikson, 1993; Erikson and Erikson, 1998). Generativity can be defined as the extent to which one's own life and deeds affect positively lives of other human beings (Magatti *et al.*, 2019). Following Erikson generativity dynamics is articulated across four verbs: to desire, to give birth, to accompany, to let it go. Using impact evaluation concepts, we can consider whether individuals are truly generative or not also taking into account problems of deadweight and drop off, that is comparing their actions with the counterfactual

Generativity, intended as the capacity of affecting positively other human lives, has a strong and significant effect on life sense and life satisfaction. The concept of generativity is a key element for eudemonic wellbeing (sense of purpose and meaning life) that in turns has been shown to raise life expectancy (Ryff, 2017).

When discussing the literature of subjective wellbeing we must have in mind and distinguish between three different concepts widely used in the literature: 1) cognitive wellbeing (life satisfaction), 2) hedonic wellbeing (different kinds of feelings) and 3) eudamonic wellbeing (sense of purpose and meaning life). The importance to stress this last aspect of wellbeing is because sense of meaning and purpose in life are in general less investigated while they are strongly linked to longer lifespan and evidence shows that subjective wellbeing is associated with longer survival (Steptoe *et al.*, 2015).

In this direction the concept of generativity is also a relevant driver of life satisfaction and before it is a key element for eudemonic wellbeing, because it represents the act of an individual using his/her available set of doing (capabilities)

and the states of being and doing (functionalities) for doing things that he/she expects may have positive effects on the life of other human beings.

Becchetti and Conzo (2021) show on data of the European Social Survey, with evidence robust across countries and waves, that generativity measured as the product of creativity and care for others wellbeing is a fundamental driver of cognitive subjective wellbeing (life satisfaction), positive affect, while positively contributing as well to social capital, active citizenship and resilience (measured as the capacity to revert to the previous wellbeing/activity level after a shock). Becchetti and Bellucci (2021) find similar results when looking at wellbeing of those aged 50 and above on SHARE data.

Once being aware of the relevance of this concept it is important to wonder what generativity adds to existing multidimensional wellbeing indicators.

In a sense the relationship between one of the most important of them, capabilities, and generativity is akin to that between Aristotelean power and act. In this perspective the importance of generativity for subjective wellbeing can be understood by arguing that individuals can have satisfactory levels of income, health and education (that is, they can be equipped at best with variables used to calculate standard multidimensional wellbeing indicators) but, if they do not have a purpose in life, they cannot be happy. Richness of life sense (eudaimonic wellbeing) and life satisfaction (cognitive wellbeing) have to do not just with one's own endowment (Aristotelean power) but also and fundamentally with effortful engagement or purposeful expression of ones' own action (Aristotelean act).

Generativity is a multidimensional concept requiring three conditions to express itself. The first is the individual potential, that is the need to have good health and sufficient economic resources, apart from education in order to enhance the individual potential for generativity

The second is the local potential that relates to the political environment in which individual lives. In this second case, the relevant political conditions to enable generativity are equal opportunities, absence of corruption, and freedom of initiative and access to sources of external financing.

The third condition involves the enactment of individual actions that may have a positive effect on lives of other human beings. In this sense, generativity concerns not only leisure activities, such as voluntary work or participation to social or political groups but also working activities covering the whole spectrum of social, political and economic generativity.

The first and the second dimension of generativity are similar to that of Amartya Sen's concept of capabilities while the third one relates to the capacity of transforming the generativity potential into actions that positively affect other human beings.

Becchetti and Conzo (2021) show that strategies that can enhance creativity and care for others wellbeing can play a crucial role to increase social capital, active citizenship, subjective wellbeing and resilience. Generativity policies that reinforce the sense of purpose and meaning life of the elder raising their life expectancy should be an important target for active ageing.

Therefore, we deem important to refine and develop a new set of indicators measuring wellbeing as generativity. This can be done also at local level since cities, regions can be generative if they have rich economic and business environment, social environment and if generations living in those areas win the generativity challenges (active ageing for the elders, escape from the NEET trap for the young).

4. Three issues on methods and indicators to face the three challenges and related methodological problems

4.1 The development of Generativity indicators

Evidence on the importance of generativity, intended as a product of creativity and care for others wellbeing, for life satisfaction, richness of life sense, resilience and active citizenship suggests that it would be important to device statistical measures of generativity at individual and local level.

In order to do so we perform an experiment by selecting some local variables that can be correlated to generativity (AA.VV, 2020). More specifically we identify four domains. The first is economic generativity that can be measured with number of start-ups, patents and is generally related to productivity and innovation. A second domain relates to social generativity and aims to measure the capacity of the local community to produce social impact outcomes. It can be measured with institutional indicators (ie. number of social organisations) or in terms of individuals or hours dedicated to social outcomes (ie. number of volunteers, of blood donors, hours of volunteer work). A third and fourth domain refer to generational generativity challenges. More specifically we think that the share of Neet (young that neither work, nor study) could be a good measure of the lack of generativity of the younger generation, while active ageing is definitely a measure of generativity of the elders. As it is clear from the selection of these potential indicators, generativity measures have a straightforward predictive capacity of social and economic outcomes.

In addition to it, the measurement of generativity indicator helps pratictioners and policymakers to focus on strategies that, by increasing generativity, can

significantly contribute to enhance active citizenship, resilience, subjective wellbeing, social and economic local outcomes. Just to suggest some directions for policy action we know about the importance of the role of education given that schooling years correlate with social capital and lifelong learning contributes to active ageing. Looking at the young, the main suggestion for generativity policy is to create paths and strategies (such as school-work experiences, civic experiences and discernment moments) aimed to stimulate desires that are the first fundamental step for a generativity path. A strong professional desire can in fact motivate work and effort in stepping up the talent ladder and reduces the risk of ending up in the NEET trap.

4.2 Indicators for ecological transition

Ecological transition is the heart-breaking challenge of the mankind in the next future. In order to avoid overcoming the threshold of 1.5/2 Celsius degree increase in the world temperature we must achieve the target of net zero emissions by 2050 from the actual level above 45 billion tonnes of Co2 equivalent emissions. If we want to attain this goal, we need to modify thoroughly our lifestyles and methods of production in five crucial fields: manufacturing (especially in the hard-to-abate sectors), agriculture and animal farming, ecological efficiency of buildings, mobility and transport and production of energy, provided that we have enough energy production capacity in renewables.

As it is clear by its definition, ecological transition is an inherently dynamic goal that is, it is compatible with a set of admissible transition paths all implying a given negative rate of change in carbon dioxide emissions.

The environmental sustainability challenge is however not limited to the global warming problem (that can be tackled by adaptation and mitigation strategies), while it extends to the other relevant fields of air pollution, biodiversity threat, development of circular economy and availability of water for the world population. To make this multidimensional goal clearer the EU has defined the Do Not Substantially Harm (DNSH) standard by which all Next Generation projects must meet a "green Pareto improvement" criterion that is, they must not cause a negative change in none of these six domains.

The EU Taxonomy strategy in definition of standards helping us to achieve this dynamic goal is however static and difficult to be completed. The "Linnean" classificatory approach of creating full-fledged taxonomies defining for each industrial sectors investment, activities and production processes that are or aren't compatible with ecological transition is indeed a daunting task. The risk is that the taxonomy will never be completed for problems related to the complexity of the

task itself and the political controversies that can arise between EU members about including/not including activities that can be strategic for some and not for others. A third problem is that, even assuming that the task will be completed one day, the possibility that it becomes soon obsolete is not remote given the tremendous pace of technological innovation in environmental sustainability. This is why the suggestion we propose in this paper is the use of a much simpler "DNSH consistent" dynamic approach consisting of the creation of a few synthetic indicators measuring the change produced by corporate investment versus the counterfactual for a given investment (see on this point the GIFT approach developed by Becchetti, Cordella and Morone, 2021). This is because, on the corporate side, the goal of net zero emissions can be achieved only through investment, that is the replacement of the current capital stock with new production process more efficient in the use of energy.

The approach of DNSH consistent measures of the change generated by a given investment in each of the six DNSH domains is much simpler and pragmatic, it is open to the creation of new technologies that meet the target without requiring new classifications. It also allows policymakers to decide ambitious thresholds for admissible investment (ie. 20 or 30% reduction of emissions) compatible with the overall ecological transition path. The use of this indicators can and should be accompanied by incentives for ecological transition compatible investments (ie. subsidised loans, access to loan guarantees, accelerated depreciation, etc.).

4.3 The Next system of living indicators (up to SME rating approaches)

The growing importance of corporate social responsibility and ecological transition is pushing companies to measure and communicate their environmental and social effort. However, most metrics, ratings, certification standards and regulation are tailored for large firms, while fixed costs of CSR compliance are too high for small and medium sized firms. Small and medium firms are nonetheless forced to participate to CSR information release and practices. This is because large firms are often evaluated in terms of their behaviour on the entire value chain (and therefore also on the selection of suppliers). This is why the CSR requirement for large firms turns into requirement also for their small and medium run suppliers along the value chain. An open issue is therefore that of devising measures allowing also small and medium business to participate to the process of ecological transition without setting prohibitively high fixed costs of access.

In this respect a plausible solution is the creation of mechanisms of "participated self-evaluation" such as those incorporated in the Next index (Becchetti and Bellucci, 2021) The process starts with the creation of a

questionnaire with six domains and a total of 30 questions on the different sides of corporate social responsibility (workers, customers, environment, suppliers, relationships with local stakeholders and governance) by a group of statistical and economic experts. The original questionnaire is then discussed and validated with relevant stakeholders (ie. environmental organisations, trade unions, customer associations) having specific expertise in the different areas. The questionnaire is therefore tested on small and medium sized companies and timely revised by the joint work of the team of experts, relevant stakeholders and end users. The "self-evaluation" side of the process starts from the point of view of corporate end-users that give a score on the different items to evaluate themselves. The scores are in most cases bounded by ranges defined in the same questionnaire structure (ie. maximum point of five for a given minimum range of distance between minimum and maximum wage within the organisations). Corporate end users have the burden of proof for provided scores as they have to support them with relevant documentation where possible. In any case stakeholders have the right to revise the score and reject it asking for a further round of analysis if they deem it not consistent with the actual end users sustainability position.

The advantage of this participative approach is both cognitive and relational. On the first side, complementary skills arising from different point of views and experiences of experts, stakeholders and end users can be combined to create a better final product. On the second side, the participatory approach creates as well a process useful for learning and improving strategies of end users along the sustainability and ecological transition path.

The Next Index can be easily transformed into a rating system when adding some ingredients to the process. The first is weighting the different items and domains in order to have a final single score. A is well known in the literature weighting can be value based or determined with purely statistical approaches basically eliminating redundancy and taking into account correlations among different items. However, even beyond the so-called statistical approaches, the final outcome of the process inevitably conceals value judgements about the relative importance of different items and domains. It is therefore more transparent and explicit to follow a Delphi approach where, after taking out all redundancy effects suggested by statistical analysis, a panel of relevant stakeholders defines weights making explicit their ranking of values.

The rating index defined so far has however the limit of providing a static picture of the situation of the company, regardless of its exposure to ESG risk and controversies. In this respect the index can be usefully integrated by an evaluation of such exposure, using weights for the different controversy types and a final weight between the relative importance of the static score and the score of exposure to ESG risk and controversies.

The overall approach ends up reducing significantly costs of ESG evaluation and rating for small and medium sized companies (no external certification and rating costs). The lack of external certification and rating costs is not in principle a limit to the external validity and use of the above described scoring system. To make just an example in green and social procurement bidders can provide evidence in Italy that they meet minimum environmental and social standards even using the "equivalence principle", that is, by providing an evaluation mechanism alternative to those officially considered. The validity of the mechanism will be evaluated by the commission in charge of the tender. Our argument is that the Next "living" index is a valid though well methodologically standardised alternative reducing costs of access to environmental and social sustainability rating for small and medium companies.

5. Conclusions

The tragedy of the COVID-19 pandemics made salient the role of global public goods, the importance of coordinated action among civil society, responsible business and enlightened institutions to tackle global problems in a "blended" public-private perspective and made clear that externalities matter and market failures prevent laissez-faire economics from being a possible solution.

In our work we outline the four main global challenges that we will face in the future (pandemics. ecological transition, race to the bottom competition and (poverty of sense related) despair death crises as that occurred in the US).

We argue that, in the light of the civil economics paradigm, the desirable solution lies in a coordinated action of four hands (market, civil society, responsible business, enlightened institutions) in a broadened economic paradigm where the direction of progress lies in the exploration of the potential of non-myopically self-interested consumer preferences, responsible business looking jointly at impact with profits, multidimensional wellbeing indicators addressing the poverty of sense problem and enlightened institutions devising smart responses that enhance energies and generativity of household and productive organisations.

Within this perspective we identify three main directions for future development in the field of methodologies and measures for civil progress.

The first is the development of new multidimensional wellbeing indicators more able to capture generativity and richness of sense of life with respect to currently adopted indicators.

The second is the development of a simple set of indicators capturing the dynamic effect of corporate investment on ecological transition in the six domains of the DNSH approach.

The third is the development of forms of stakeholder participated self-evaluation mechanisms helping small and medium sized firms to overcome high fixed costs of CSR ratings and certifications and creating participated transition paths toward sustainability

We believe that these three approaches can help us to tackle challenges on methodologies and indicators for ecological transition creating new directions for civil progress.

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SUMMARY

Methods, measures and policies for a generative and resilient recovery

A main lesson of the COVID-19 pandemics is that global public bad problems, such as the pandemics and global warming, can be properly addressed only with the concurring action of four "hands" (market mechanisms, responsible business, active citizenship and enlightened institutions leveraging the best energies of companies and the civil society) in order to address jointly market and institutional failures. In the paper we explain how this approach can be applied and what are its challenges in terms of methodological approaches and indicators. More specifically we envisage three main frontiers: i) definition of generativity-based wellbeing indicators as a step ahead beyond the traditional multidimensional wellbeing approach; ii) construction of "living" sustainability indexes easing access of SMEs to sustainable development; iii) Do Not Substantially Harm (DNSH) indicators measuring "green Pareto improvement" in investment, consistent with the ecological transition goal of net zero emissions by 2050

Leonardo BECCHETTI, University of Rome Tor Vergata, becchetti@economia.uniroma2.it

Massimo CERMELLI, Deusto Business School – University of Deusto, massimo.cermelli@deusto.es

MEDITERRANEAN BASIN IN THE COVID-19 CRISIS HAS THE IMPACT OF THE COVID-19 CRISIS BEEN DIFFERENT FOR THE DIFFERENT POPULATIONS OF THE REGION?

Silvana Salvini

1. Introduction

Divided among the three continents of Europe, Asia and Africa, for a long time the Mediterranean formed an interrelated context or a "world economy": an area of the globe where economies, cultures and societies interacted with one another (Braudel, 2017). Even today, within the global economy, the Mediterranean countries are joined together both by flows of production factors and trade of goods. Massive legal and illegal flows of people daily move from the less developed southern and eastern economies towards the North of the Mediterranean (Salvini, 1990). The trade of goods between the EU and the MEDA (Mediterranean countries in the Euro-Mediterranean Partnership) represents in 2015 around 9 percent of the total EU external trade (European Commission, 2015)[1]. Energy sources play a central role in these exchanges. The EU nations are the main investors in the countries of southern Mediterranean (Daniele and Malanima, 2016).

«There can no longer be any doubt, COVID-19 has pushed us into a new era. We must ask, how the Mediterranean region, and the world, can come together to emerge from the global crisis stronger and more resilient. The outbreak of COVID-19 is certainly one of the greatest crises we face in over a century and serves as a stark and uncompromising reminder of the need for tangible cooperation across borders, between sectors and among citizens and their representatives». These are the words of Nasser Kamel, the Secretary General of the Union for the Mediterranean (2020).

[1] The Union for the Mediterranean aims to establish a common area of peace, stability, and shared prosperity in the Euro-Mediterranean region. EU-Southern Mediterranean relations at bilateral level are managed mainly through the Euro-Mediterranean Association Agreements.

- Nearly all countries have concluded Association Agreements with the EU. Preparations are going to deepen these agreements through the establishment of deep and comprehensive free trade areas.
- Negotiations for a Framework Agreement between the European Union and Libya are currently suspended.
- Steps towards the signature of the initialled Association Agreement with Syria are currently suspended.

More than 10,1 million COVID-19 cases and 202,121 deaths have been reported from 22 countries across WHO's Eastern Mediterranean Region since the first documented case on 29 January 2020. "This is a troubling milestone for everyone in our Region. Despite all our efforts over the past 16 months, we have not yet controlled the pandemic and there is much work to do. We all have a role in reducing infections and deaths by acting responsibly to protect ourselves and our loved ones", said Dr Ahmed Al-Mandhari, WHO Regional Director for the Eastern Mediterranean (WHO, 2021).

The Institute for Health Metrics and Evaluation noted a threefold increase in the number of deaths in the region between September and December 2020, with COVID-19 projected to become the fourth leading cause of death by early 2021. Yet significant discrepancies in both indicators and quality of data reported across the MENA region limit our understanding of the scope and the implications of the pandemic in the Arab context. The MENA region is distinctly conflict-affected and displacement-affected, which may foster unique vulnerabilities to SARS-CoV-2 transmission and illness severity. Low testing rates, limited data on excess mortality and poor vital registration systems, which are further weakened in the context of chronic political unrest, all contribute to consistent under-reporting in the region. In contrast to other regions, most Arab countries in MENA region do not publicly report comprehensive and disaggregated epidemiological data on COVID-19. Comprehensive and reliable data are essential in understanding the implications of the health crises, generating meaningful epidemiological research and developing prompt and contextualised responses (Wehbe *et al.*, 2021). Problems of data instead do not affect the countries of southern Europe, such as Italy.

2. The diffusion of COVID-19 in the two shores of Mediterranean Sea

As of 30 May 2021, almost 63% of all COVID-19 cases were reported from Islamic Republic of Iran, Iraq, Jordan, Pakistan and United Arab Emirates, and about 72% of total deaths were reported from Islamic Republic of Iran, Pakistan, Iraq, Egypt and Tunisia.

Table 1 reports some figures of the disease around the end of 2020. Most countries saw fairly slow transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) during the early months of the pandemic but in May, as social measures, such as restrictions and partial or full lockdowns, were relaxed during the holy month of Ramadan, disease transmission accelerated.

After a small reduction in the summer, cases increased in late August as disease surged in countries, such as Jordan and Tunisia, where transmission had been low earlier in the year (Al-Mandhari *et al.*, 2020).

Table 1 – *Cases of COVID -19 in the Eastern and Southern shores of Mediterranean Basin (end of 2020).*

Country	Daily Cases	Deaths	Cases	Cases/million	Lethality Rate
Algeria	138	3,130	118,516	2,756.19	2.60%
Bahrain	1,060	557	156,462	10,138.146	0.40%
Egypt	812	12,445	210,489	2,101.90	5.90%
Iraq	6,791	14,713	924,946	23,639.04	1.60%
Jordan	3,340	7,773	665,735	62573,43	1.20%
Kuwait	1,390	1,407	247,094	55.902,23	0.60%
Lebanon	2,213	6,661	496,846	72.793,23	1.30%
Libya	937	2,823	167,825	24,424.10	1.70%
Mauritania	10	450	18,022	4,420.03	2.50%
Morocco	414	8,900	502,102	14,008.29	1.80%
Palestine	2,235	2,860	268,132	53.877,64	1.10%
Saudi Ar.	799	6,754	398,435	11,643.96	1.70%
Syria	108	1,378	20,226	1,155.73	6.80%
Tunisia	1,564	9,293	271,861	23,192.30	3.40%
UAR	1,810	1,531	483,747	48,910.76	0.30%

Source: Global Health Institute 2021. ° Number of cases per million inhabitants. Ratio of deaths per 100 cases of disease.

Table 2 – *Cases of COVID -19 in the Northern shore of Mediterranean Basin.*

Country	Cases of Covid	Deaths by Covid	Lethality rate by Covid
Croatia	292,516	6,308	2.16
Cyprus	51,505	272	0.53
France	5,058,680	98,778	1.95
Greece	295,480	8,885	3.01
Italy	3,769,814	114,254	3.03
Malta	29,614	402	1.36
Portugal	827,494	16,916	2.04
Slovenia	226,499	4,408	1.95
Spain	3,347,512	76,328	2.28

Note: Data collection April 12 2021. Source: European Centre for Disease Prevention and Control, 2021.

The comparison among Mediterranean countries shows sometimes similar values of lethality rates, even if the general survival and health status of southern shore is generally worse. The low crude rates depend on the age structure, much younger to Eastern and Southern Mediterranean countries with respect to Europe. Consequently, the older age structure in Europe leads death rates to higher values, even if the general survival is higher, comparing the worse situation of pandemic disease in East-South Mediterranean Basin, immediately visible in Egypt and Syria.

3. Social and economic characteristics of the two Mediterranean shores

Let's go to present the macro differences in the social and economic situation of the two shores, starting with Human Development Index (HDI, tables 3 and 4) and infant mortality rate (IMR) from one side, and poverty and income from the other.

This index supplies a picture of the European countries (table 3) and of the southern-eastern Mediterranean countries (table 4) and outlines the difference between the two shores, starting with HDI, an indicator that includes mortality, education and income.

All countries belonging to southern-eastern, apart Israel, are in the lower part of ranking of HDI, and the piece of puzzle outlined by this index goes together with the other economic indices that we are now going to describe, and together with the picture depicted by the COVID numbers.

Table 3 – *HDI Index for northern Mediterranean countries.*

Rank: in the region	in the world	Country	HDI 2019	HDI 2018
14	22	Slovenia	0.917	0.902
6	25	Spain	0.904	0.893
17	26	France	0.901	0.891
19	28	Malta	0.895	0.885
20	29	Italy	0.892	0.883
22	32	Greece	0.888	0.872
23	33	Cyprus	0.887	0.873
28	38	Portugal	0.864	0.850
31	43	Croazia	0.851	0.837

Source: Wikipedia, 2021a.

Table 4 – *HDI index for southern and eastern Mediterranean countries*.

Country	2019	Category
Israel	0.888	Very high
Turkey	0.820	Very high
Algeria	0.746	High
Lebanon	0.744	High
Jordan	0.729	High
Libya	0.724	High
OPT	0.708	High
Egypt	0.707	High
Tunisia	0.698	High
Morocco	0.686	Medium
Syria	0.567	Medium

Source: Wikipedia, 2021b
Note: The top 3 countries are Netherland, Ireland and Germany; the last countries in the ranking are Latvia, Romania and Bulgaria.

The mean value of infant mortality rate in Southern Europe is very low (IMR range from 1.7 in Slovenia to 6.6 in Malta) while in the North Africa and Western Asia is higher (from 22.6 per 1,000 in Iraq to 6.6 per 1,000 in Lebanon) (Euro-Peristat, 2018; GBD, 2018). The Eastern Mediterranean region accounts for almost 15% of the total global burden of newborn and child mortality, most of which is concentrated in a few countries. Despite falls in mortality from 1970 to 1990, rates in these countries have recently increased (such as in Iraq) or stagnated. Accurate data for child health indicators in the Gaza Strip are not available, and we do not yet know the full effect of the current humanitarian crisis in Lebanon on child health (Bhutta *et al.*, 2006; Unicef, 2020).

In this Region, some countries still struggle to control infectious diseases, while others face a greater threat from chronic, lifestyle-related diseases such as cardiovascular diseases, diabetes, respiratory diseases and cancers. The World Health Organization (WHO) continues to support countries to ensure functioning and accessible health care systems. Nearly two thirds of countries in the Region are directly or indirectly affected by crises. The magnitude of conflict, natural disasters and political instability – resulting in widespread human suffering – places unique challenges on countries in the region. Since early 2020, the region has also been affected by the ongoing coronavirus disease (COVID-19) outbreak. The outbreak is testing health care systems and affecting population health outcomes. It also demonstrates that enhancing health system preparedness is not only an issue for

emergency-prone countries; it is a necessity for all countries, even those with well-established and strong health care systems.

Inequalities in the region of Mediterranean Basin may be measured by Gini Index and share of poverty. Table 5 reports Gini index for all countries examined. Inequalities in income is larger in Turkey, in Tunisia and in Morocco, while the other countries assume lower similar values. The greater values of the Gini index, the larger are inequalities in the countries.

Table 5 - *Gini indices of personal income distribution.*

	80-85	85-90	90-95	95-00	00-05	05-10	10-14
Portugal	34.9	32.7	34.9	38.4	38.8	35.9	34.4
Spain	33.7	32.7	34.7	34.9	33.6	32.5	34.2
France	31.6	31.8	32.1	31.5	31.1	28.7	30.2
Italy	29.1		27.9	32.5	32.7	31.8	32.5
Malta					27.0	27.5	27.5
Slovenia		22.6	23.4	26.3	25.4	23.4	24.2
Croatia		35.8	34.8	32.1	31.0	31.6	30.8
Bosnia				33.1	34.1	35.2	35.7
Serbia				32.2	33.0	29.8	29.7
Montenegro				30.1	29.9	31.1	
Macedonia				31.0	38.6	39.9	37
Albania				27	32.5	30	29
Greece	39.2	37.1	35.8	34.6	33.1	33.6	34.2
Turkey		43.5	41.3	41.6	41.6	40	40
Cyprus		34.0	30.0	29.8	31.0	29.4	31.9
Israel	32.6	32.9	33.4	34.3	36.3	37.1	36
Jordan	38.4	38.4	40.0	38.6	37.3	36.0	
Egypt	35.1	33.0	34.1	36.0	32.6	32.5	
Tunisia	35.9	33.9	36.6	48.0	43.0	39.8	
Algeria		37.9	35.6	35.6	35.9	35.6	
Morocco	39.2	39.2	39.2	39.6	45.0	47.0	

Sources: WYD EU SILC- 2008-2014; LIS-SILC-Eurostat 2010-2014; LIS-SILC Income; OECD-Eurostat; Eurostat; WIID-Eurostat; ECA–Eurostat 2005-2014; WID, Ortiz and Cummins; World Bank; POVCAL; WIID; Eurostat 2003-12; OECD; WYD –Eurostat from 2003; WYD-POVCAL; POVCAL-WYD gross income; POVCAL-WYD.

Note: averages of available data for five years. Sources: INDIE, LIS, SILC, WYD and WIID surveys are the primary sources of data used by B. Milanovic, All the Ginis Dataset, World Bank Research Department, version June 2013, http://go.worldbank.org/9VCQW66LA0; Ortiz and Cummins (2011); OECD, Income distribution and poverty dataset, online, OECD.Stat. Eurostat, Gini index of equivalised disposable income, online dataset. World Bank, World Development Indicators (WDI) 2015 online database. Source: Trends in Mediterranean Inequalities 1950-2015 Daniele and Malanima, MPRA, in https://mpra.ub.uni-muenchen.de/78324/1/MPRA_paper_78324.pdf.

Historical data on income accruing to the top 10 percent for three Mediterranean countries such as France, Spain and Italy, suggests diverse trends. While in Italy inequality in income rose from 1984, it was diminishing in France from 1964 and was almost stable in Spain. European countries show generally similar values with Gini index around 30%, while Asian and African indices are a little higher but differences are weak.

And poverty? A comprehensive investigation of patterns of social protection in southern Europe is outside the scope of our analysis. It is sufficient to stress here that southern European countries share many characteristics in terms of historical development, socio-economic trends, value systems, institutional structures and welfare arrangements: they more or less lag behind in welfare state development, and their most salient socio-economic and political structural characteristics largely contrast them with north-western European countries.

Table 6 - *Poverty, main indicators, 2003 and 2013*.

	Poverty headcount ratio (%)						Income quintile	
	Urban		Rural		Total		Share ratio	
	2003-2013		2003-2013		2003-2013		2003-2013	
EU-28								5.0
Egypt	10.1	17.6	26.8	32.4	19.6	26.3	3.9	4.8
Israel	19.1	18.8	16.5	13.7	20.6	18.6	3.4	7.1
Jordan	12.9		19.2		14.2	14.4	6.6	
Lebanon							28.5	
Libya					12.6		2.3	
Morocco	7.9		22.0		14.2		7.4	
Palestine	32.0	26.1	38.5	19.4	35.5	25.8	6.1	6.4
Syria	8.7		14.2		11.4		5.7	
Tunisia	15.4	9.0	31.5	22.6	23.3	15.5		

Source: https://now.allthatstats.com/articles/income-quintile-share-ratio-54

Table 7 – *Poverty (see note 1) in the southern European countries, 2018*.

	Poverty		Poverty
Albania	14.3	North Macedonia	21.6
Cyprus	14.7	Malta	17.1
Spain	20.7	Montenegro	24.5
France	13.6	Portugal	17.2
Greece	17.9	Serbia	23.0
Croatia	18.3	Slovenia	12.0
Italy	20.1		

Source: World Bank. 2020.

If southern Europe lag behind northern Europe, many Asiatic and African Mediterranean countries show stronger inequalities in income and poverty than Europe. The events taking place in several of South Mediterranean countries since December 2010 show that multiple deprivations may be powerful drivers of political instability. Though improvements of the living conditions have been regularly principal demands along with civil and political liberties in the demonstrations, one of the main striking facts about this so-called "Arab Spring" is that poverty had not been given the same emphasis in southern Mediterranean countries during the last decades as in other areas of the developing and emerging world.

We wonder if there is some type of association among COVID -19 ranking and these forms of economic and social indicators. The share of people under the threshold of poverty is reported in table 7. The poverty ratios presented are relative measures, showing the proportion of the population having insufficient resources to satisfy their minimum vital needs (food products and non-food products or staples). To take specific national characteristics into account, the calculation method varies from one country to the next and as a result caution should be applied when making comparisons. Jordan and Tunisia (both 2010 data) reported the lowest national poverty ratios among ENP-South countries, while the highest ratios were recorded in Palestine (2011 data) and Egypt; note that no recent data are available for several countries. Palestine reported a higher poverty rate in urban areas than in rural areas, whereas the reverse situation was observed in Egypt, Israel and Tunisia.

4. An overview

We want now to consider together all the factors that we have above described, taking into account the lethality rate by COVID 19, infant mortality, share of poverty[2], HDI and Gini Index. Some countries do not have available data relatively to all variables so we cannot include them in the correlation and cluster analysis (Method: K-means) that we performed to attempt to understand the association (tables 8 and 9).

[2] National poverty headcount ratio is the percentage of the population living below the national poverty line(s). National estimates are based on population-weighted subgroup estimates from household surveys. For economies for which the data are from EU-SILC, the reported year is the income reference year, which is the year before the survey year.

Table 8 – *Correlations among the variables used in the analysis.*

		Poverty	Gini	HDI	IMR	COVID
Poverty	PI*	1.000	0.060	-0.101	0.028	0.685**
Gini	PI*	0.060	1.000	-0.697**	0.623**	0.062
HDI	PI*	-0.101	-0.697**	1.000	-0.982**	-0.389
IMR	PI*	0.028	0.623**	-0.982**	1.000	0.315
COVID°	PI*	0.685**	0.062	-0.389	0.315	1.000

**Pearson Index; **Correlation is significant at level 0.01 (one tail).°lethality rate*

Source: Our elaboration on the above cited source of data.

The correlation between variable is negative and high for HDI-IMR, Gini coefficient, -HDI and COVID-19. The correlation instead is positive and high for poverty-COVID, Gini coefficient-IMR and finally for COVID-IMR. COVID presents therefore positive correlation with variable which denotes unease and social inequality. The variables distinguish perfectly the two shores.

Table 9 – *Final centres of the clusters.*

	Cluster 1	Cluster 2
Poverty	16.800	17.600
Gini	31.000	38.800
HDI	0.880	0.656
IMR	3.000	13.000
COVID lethality rate	1.900	3.080

Source: Our elaboration on data coming from the sources indicated in the previous tables.
Note: In cluster 1 are included Albania, Croatia, Cyprus, France, Greece, Israel, Italy, Malta, Portugal, Slovenia and Spain. In cluster 2 Egypt, Jordan, Morocco and Tunisia.

Putting together in the cluster analysis the variables rate of lethality due to COVID; infant mortality rate (IMR), poverty and Gini coefficient we obtain two distinct clusters, one for northern shore, the other for the southern-eastern one, the first characterized by high values of the variables that imply more developed contexts, the second by values of the variables that imply less favourable situations.

5. Conclusions

The COVID 19 pandemic is a major world phenomenon. Its economic impact is just beginning to unfold, but we already know that its size will be huge, of an unprecedented order of magnitude. It already has impacted many aspects of human

and social behaviour and will continue to do so. People most at risk are the poor, the marginalized and the socially excluded whose basic components of their livelihood are under threat: their health and their income.

While data on European countries are rich and detailed, often in the southern-eastern Mediterranean countries are not. For example, sex-disaggregated data on COVID-19 incidence and mortality, respectively, have been reported in only 15 and 10 out of the 22 Arab countries. The significance of COVID-19-related gender disparities has been recognised worldwide and carries far-reaching implications in the Arab context, which has the world's lowest female labour force participation rates. Additionally, gendered caregiving responsibilities, which include caring for ill relatives, may place Arab women at greater risk of contracting the virus. Sex-disaggregated data are thus vital for developing prompt and contextualised responses. Moreover, age-stratified COVID-19 mortality estimates are reported in only 10 Arab countries. Consequently, we cannot analyse disaggregated data to make a comparison between the two different shores. This represent the first critical point for our study that is consequently only partial.

In our review, to the aim to outline groups of countries according Covid data and health and income characteristics, we have performed our overview analysis only for 15 countries because the others lack the needed data. This represents the second critical point for our research. But the picture is clear: European, Asiatic and African Mediterranean countries are very different according to these variables: they are divided according to economic and health factors very clearly, and North Mediterranean countries are less disadvantaged from the various points of view we have examined, with the pandemic associated with worse living conditions. We are not able to outline a cause-effect link between COVID and factors, but there is certainly a real association.

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SUMMARY

Mediterranean basin in the COVID-19 crisis

The Institute for Health Metrics and Evaluation noted a threefold increase in the number of deaths in the region between September and December 2020, with COVID-19 projected to become the fourth leading cause of death by early 2021. Yet significant discrepancies in both indicators and quality of data reported across the MENA region limit our understanding of the scope and the implications of the pandemic in the Arab context.

The aim of our research is to understand if there is some association between COVID and health and economic situation in the countries of Mediterranean Basin. We have firstly described some economic and health factors (IMR, Gini index for evaluate inequalities, and share of poverty in the two shores of Mediterranean Sea. Then through the cluster analysis we have obtained an overview of the countries outlining two cluster that override precisely the two regions, the European one and the Asian-African one. The greatest inequalities, the highest infant mortality, the largest share of people below the poverty line are associated with the higher prevalence of Covid. It should be noted that in the countries of south-eastern shore the data are not excellent and therefore caution is required in the interpretation of the results.

Maria Silvana SALVINI, Dipartimento di Statistica, Informatica, Applicazioni, Università di Firenze, mariasilvana.salvini@unifi.it

MOBILITY AND MORTALITY IN COVID-19 EPIDEMIC: A SPATIAL ANALYSIS

Venera Tomaselli, Massimo Mucciardi

1. Mobility and mortality in COVID-19 disease

The global epidemic of coronavirus disease 2019 (COVID-19) has threatened the loss of human life (Hu *et al.*, 2021), public health, safety, and disruption of face-to-face communication due to intangible, clinical severity of the infection, and fatal symptoms and has inhibited social-economic development worldwide in 2020, too (Liu *et al.*, 2020). The COVID-19 epidemic has forced public decision makers to implement mobility blocking policies to reduce the spread of the disease and, consequently, of the mortality through social distancing, school closures, and general lockdown of economic activities. Since the general non-uniform spread of the contagion within a country, a relevant policy issue is whether to have a differentiated implementation of the lift of the lockdown restrictions for different geographic areas, called a zone-based social distancing (Friedman *et al.*, 2020), or the geographic segmentation by World Health Organization (2020).

The public health rationale behind lockdowns is the risk of disease spread associated with movement of people. These policies have included working from home (so-called, *smart working*), reducing the number of commuters with the implicit assumption that restricting the movement of people, the risk of infection for travellers and other commuters in their areas of residence, work, and all of other activities decreases since the people mobility is a known vector for the spread of disease.

Despite the fact that lockdowns are aimed at restricting movement of people, this spatial dimension of infections is often overlooked in many empirical and theoretical papers addressing COVID-19 (Francetic and Munford, 2021). Since a consistent method to measure the evolution of contagion is missing, in the analyses of the spread and the consequences of the COVID-19 epidemic the spatial effects - in terms of dependence and heterogeneity (Bourdin *et al*., 2020) of the relationships among variables in different territorial areas - have been taken into account because the infection is concentrated in some areas and follows specific patterns according with territorial proximity (Kraemer *et al.*, 2020; Gatto *et al.*, 2020). The mobility restrictions play a key role in the spread of infection diseases mainly through social contacts between infectious and susceptible individuals (Zhang *et al.*, 2020; Riley,

2007) in order to save lives (Jia *et al.*, 2020; Wu *et al.*, 2020). Mobility data, indeed, can be useful to understand the dynamics of the epidemic and limit the impact of future waves and excess deaths. Mobile positioning personal data, as proxy of human mobility, shows a high correlation of the mobility and the spread of COVID-19 in the initial phase of outbreak (Iacus *et al.*, 2020).

In the present study an analysis is proposed to gauge for spatial patterns in the data on excess deaths, as a reliable indirect indicator, less affected by territorial assumptions and available at provincial level. The relationship between human mobility variations and increasing of excess mortality in Italy is analysed by the means of spatial effect estimation models, comparing the epidemic period from February to December 2020 to the pre-epidemic period from 2015 to 2019.

To analyse mobility flows among Italian provinces accounting spatial correlation, a spatial regression model is specified to estimate the effects of reduced human mobility on excess mortality using digital mobility data at provincial level after controlling for the time trend of the epidemic and provincial differences. The ongoing COVID-19 epidemic has highlighted the potential benefit of geo-located smartphone data to inform public health (Oliver *et al.*, 2020) and assess the impact of mobility restrictions on social distancing in near real-time (Pepe *et al.*, 2020; Badr *et al.*, 2020). Then, the relationship between mobility data, provided by Google Community Mobility Reports (GCMR, 2021) - a good source to assess changes in mobility due to different social distancing measures (Basellini *et al.*, 2020) - and data on excess mortality, registered by ISTAT (2021) from January to December 2020, is examined. Since the variation in human mobility may take a long time before producing an effect on mortality, the potential effect of changes of 'delayed' or lagged indicators of human mobility on excess mortality is mediated by a time lag of predictors (from the symptom onset to the death, the median value is equal to 24 days in June-September 2020) as estimated by National Institute of Health-ISS (2021).

The study aims at testing if the mobility indicators affect the excess mortality in 2020 both globally and locally in order to take into account temporal lag disparity among Italian provinces. In the first step, stepwise regression models have been specified selecting predictors related to human mobility. Afterwards, Geographically Weighted Regression (GWR) models (Wu *et al.*, 2021) are employed to test for spatial heterogeneous effects of the mobility on the mortality variation.

2. Spatial models for mobility and mortality data analysis

Spatial-temporal analysis of COVID-19 is crucial to understanding the spread of COVID-19. Specifically, for the spatial study, we explore the inter-correlations among independent variables before building the models. The GWR modelling is taken into

account for the geographical disproportion of the number of deaths. More importantly, compared to OLS models, GWR models are local linear regression models. They embrace the calculation of a parameter estimate of variations over space in the link between independent and dependent variables. The ordinary least square (OLS) is a traditional method for estimating a linear regression between dependent and independent variables. OLS assumptions involve the disturbances that have 0 mean and constant variance, in addition to no correlation among explanatory variables. The ordinary least squares (OLS) regression is an empirical approach that has generally been applied in the field of demography. Model parameters are assumed to be applied globally over the entire territory where measurements have been taken into account under the assumption of spatial stationarity (Brunsdon *et al*., 1996; Fotheringham *et al*., 2002) in the relationship among the variables. Therefore, OLS generates 'global' regression coefficients assuming that the relationships are constant over space.

This approach may mask spatial variability in the relationships and ignores the spatial dependency among variables. This circumstance may sometimes provide biased estimates and overstated statistical significance of relationships. Moreover, ignoring spatial effects in a modelling process causes misleading significance tests and suboptimal model specification (Huang and Leung, 2002). Several approaches for controlling spatial variability have been developed in a regression model, including use of a term representing or spatial autocorrelation in the dependent variable or in the residuals of the independent variables (Crase *et al.*, 2012) and the use of simultaneous autoregressive models (Pioz *et al.*, 2012). Among these, the Geographically Weighed Regression (GWR) models are particularly suitable for analysing territorial phenomena characterized by non-stationary variability, in contrast to standard regression models (OLS) (Brunsdon *et al.*, 1996; Fotheringham *et al.*, 2002).

The GWR procedure is founded upon two conditions. First, similarities between more adjacent geographical entities exist according with the Tobler's first law of geography, widely adopted as a basic principle in Geographic Information Science (Tobler, 1970). Each local regression of GWR is estimated with data whose influence decays with distances, commonly defined as straight line or Euclidean. Second, there are disproportionate distributions of explanatory variables in different territorial units, due to spatial autocorrelation and spatial heterogeneity. Based on Foster's spatial varying parameter regression, a Geographically Weighted Regression model (GWR) is localized through weighting each observation in the dataset. As pointed out by Fotheringham *et al.* (2002), local smooth processing was used to address the spatial heterogeneity. Under the consideration of spatial disparity, geographic coordinates and core functions are employed to carry out local regression estimation on adjacent elements. We recall that GWR model extend the traditional regression models by allowing the estimation of local parameters, so that the model can be written as:

$$y_i = \beta_0(u_i, v_j) + \sum_k \beta_k(u_i, v_j) x_{ik} + \epsilon_i \qquad \text{for } i = 1, \ldots\ldots, n \tag{1}$$

where: (u_i, v_j) denote the coordinates of the *i*-th location in space; $\beta_k(u_i, v_j)$ is a realization of the continuous function $\beta_k(u, v)$ at location i; y_i is the dependent variable at location *I;* x_{ik}, is the *k*-th independent variable at location *I;* ε_i is random error at location *i* with normal distribution and variance a constant.

GWR provides a regression equation for each observation weighted by location, which takes into account spatially varying relationships. To calibrate the model (1) Fotheringham *et al.* (2002) suggested using n local models (one for each location point) introducing a kernel weighting function. The principle of the kernel weighting function is to set a distance decay model (with weight range from 1 to 0 based on the distance of the points) around a point or spatial unit and to compute the local coefficients $\beta_k(u_i, v_j)$ using all the observations. Thus, around each regression point, nearer observations have more influence in estimating the local set of coefficients than observations farther away (Fotheringham *et al.*, 2002). In essence, GWR measures the inherent relationships around each regression point *i*, where each set of regression coefficients is estimated by weighted least squares.

3. Mortality and mobility variation data

The human mobility changes are observed through the data collected from Google Community Mobility Reports (GCMR, 2021) sources referred to human movement trends across different categories of settings: retail and recreation, grocery and pharmacy, parks, transit stations, workplaces and residential areas, during February-December 2020 at the Italian territorial provincial level. The GCMRs show how the visits and their lengths change compared to the baseline day, calculated for a specific calendar date as a positive or negative percentage. A baseline day represents a normal value for that day of the week. Mobility data from the GCMR are considered as an additional fixed effect. Thus, the regression coefficient has been interpreted as the change in *per capita* excess mortality for a unit change in the mobility indicator, always as compared to the baseline period (Basellini *et al.*, 2020).

GCMRs define the baseline as the median value, for the corresponding day of the week, during the 5-weeks period from January 3rd to February 6th, 2020. Next, the GCMR database is linked with the total deaths in the year 2020 at the provincial level compared with the average deaths in the period 2015-2019 (ISTAT, 2021). Since the high uncertainty surrounding the number of infections and deaths, in line with the growing general consensus in the scientific community (National Academies of Sciences, Engineering, and Medicine, 2020) on the excess mortality as the best indicator to assess the impact of the epidemic, the present analysis is focused on estimation of the excess mortality rate in terms of number of deaths above what would be expected in a non-crisis period, controlling for the size of the population. So, the

excess mortality variation (MV) is compared with the human variation mobility, measured through the GCMR variables shown in table 1.

Table 1 – *Mobility and mortality variables.*

Variable	Label	Source
Retail and recreation	Mobility trends for places like restaurants, cafes, shopping centers, theme parks, museums, libraries, and movie theaters.	Google
Grocery and pharmacy	Mobility trends for places like grocery markets, food warehouses, farmers markets, specialty food shops, drug stores, and pharmacies.	Google
Parks	Mobility trends for places like local parks, national parks, public beaches, marinas, dog parks, plazas, and public gardens.	Google
Transit stations	Mobility trends for places like public transport hubs such as subway, bus, and train stations.	Google
Workplaces	Mobility trends for places of work.	Google
Residential	Mobility trends for places of residence.	Google
Mortality variation	Mortality variation between 2020 and mean 2015-2019.	ISTAT

Since the analysis aims at assessing if an association between excess mortality and human mobility changes over time still exists, after controlling for the variation in provinces, it focuses on the period between May-September 2020 only to avoid mobility constraints imposed by national and local lockdowns. Moreover, considering that changes in human mobility may take some time to have an effect on mortality, the relationship between excess mortality and lagged indicators of human mobility is analysed. In other studies, accounting for a time lag of 5 or more weeks, a positive correlation between increased mobility and excess mortality, and a negative correlation between time spent at home and excess mortality has been measured. These relationships were significant within a mixed-effects regression setting that controls for the time trend of the epidemic and the different regional effects (Basellini *et al.*, 2020). The time period is set in about 30 days considering four times: 1) the onset of the symptoms of the disease; 2) the SARS-CoV-2 test; 3) hospitalization and 4) deaths as reported by Italian National Institute of Health-ISS (2021). In figure 1, the monthly trends for all the mobility categories, except for *residential*, show a strong decrease in mobility compared to the baseline.

The mortality variation (MV) is shown in the figure 2A. The highest values are concentrated in northern provinces despite the average national value: 15.57% (ISTAT, 2021). The Moran's index in figure 2B shows spatial correlation in the mortality data such just to support the spatial regression analysis. The trend for MV follows the so-called 'waves' of March and October (figure 2C).

Figure 1 – *Mobility trends by places from February to December 2020 – (Change from the baseline).*

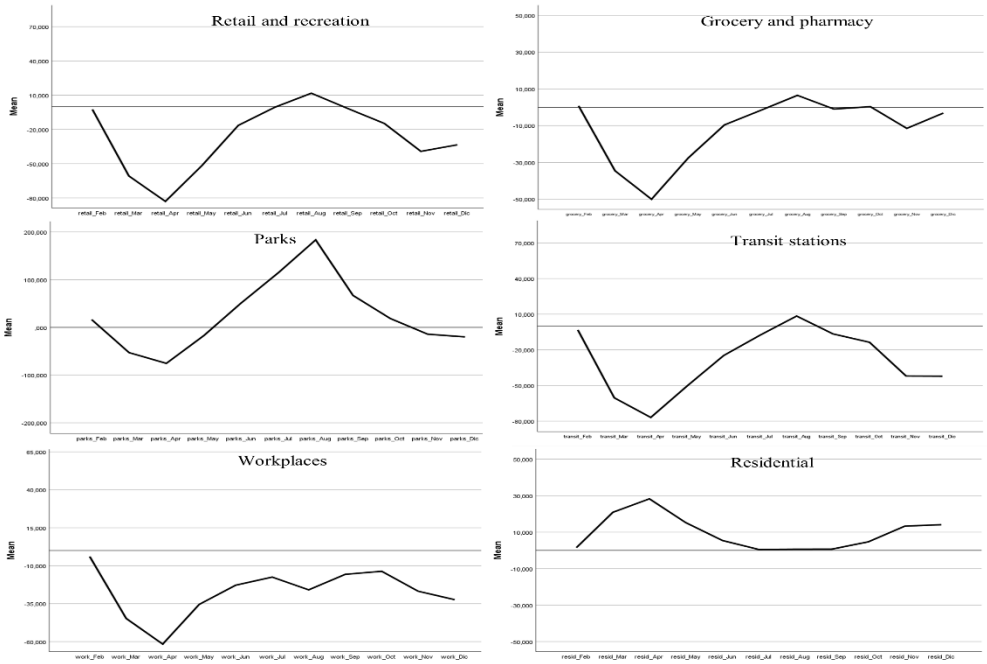
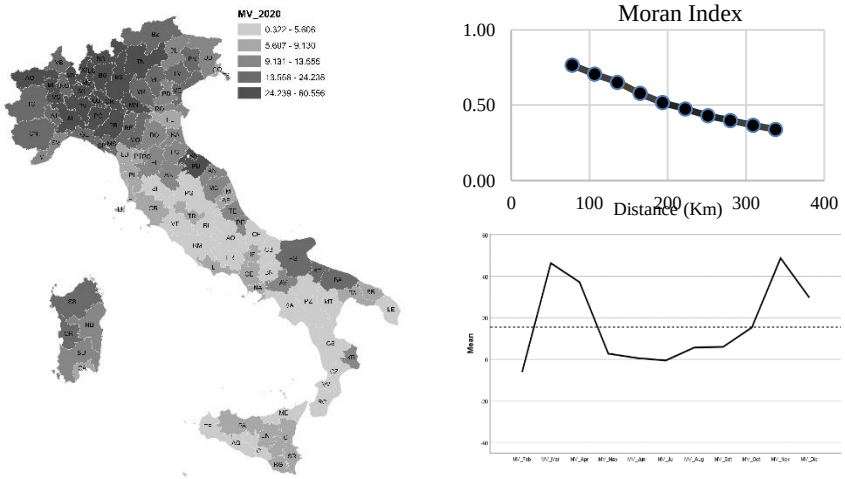


Figure 2 – *MV in Italian provinces (2020 vs 2015-2019) - (A); Moran index - (B); MV trend from February 2020 to December 2020 (C).*



4. Results

Before using the GWR model, stepwise regression models are specified to select the best lagged predictor of human mobility for the variable MV. Afterwards, the spatial analysis proceeds specifying the GWR model out the lockdown period (June, July, and August). The GWR model is specified if the test for spatial non-stationarity of the parameters is significant. A Monte-Carlo test has been employed to perform the analysis (Brunsdon *et al.*, 1996; Fotheringham *et al.*, 2002).

The results of the estimates for the 3 months are shown in table 2, where the correlation is positive (0.377) between MV in June 2020 and the time that people spent for retail and recreation in May 2020; negative correlation (-0.987) between MV in July 2020 and time that people spent at home in June 2020 and negative correlation (-0.938) between MV in August 2020 and time that people spent at home in July 2020.

Table 2 – *Estimates for the OLS and GWR model.*

Variable	OLS	Min	I Quartile	Median	III Quartile	Max	Test for non-stationarity
Model 1 - Dependent variable - MV_June							
(Constant)	20.121*	18.656	19.743	20.838	21.793	23.812	1.258
Retail_May	0.377*	0.345	0.370	0.389	0.412	0.449	0.026
Model 2 - Dependent variable - MV_July							
(Constant)	4.868*	-6.844	2.071	4.910	6.359	31.863	6.642*
Residential June	-0.997**	-5.669	-1.372	-1.062	-0.587	0.439	1.112*
Model 3 - Dependent variable - MV_August							
(Constant)	6.144**	5.895	5.981	6.006	6.041	6.298	4.302*
Residential July	-0.908*	-1.102	-0.963	-0.859	-0.796	-0.741	1.107*

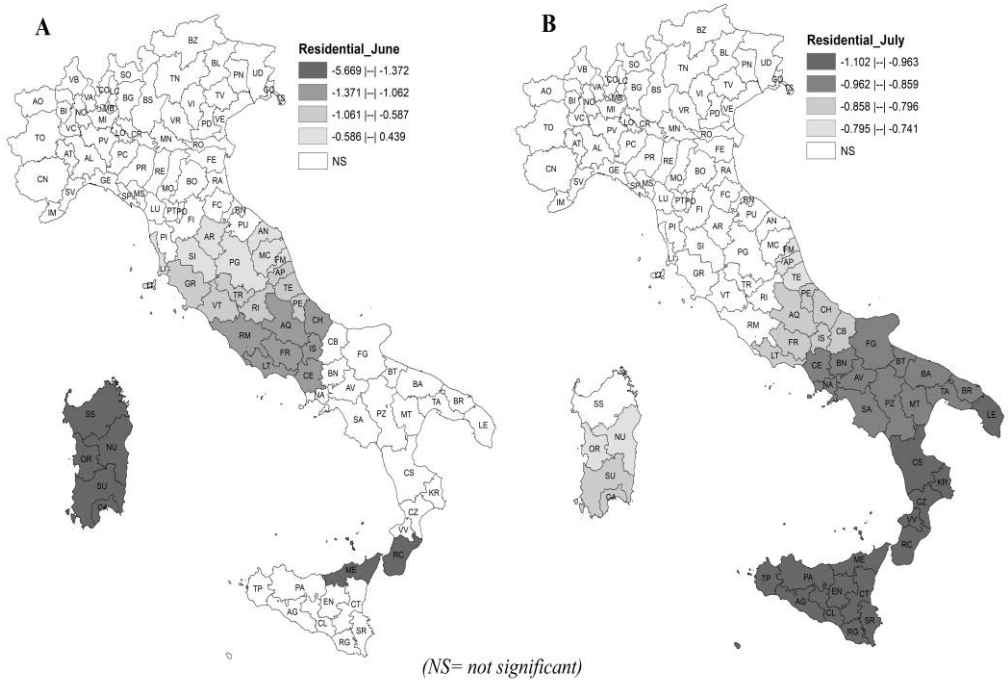
*p<0.05 **p<0.01. Both stepwise OLS and GWR (with Gaussian Kernel function) estimations are produced through STATA ver. 14.

As we can see for the June MV (model 1), the stepwise OLS model identifies the *retail and recreation* variable (mobility trends for places like restaurants, cafes, shopping centres, theme parks, museums, libraries, and movie theatres) as the best predictor. But the spatial non-stationarity test is not significant. Therefore the spatial analysis is not carried out (however, GWR estimates are shown).

In the models for the explanation of the July (model 2) and August MV (model 3) the best predictor is *residential* (mobility trends for places of residence or time spent in places of residence). In these two models the spatial non-stationarity test is significant and therefore the GWR is conducted in addition to the stepwise regression. Moreover the local coefficient mappings are shown in figure 3 for model 2 and 3 only.

In particular, the global analysis (OLS) shows that the reduction of time spent at home in the period of June (*residential*) is correlated to an increasing in the variation of mortality in July (table 2, model 2). Taking into account that isolation in Italy ended on May 4th, 2020, a time lag of about 1 month is needed to identify a relationship between excess mortality and change in human mobility. This is consistent with the amount of time over which the change in mobility affects the excess mortality. The re-opening of restaurants and in general of all activities related to leisure has (probably) an impact on the contagions and as a result on mortality in June. This impact does not show local clustering at the provincial level but the effect is across the country. July and August are traditionally characterized by holidays, with principal trips from Nord to Centre-South and in the main islands of Italy. So, the time spent at the home decreases significantly compared to the lockdown period (see figure 1, category *residential*).

Figure 3 – *Local coefficient estimates of Residential by quintiles range in June (A), July (B).*



5. Conclusions

In this paper the relationship between MV and changes in human mobility out of the lockdown period in Italy is explored. In detail spatial analysis shows the provinces where the lagged mobility predictors have the greatest impact on MV. Early results provide evidences to support that changes in human mobility are (probably) a 'conduit' for the changes in mortality observed in the summer of 2020. This is coherent with the findings of Francetic and Munford (2021) and Basellini *et al*. (2020). Although other experiments should be done, a time lag of approximately one month needs for the relation between excess mortality and change in human mobility.

However, the findings must be considered with great caution. GCMR data do not represent a perfect random sample of the target population as smartphone and tablet users. They may differ from the general population in terms of demographic, social, and economic features. Thus the results could be affected by a sampling self-selection bias. Nevertheless, the analysis shows not only that the mobility restrictions are effective to limit the potential negative effects of the COVID-19 epidemic on mortality but also the specific setting of mobility such as mobility trends for places of residence, is crucial. Furthermore, we plan to deepen the research considering an analysis by gender and re-estimate the models for the year 2021 also. In our opinion, the results obtained are consistent with the evidence that the re-opening in the summer after the lockdown probably favoured the re-start of infections and the second epidemic wave of autumn 2020 in Italy.

Finally, the analysis framework can be useful not only to address the debate within the scientific community in order to improve the understanding of the course of the epidemic and the actual benefit of a strategy to control the spread of COVID-19, but also to assess the crucial implications for public health decision-making in the event of future such inauspicious occurrences, as current events show, unfortunately.

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SUMMARY

Mobility and Mortality in Covid-19 Epidemic: A Spatial Analysis

The COVID-19 epidemic forced authorities to implement lockdown policies to reduce the spread of the disease and, as a consequence, the excess mortality. These policies encouraged homeworking, hence reducing the number of commuters with the implicit assumption that restricting human mobility reduces the risk of infection in areas of residence, work, and other activities. Yet, the spatial relationship among different areas has been rarely addressed both in the public discourse and in early accounts of the consequences of mortality in COVID-19 time period. As shown in literature, the spatial regression models are useful to analyse phenomena with non-stationarity variability in contrast to standard regression models.

By employing spatial regression models, the findings suggest that the higher the mobility to places of residence, the higher the excess mortality. This increasing in mortality is not homogeneous throughout the Italian provinces. Specifically, the variability in the mortality on August 2020 compared to the average value on 2015-2019 period (baseline) is greater in the Central-Southern provinces, due to the movements to the residence places in July 2020.

In conclusion, the spatial interactions between mobility and COVID-19 spread could support the analysis about the relationship between excess mortality and socio-economic settings, highlighting the importance of modelling spatial variability.

Venera TOMASELLI, Department of Political and Social Sciences, University of Catania, IT, venera.tomaselli@unict.it

Massimo MUCCIARDI, Department of Cognitive Science, Education and Cultural Studies, University of Messina, IT, massimo.mucciardi@unime.it

THE SANITARY EMERGENCY IMPACT ON THE COMPOSITION BETWEEN HOURS WORKED AND SHORT-TIME WORKING ALLOWANCE HOURS

Diego Chianella, Giuliano Latini, Annalisa Lucarelli, Emilia Matera

1. Introduction

Starting from 2020, due to the health emergency from Covid-19, there has been a reduction in the activities carried out by companies, both in the industrial (NACE Rev. 2 economic activity sections from B to F) and in the services sectors (NACE Rev. 2 economic activity sections from G to S). Hours worked decreased in all sectors while there was a large increase in the use of the Short-Time Working Allowance use (Cig in Italian). The recourse to the Cig by companies was made possible, also thanks to various support measures for businesses launched by the government (see Paragraph 2).

The quarterly survey on job vacancies and hours worked (Vela) and Large Business (GI) surveys, conducted by Istat, collect information on the hours worked in companies (Bellisai et al., 2013). The Cig hours collected include ordinary, extraordinary or derogating Cig hours and the solidarity contract hours. In 2020, they also include the solidarity fund hours.

In March 2021, Istat issued the focus entitled "The sanitary emergency impact on the Short-Time Working Allowance use" in the labour market press release. In the focus, an analysis is conducted on the evolution of Cig hours per employee used by companies both for the total economy (B-S) and for Industry and services separately. Furthermore, an analysis was carried out at the level of a single section of economic activity (Nace Rev.2 Classification). The purpose of this work is to resume that analysis, and update it with the annual reviews of the indicators produced within the Vela survey, which took place in June 2021. The analysis is also extended to the evolution of hours worked per employee and the series is extended to the first quarter of 2021. The contribution of the Cig hours per employee and the hours not worked but paid by the employer per employee to the total hours paid per employee will also be shown in the work (Paragraph 4).

The series analyzed in this work are from Q1 2016, as Istat published the series of hours worked for the total companies with employees, starting from the press release on the Market Labour of June 2019 (Chianella et al., 2020). Previously, the indicator was calculated only for companies with more than ten employees.

2. Government interventions

In order to limit the impact of the economic and labor crisis caused by COVID 19, the Government and Parliament have promptly adopted effective and coordinated measures (see Table 1). The volume of resources deployed amounts to over € 140 billion.

Table 1 – *Synoptic panel of the special government interventions. Year 2020.*

Decree	Time	Period	Social safety net
"Decreto Cura Italia" (DL 17.03 2020, n.18)	From 23 February to 31 August 2020	9 weeks	CIGO,CIGD, Solidarity contract hours (*)
"Decreto Rilancio" (DL 19.05.2020, n.34)	From 1st September to 31st October 2020	+ 9 weeks. 5 + 4	CIGO, CIGD (**), Solidarity contract hours
"Decreto Agosto" (DL 14.08. 2020, n. 104)	From 13 July to 31 December 2020	18 weeks. 9 + 9 (***)	CIGO,CIGD, Solidarity contract hours
"Decreto Ristori" (DL 28,10. 2020 n.137)	From November 16, 2020 to January 31, 2021	6 weeks (***)	CIGO,CIGD, Solidarity contract hours
Budget Law 2021 (L. 30.12. 2020, n.78)	From January 1st to March 31st 2021. From January 1st to June 30th 2021.	12 weeks	CIGO, CIGD Solidarity contract hours

(*) Short-Time Working Allowance (Cig in Italian): ordinary (CIGO), extraordinary or derogating (CIGD).The Solidarity contract hours is also recognized to employees of workers who receive other Solidarity Funds (i.e. those for handicrafts and temporary workers and for the autonomous provinces of Trento and Bolzano), which employ from more than 5 to 15 employees.
(**) CIGD is granted to private sector employers who are not protected by the current provisions (referred to in Titles I and II of Legislative Decree 148/2015) regarding the working hours suspension or reduction.
(***) The employer is obliged to pay an additional contribution for the second nine weeks.

The government's first action resulted in the "Cura Italia Decree", which provided for urgent measures not only to protect the health of citizens but also to support the world of work.

The subsequent "Rilancio Decree", issued in May 2020, offers a further and important intervention aimed at prolonging and strengthening actions in favor of health and safety and initiatives in support of businesses, employment income, tourism and culture.

The "Agosto Decree" continues with the aim of ensuring the economic and social stability of Italy, extending the measures already adopted in support of workers.
For the categories most affected by the crisis, the Government launches the "Ristori Decree" in October: the new measures are characterized by simple and immediate delivery methods.

At the end of 2020, the 2021 Budget Law offers a wide range of interventions in the field of work and business support and development.

The need to extend the restrictions following a new and significant increase in infections, in March 2021 the Government passed the "Sostegni Decree" to protect work and fight poverty.

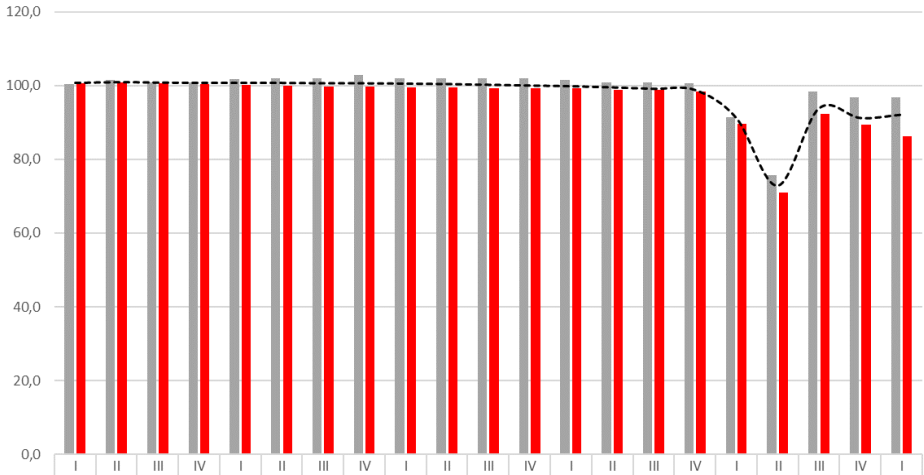
3. Dynamics of the short-time working allowance hours for the total economy, Industry and Services

Because of the COVID-19 health emergency, the year 2020 was characterized by an exceptional recourse to the Short-Time Working Allowance. It was due to the suspension or reduction of the enterprise working activity and supported by special government interventions. Figure 1 shows the seasonally adjusted series of indices of hours worked per employee. The collapse in hours worked per employee is evident starting from the 1st quarter of 2020. For the total economy (NACE Rev. 2 economic activity sections from B to S), in fact, it goes from an average index (over 2016-2019) of hours worked per employee of 100.3 to 87.3 in 2020. On the other hand, Figure 2 shows the series of Cig hours per employee, where the exceptional increase starting from the 1st quarter of 2020 is evident.

For the total economy (B-S), the hours of Cig per employee go from an average of 3.1 over the period 2016-2019 to an average of 45.2 in 2020. In the first quarter of 2020, the effects of the pandemic and the consequential lock-down mainly concerned the month of March and, therefore, had a more limited impact than that observed for the second quarter, when the total lock-down lasted for about two months.

As a result, per capita Cig hours – in industry and services (B-S) – rose from 27.2 in the first quarter to 93.0 in the second. In the third quarter of 2020, the improvement in the sanitary conditions and the consequential recovery of many economic activities led to a decrease in the use of the Cig, which fell to 28.8 per capita hours.

Figure 1 – *Seasonally adjusted quarterly series of hours worked per employee for Total economy (B-S), Industry (B-F) and Services (G-S) – from Q1 2016 to Q1 2021.*



	I 2016	II 2016	III 2016	IV 2016	I 2017	II 2017	III 2017	IV 2017	I 2018	II 2018	III 2018	IV 2018	I 2019	II 2019	III 2019	IV 2019	I 2020	II 2020	III 2020	IV 2020	I 2021
Industry (B-F)	100,5	101,6	100,8	100,9	101,8	101,9	101,9	102,9	102,0	102,0	102,0	101,9	101,6	100,9	100,8	100,6	91,4	75,8	98,3	96,9	96,9
Services (G-S)	100,7	100,8	100,7	100,4	100,2	100,0	99,8	99,7	99,6	99,6	99,4	99,2	99,2	98,9	98,8	98,4	89,6	71,0	92,4	89,5	86,2
Total (B-S)	100,7	100,9	100,8	100,7	100,7	100,7	100,6	100,6	100,5	100,4	100,2	100,0	99,8	99,5	99,1	98,8	91,2	72,9	93,8	91,2	92,1

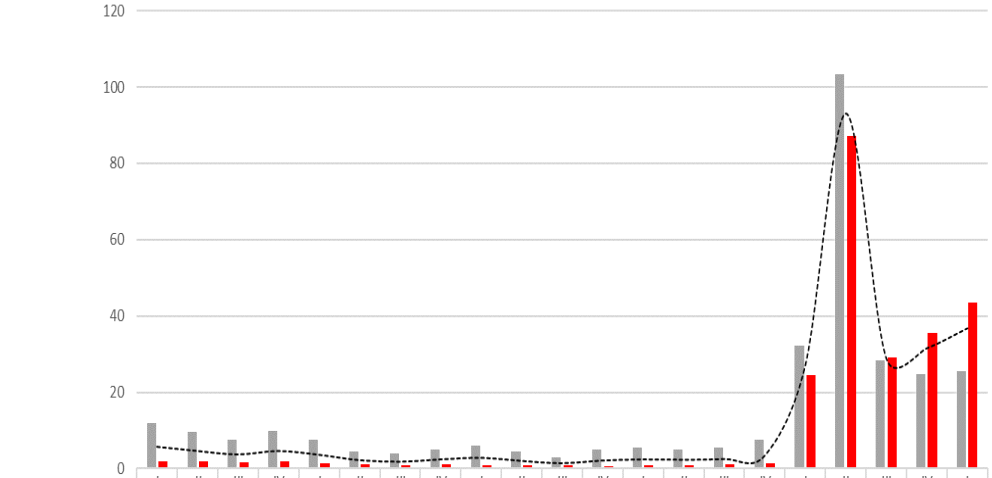
Source: Istat, processing on Vela and GI surveys.

In the fourth quarter of 2020, due to the second wave pandemic and the local lock-downs, the Cig per capita hours slightly increased (31.6 hours), mainly in the service sector.

Finally, in the first quarter of 2021 there is a further increase in Cig hours per employee (36.8 hours) following the increase in the number of positive cases at Covid-19 and the precautionary measures that have affected all Italian regions (yellow zone, orange and red).

The sectorial analysis shows that even if in the first two quarters of 2020 the Cig per capita hours were higher in industry than in the services' sector (32.1 to 24.5 in the first quarter, and 103.4 to 87.1 in the second quarter). In the third quarter, the two values are quite similar (28.4 and 29.0), while in the fourth quarter services exceed industry Cig hours (24.8 in Industry against 35.4 in Services). In the first quarter of 2021, the gap between industry and services in the use of the Cig increases. Compared to the 4th quarter of 2020, Cig hours in industry increased by 2.8% (reaching 25.5 hours of cig per employee) and by 22.3% in services (reaching 43.4 hours of cig per employee).

Figure 2 – *Per capita Cig hours per employee for Total economy (B-S), Industry (B-F) and Services (G-S) – from I 2016 to I 2021.*



	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I
	2016				2017				2018				2019				2020				2021
Industry (B-F)	12	9,6	7,6	9,8	7,6	4,6	3,9	4,9	6,1	4,5	2,9	5,1	5,6	5,1	5,4	7,5	32,1	103,4	28,4	24,8	25,5
Services (G-S)	2	1,8	1,7	1,9	1,5	1,1	0,8	1,1	1	0,8	0,8	0,6	0,8	1	1,1	1,4	24,5	87,1	29	35,5	43,4
Total (B-S)	5,8	4,7	3,8	4,7	3,7	2,3	1,9	2,5	2,9	2,1	1,5	2,2	2,5	2,4	2,6	3,5	27,2	93	28,8	31,6	36,8

Source: Istat, processing on Vela and GI surveys.

4. Contribution of the Cig hours and hours not worked but paid by the employer to the total of the paid hours

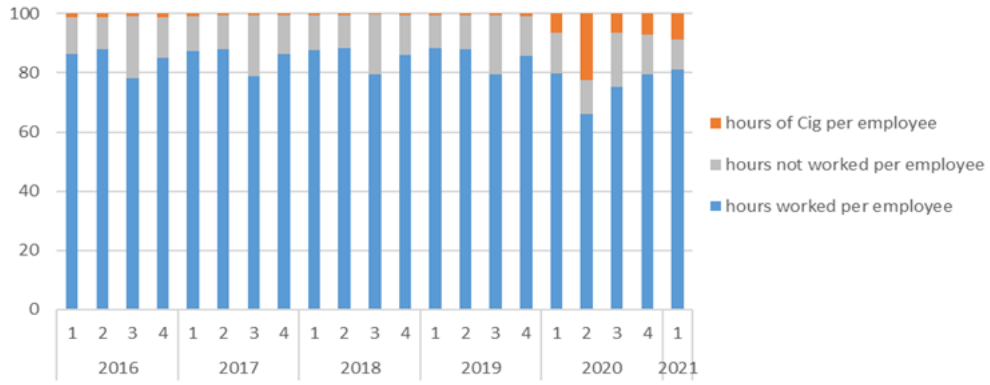
We consider the hours paid as the sum of three components: the hours actually worked and paid, the hours not worked but paid by the employer (such as holidays) and the hours of Cig.

Figure 3 shows the trend of the percentage contribution of the hours worked, hours not worked but paid by the employer and the hours of Cig, to the total of the paid hours, from the first quarter of 2016 to the first quarter 2020, for Industry and Services (B-S).

Starting from 2020, the series of hours paid per employee has been fairly preserved thanks to the increase in the share of the hours of Cig. Moreover, the contribution of hours not worked but paid by the employer, such as vacation days, show a high increase year-on-year, in the first quarter of 2020 (from approximately 11.0% in the first quarter 2019 to approximately 13.7% in the first quarter 2020). It is also evident,

from the Figure 3, that the greatest contribution of Cig hours to the total of paid hours took place in the second quarter of 2020, coinciding with the period in which there was the greatest number of days in lock-down.

Figure 3 – *Series of the percentage composition of paid hours, for Industry and Services (B-S). Q1 2016 - Q1 2021.*

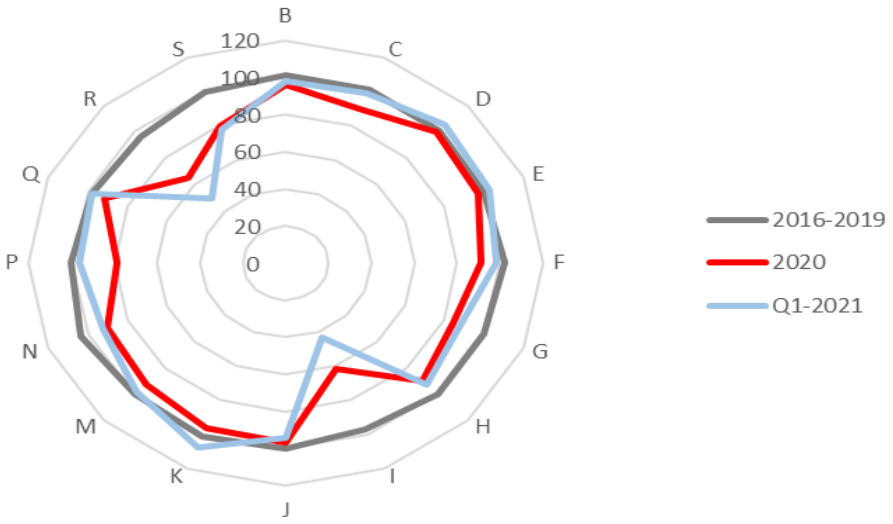


Source: Istat, processing on Vela and GI surveys.

5. Analysis of the Cig hours by Section (Nace Rev.2 Classification)

The radar chart in Figure 4 shows the evolution in the index numbers of hours worked per employee by section (Nace Rev.2 Classification). During 2020, the hours worked per employee decrease for all sections. In particular, for Accommodation and food services (I) the index number (base 2015=100) goes from an average value for the years 2016-2019 of 97.1 to 62.0 for the 2020 average (-36.1%); for Arts, entertainment and recreation activities (R) it goes from 96.0 to 64.8 (-32.5%) and for Education (P) from 100.4 to 78.9 (-21.4%). As we will see later, these sectors appear to be those with the highest number of Cig hours per employee, in support of paid hours per employee. In the first quarter of 2021, compared to 2020, the indices of hours worked per capita increase in almost all sections. The only sections in which they decreases are Accommodation and food service (I) from an average of 62.0 in 2020 to 43.6 (-29.7%); Arts, entertainment and recreation (R), which goes from 64.8 to 49.2 (-24.1%); Other service activities (S) from 79.8 in 2020 to 77.8 (-2.5%) and Information and communication (J) which passes from 97.1 to 94.5 (-2.7%).

Figure 4 – *Hours worked per employee (raw index number, base 2015=100) by economic activity section. Years 2016-2020 and Q1 2021.*



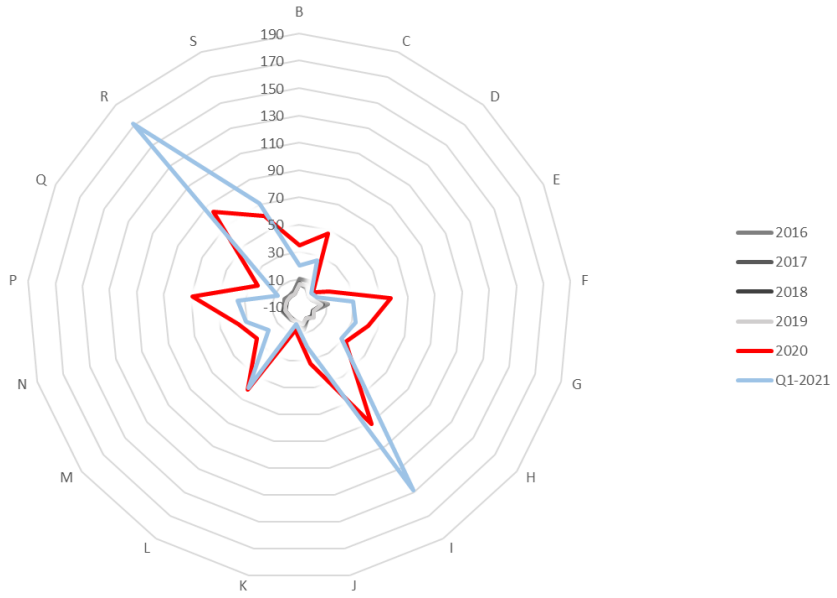
Source: Istat, processing on Vela and GI surveys.

Figure 5 shows the increase in per capita Cig hours in 2020 by economic activity sections, making a comparison between the annual averages in 2020 and in the years before the COVID-19 emergency (2016-2019).

In the past years, the economic activity sections that made the Cig's greater use were Construction (section F), Mining and quarrying activities (section B) and Manufacturing (section C) – showing average per capita Cig hours, in 2016-2019, equal to 8.1, 7.8 and 6.4, respectively –. In 2020, per capita Cig hours were about seven times higher than in the past years in sections F (57.3 hours) and C (47.5 hours), and about five times higher in section B (34.7 hours).

Furthermore, sections with the highest number of per capita Cig hours in 2020 were: Accommodation and food services (I), which from an average of 0.4 per capita Cig hours in the 2016-2019, rose to 91.0 in 2020; Arts, entertainment and recreation activities (R), from 0.4 to 83.9; Education (P) from 0.3 to 68.9. As mentioned above, these sectors have had the greatest decrease in hours worked per employee. On the other hand, the sector with the lowest use of the Cig was Electricity, gas and steam (D), which stood at an average of 4.4 hours per employee (0.4 in 2016-2019).

Figure 5 – *Hours of Cig per employee by economic activity section. 2016-2020 (annual averages) and Q1 2021.*



Source: Istat, processing on Vela and GI surveys.

In the first quarter of 2021, the hours of Cig per employee compared to the 2020 average, decreased in almost all sectors. The only exceptions concern: Arts, entertainment and recreation (R) where the hours of Cig went from 83.9 to 171.3; Accommodation and food service (I) which from an average of 91.0 per capita Cig hours rose to 148.4; Other service activities (S) which goes from an average of 60.9 in 2020 to 71.1 in the first quarter of 2021. As mentioned before, these 3 sectors correspond to those that have had a decrease in hours worked in the 1st quarter of 2021 compared to the average of 2020.

The index numbers of the hours worked per capita and the Cig hours per capita for the periods 2016-2019 and 2020 are shown in Table 2. The sectors highlighted in red are those just described for which there was a greater decrease in hours worked per capita and which have a greater number of Cig hours per capita.

Table 2 – *Hours worked per employee (index numbers, base 2015=100) and hours of CIG. Average values (2016-2019 and 2020).*

Economic activity section (Nace Rev.2 Classification)	Hours worked per employee (index number and variation %)			Hours of Cig per employee	
	average 2016-2019	average 2020	variation %	average 2016-2019	average 2020
B Mining and quarrying	101,4	95,8	-5,5	7,8	34,7
C Manufacturing	101,4	89,7	-11,5	6,4	47,5
D Electricity, gas, steam	101,3	99,7	-1,6	0,4	4,4
E Water supply; sewerage and waste	100,2	97,5	-2,7	0,7	14,4
F Construction	102,1	91,3	-10,5	8,1	57,3
G Wholesale and retail trade	99,9	84,9	-15,0	0,8	42,7
H Transportation and storage	100,5	90,1	-10,3	2,1	32,8
I Accommodation and food service	97,1	62	-36,1	0,4	91,0
J Information and communication	100,1	97,1	-3,0	4,8	32,7
K Financial and insurance activities	101,3	96,6	-4,6	1,3	7,4
M Professional, scientific, technical activities	99,8	92,4	-7,4	0,6	29,1
N Administrative and support service activities	103,5	90,6	-12,4	1,6	36,7
P Education	100,4	78,9	-21,4	0,3	68,9
Q Human health and social work activities	98,3	91,4	-7,0	0,5	24,3
R Arts, entertainment and recreation	96,0	64,8	-32,5	0,4	83,9
S Other service activities	99,4	79,8	-19,7	0,7	60,9

Source: Istat, processing on Vela and GI surveys.

6. Conclusion

We have seen that the government issued several decrees during 2020 to allow companies in all sectors to take advantage of the Cig hours, to manage the crisis due to the Covid-19 health emergency. During 2020, due to the health emergency due to Covid-19, companies experienced a decrease in hours worked per employee and an exceptional increase in Cig hours, both in the industrial (B-F, according to Nace Rev.2 classification) and service sectors (G-S). While in the first two quarters of 2020, it was

the industry sector to have the highest number of Cig hours per employee, starting from Q3 2020 it was the services sector. This is due to the second wave pandemic and the local lock-downs, which has had negative repercussions, in particular for Accommodation and food services (I), for Arts, entertainment and recreation activities (R) and for Education (P).

In the first quarter of 2021, the hours of Cig per employee compared to the 2020 average, decreased in almost all sectors. The only exceptions concern: Arts, entertainment and recreation (R); Accommodation and food service (I) and Other service activities (S).

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SUMMARY

The sanitary emergency impact on the composition between hours actually worked and short-time working allowance hours

This work aims at analyzing the effect of the special government interventions, carried out to face the COVID-19 health emergency, on the composition between hours actually worked and short-time working allowance hours (Cig in Italian). Furthermore, the impact of the government measures on different types of enterprise activities has been taken into account (at NACE Rev.2 economic activity section level).

The analysis carried out in this work have been based on the variables available from the Istat quarterly survey on job vacancies and hours worked (Vela) and the monthly Large Business Survey (GI). These sources of information, in addition to the hours worked – broken-down by ordinary, overtime and paid but not worked (such as holidays, festivity, etc.) hours –

quarterly collect data on the effectively used Cig hours, which include ordinary, extraordinary or derogating Cig hours and the solidarity contract hours. The information used in this work is in terms of the per capita quarterly hours, that are defined as the total amount of hours over a quarter (actually worked, Cig, paid but not worked hours) divided by the average number of employees. Changes in the composition have been focused by means of year-over-year changes and a comparison between the annual averages in 2020 and in the years before the COVID-19 emergency (2016-2019).

The analysis has showed that quarterly dynamics of both the hours actually worked and the Cig hours follow the effect and the length of the government interventions, highlighted the exceptional recourse to the Cig with respect to the past years.

In particular, in the first quarter of 2020, the effects of the pandemic and the consequential first lock-down mainly concerned the month of March and, therefore, had a more limited impact than that observed for the second quarter 2020, when the total lock-down lasted for about two months. As a result, per capita Cig hours – in industry and services (NACE Rev. 2 economic activity sections from B to S) – rose from 25.6 in the first quarter to 91.7 in the second; while per capita hours actually worked in the quarter fell from 339 to 278.

In the third quarter of 2020, the improvement in the sanitary conditions and the consequential recovery of many economic activities led to a decrease in the use of the Cig, which fell to 28.5 per capita hours, and to an increase of the hours actually worked in the quarter, up to 330 per capita hours. In the fourth quarter of 2020, due to the second wave pandemic and the local lock-downs, the Cig per capita hours slightly increased (32 hours) while the actually worked ones slightly decreased (346).

The work also analyzed the composition of the Cig per capita hours at the level of economic activity section (NACE Rev.2) and the changes compared to past years were highlighted.

Diego CHIANELLA, ISTAT, chianella@istat.it
Giuliano LATINI, ISTAT, latini@istat.it
Annalisa LUCARELLI, ISTAT, anlucare@istat.it
Emila MATERA, ISTAT, ematera@istat.it

RESEARCH-ACTION AND COVID-19: A CASE STUDY

Nidia Batic

1. Premise

1.1 Children and the lockdown

Only a few studies have been undertaken so far to determine the psychological consequences of the 2020 lockdown[1] on children. Sprang and Silman studied in 2013 the psychological effects resulting from pandemics, highlighting that periods of isolation such as quarantine can traumatize children, as well as their families. Taking account of current experience, it appears to be the case that children and adolescents are more vulnerable to the effects of the Covid-19 pandemic than adults, and tend to react psychologically in a negative way (Zhou, 2020), leading to manifestations of anxiety, depression and stress (Xiang *et al*., 2020)[2] or uncertainty, fear, distraction and irritability (Jiao *et al*., 2020).

In Italy, Conti *et al*. (2020) assessed emotional and behavioral changes in minors with neurological and / or psychiatric disorders during lockdown, verifying an increase in anxiety disorders and somatic problems in children (up to 5 years), with an increase in obsessive problems -compulsive between 6 and 18 years, which are also correlated with the onset of economic problems in the family. A research study by IRCCS Gaslini (2020)[3], highlighted the onset of sleep disorders, anxiety attacks and increased irritability in Italian children and adolescents during the same period. Mantovani *et al*. (2020)[4] explored the emotional and behavioral reactions of young children through the testimonies of parents and, considering the age group between 6 and 10 years, there was an improvement in relationships with parents (37.6%) and

[1] With the Prime Ministerial Decree of March 9, 2020, the start of a national lockdown period was decided, due to Covid-19, which had lasted until May 18, 2020.

[2] There is abundant literature relating the psychological and social effects of traumatic disasters (Covid-19 on the adult population. See: Osofsky J.D. et al. (2020); Pfefferbaum and North (2020).

[3] The research was conducted between March 24 and April 3, 2020 and revealed that, just a few days after the beginning of the lockdown period, the isolation had led to reactions both on physical health and also on the emotional state of family members, of all ages.

[4] The research was conducted in July and August 2020 in the provinces of Lombardy most affected by Covid-19, involved 3,440 families and concerned about 6,000 children between the ages of 1 and 10.

with siblings (31.1%), but at the same time they suffered from not being able to go to school (62.3%) and, above all, not being able to play with other children (78.4%). With regard to behavioral reactions, sleep alterations emerged in 47.9% of cases, a widespread decrease in attention (73.8%) and a worsening in concentration (83.0%). One third of parents have noted the presence of fears in their children (the most common are: the fear of going out and interacting with other people), which corresponds to 17.9% of children between 6 and 10 years.

Wang *et al*. (2020), reports that the absence of school activity causes a harmful psychological impact in children and adolescents leading to impaired concentration on school activities. Phelps and Sperry (2020), in their study correlate this with the strong emotional and also economic impact that the pandemic has had on families. The children's response therefore depends on the reactions of their parents, and it appears that children who have suffered loss of loved ones during a pandemic may even experience serious mental crises (Earls *et al*. 2008).

As Maria Rita Parsi (2020) reflects, even forced separation from grandparents or their demise can have negative repercussions on children. Furthermore, the family itself can be a source of destabilization for those children who have been forced to stay at home for the entire time of the lockdown in "dysfunctional" families where economic difficulties and psychological breakdowns have been added to the pre-existing problems of coexistence and relationships. For those children who live in "containing" families the situation is different. Those children who have lived in a climate of harmony have been able to overcome the psychological repercussions of the pandemic. In both cases the behavior of the parents has an influence on their children and the sudden changes that families had to face may have provoked maladaptive psychological reactions (Fontanesi *et al*. 2020).

What Parsi fears is that Covid-19 has given rise to "Psicovid-19", that is a long trail of consequences on an emotional level in all age groups, including children, "triggering fears in them, as in all for the near and future future, anguish of death, panic, psychic and physical malaise "(Parsi, 2020, p. 121).

But the lockdown period has also had positive results, due to the fact that in many cases parents and children have been able to spend a lot of time together, without the daily commitments that mark the day and have been able to devote themselves more to activities that they are usually are not able to share, improving the relationship between parents and children (Wang *et al*., 2020).

1.2. Action research

The German psychologist Kurt Lewin[5] coined in the 1940s (Lewin, 1946, 1947) the concept of action research. A peculiarity of action research consists in combining theoretical knowledge and action in a circular process, for change in a group or for social change, in which researchers are themselves actors of change, and represents "the place and the moment through which [the process] produces knowledge" (Trombetta and Rosiello, 2000, p. 250). Subsequently, the action research method began to be used also in the educational field. Within this field it configures itself as reflective research with the aim of intervening on contingent problematic situations, circumscribed in a space-time problematic context, and not with the aim of creating laws or theories which reflect on the practice of the change to be made. Therefore, the teacher is the main protagonist of the research-action path started in the classroom. The teacher can cover both roles of researcher in a context[6] and also agent of change. Detecting a problem in a concrete reality s/he proceeds with an analysis of "that" context (which is never static and amidst unforeseen events, after Perticari, 1996) and gives rise to useful indications for starting a change that takes into account the uniqueness of that specific reality and the dynamics that are remembered in it. The exploration change starts, and it is a flexible and "recursive process of planning, observation, reflection, redesign" (Varisco, 2002, p. 243). The research can lead to modifications according to the changes that occur in reality and thereby provide an added value useful for achieving the final goal.

In action research, comparison is important throughout the process. To prevent the teacher from falling into self-referentiality it is preferable to work in a group that allows exchanges and reflections to share. However, it is also possible to remain within an individual dimension, and in this case the teacher can systematically resort

[5] Kurt Lewin was an exponent of Gestalt theory and in 1922 he theorized the concept of "psychological field", from which the study of social dynamisms began, which subsequently led him to define the concept of "social field" and to deal with individual dynamics and of interdependence between people and the environment. Lewin was convinced that social psychology should not remain relegated to the world of theory, but should immerse itself in reality, and psychological research should represent not only an opportunity for study, but for intervention on the social. This approach subsequently led him to illustrate the paradigms of Action Research in his works of 1946 and 1947 and in 1947 he founded the journal Human Relations which deals with the study of social problems (Trombetta and Rosiello, 2000). Emblematic of Lewin's thought is the statement that "Research that produces only books is not enough" (Lewin, 1946, p. 35).

[6] In action research in the school environment, the expert researcher, while remaining a point of reference, makes his knowledge and skills available to the teacher in order to make him autonomous in the entire research process and subsequent intervention on the situation-problem (Mantovani, 1998). It is in this that action-research is distinguished from pure research, where the researcher is in a position of detachment from the situation, observes it, analyzes it, interprets it, but does not intervene on it.

to feedback from pupils who become co-protagonists of the research (Losito and Pozzo, 2005).

The action research project presented here takes place within the primary school where the teacher became a researcher in order to be able to address a latent problem that probably would not have emerged without a targeted exploration: pandemic-related experiences of children.

2. Objectives, tool and method

The aim of this research was to make primary school teachers acquire useful information to understand what the emotional and experiential experience of children of third, fourth and fifth grades was during the lockdown of spring 2020 and what are the current emotional states towards the Coronavirus epidemic. To this end, a questionnaire divided into 20 questions was prepared, previously tested on a group of 67 children. A funnel technique was used to help children in memory recollection to help them to focus on the lockdown period; first asking them about the memories they had of how they spent their time during that period, and through this process to bring out the emotional aspects. After the initial factual questions (gender and class attended), questions were inserted to verify: a) the knowledge that children have about Covid-19; b) how they spent their time during the lockdown; c) emotions and feelings during the quarantine; d) current emotions and feelings; e) what they have learnt during that time. Only two open questions were introduced in the questionnaire: the initial question "Briefly explain what Covid is" and the final question "Do you want to add something?".

The administration of the questionnaire took place in the classroom. Questionnaires were distributed to the children, the teacher read the questions one at a time and the children answered independently. The data was collected anonymously and processed in aggregate form in full compliance with privacy according to the GDPR (2016/679) and Legislative Decree 101/2018[7]. The research took place in the period between January and May 2021, involving 29 primary school classes in the north-eastern provinces (Belluno, Gorizia, Pordenone, Treviso, Udine, Venice). The sample consisted of 533 pupils, of which 19.2% third grade pupils, 51.0% fourth grade and 29.8% fifth grade, with an overall presence of 51.1% males and 48.9% of females.

Given the methods of selecting the sample and the purposes of the action research, there is no probabilistic sample, therefore the results of the research cannot be subject

[7] The trainee students of the primary education science course of the University of Udine administered the questionnaires in the presence of the class teachers. The managers of the schools involved in the research project approved it before administering. The families signed after reading the information form and they gave consent for the administration of the questionnaire to their children.

to inference, but have provided useful information to the teachers who have undertaken targeted interventions in response to the emotional difficulties manifested in their pupils.

3. Data analysis and hypothesis testing

3.1. Knowledge about Covid-19

The children have understood that Covid is a virus and they explain in simple words some concepts that, given their age, are probably still being developed, but very effective: "it is a very dangerous virus that prevents us from being together and we must put on the mask "; “It is a virus that divides us like a transparent wall. It is a test of life for all of us which we must face by being strong and united”; “Covid is a very strong virus that fights all people, if you catch it you can even die. Because of Covid we had to stay home from school "; "It's a big blue ball with big lines on the hips".

Since the focus of the research project's interest was to bring out the emotional experience of children, with the intention of starting projects to support their fears, it was decided to present only those results that are directly related to this objective.

3.2. Emotional experience aroused by Covid-19

Fear is an emotion that is very present in the memory of children. In fact, the fear that during the lockdown some family member or friend would get sick with Covid, was experienced by 81.4% of children, regardless of age, but with a gender difference (males 77.1% and females 85.8 %)[8].

But the pandemic has not yet passed and the children not only remember well what they lived during that period of forced stay at home but also report what their current fears are. What is most frightening of all is the fear that loved ones can get sick (Me 5), and that they themselves can get Covid (Me 5). The fear of getting sick (Covid aside) (Me 4) is stronger as children age (χ^2 test = 35.571, critical value = 18.307) and is different for males and females (Me 3 and Me 4) (χ^2test = 20.775, critical value = 11.070). The fear of frequenting crowded places also increases with age (Me 1 in the third and Me 3 in the fourth and fifth) (χ^2 test = 32.633, critical value = 18.307), while

[8] To verify the statistical significance of the differences between age (i.e. between classes) and gender, the χ^2 test was applied, with $\alpha = 0.05$. Below, we will report only the values of the tests that were significant and the respective critical values (for the χ^2 tests, see Ian Diamond and Julie Jefferies, 2006). The χ^2 test, by gender, is equal to 6.567, critical value = 3.841.

there is no gender difference. Everything else does not seem to cause concern in children (tab. 1).

Table 1 – *What is frightening children now (median value).*

	Median
That the people they care about get Covid	5
Get Covid themselves	5
Getting sick (cough, cold, fever)	4
Attending crowded places	3
Indoor playing	1
Taking public transport	1
Playing outdoors alone	0
Playing outdoors with others	0
Be close to friends	0
Playing sports	0
Going out	0

To explore the presence of anxiety situations experienced by children it was decided to resort to an indicator that, as seen in the mentioned research, it can be an indication of stressful conditions- namely sleep- by asking them if during the lockdown they had or not had sleep-related problems [9] (tab. 2), and it emerged that the majority went to sleep late, with a statistically significant increase with increasing age (from 56.4% in third to 69.2% in fifth) (χ^2 test = 7.190, critical value = 5.991). Even the choice of going to sleep with mum and dad differs between the ages, with a higher propensity for fourth grade children (χ^2 test = 19.837, critical value = 5.991). Regarding gender, there was a difference in having bad dreams (males 18.2%, females 26.5%, χ^2 test = 5.388, critical value = 3.481), in not being able to fall asleep (males 25.2 %, females 39.6%, χ^2 test = 12.620, critical value = 3.481) and having many thoughts on the effects of Covid or on school (males 26.3%, females 36.9%, χ^2 test = 6.931 , critical value = 3.481).

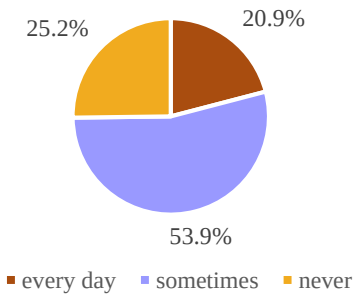
Table 2 - *Behavior of children at night by class (percentage values).*

	%
I went to sleep late	60,4
I slept peacefully	59,1
I couldn't fall asleep	32,3
I had so many thoughts	31,5
I woke up often	28,7
I had bad dreams	22,3
I used to go to sleep with mom and dad	12,1

[9] The repercussions on sleep of the current pandemic period were studied on adults (Kutana and Lau 2020; Huang and Zhao 2020).

Boredom and loneliness are emotions that emerged unexpectedly which are not to be underestimated. Boredom, to varying degrees, characterized the days of children during the lockdown without distinction of gender; only 25.2% said that they had never been bored (fig. 1). On the other hand a distinction is made by age: younger children get bored less "every day", with a crescendo with increasing age (11.7% in third, 22.3% in fourth and 24.5% in fifth).

Figure 1 - *The children got bored (percentage values).*



Out of the total number of children interviewed, 49.9% said that in that period they sometimes felt alone, without distinction of gender but of age. In fact, it ranges from 37.6% of third grade children to 48.5% of fourth grade children to 60.1% of fifth grade children (Test of $\chi 2 = 12.904$, critical value = 5.991). Of the total number of children who felt alone, 25.4% got bored every day, 54.9% every now and then and only 19.7% never. It is sobering that 77.7% of children who said they felt lonely have siblings and 83.0% of them said their parents stayed home longer than usual during the lockdown. Overall, 12.7% of all children felt lonely and bored every day and 27.4% felt lonely and bored at times.

Still in the sphere of emotions, children reflected about the things that they missed during the lockdown, using an ordinal scale with four positions (from "not at all" = 1 to "a lot" = 4) (tab. 3). It is clear that children have suffered a lot from being far from friends and relatives, so much so that it is also pointed out in the "other" option placed at the bottom of the question, from which 25.3% of friends and 14.5% of grandparents stand out. which is joined by 22.3% of teachers and, also, 4.5% of fathers and 3.0% of mothers.

Table 3 - *How far away certain habits or people are (median value).*

	Median
Meeting with the grandparents	4
Meeting with friends	4
Meeting with cousins	4
Meeting with the uncles	4
Celebrating their own birthday	4
Going out without the mask	4
Going to school	3
Running outdoors	3
Going for grocery shopping	2
Going to the garden / park	1

Faced with a situation that emotionally put them to the test, we can say that Covid has also had educational and training effects on children who have recognized that they have learnt to respect the rules (67.5%), help at home (63.5%), appreciate school (47.5%), but they have also learnt to be more independent (56.5%), and to be alone (39.2%) - even if 60% of the latter suffered from this loneliness. On the relational front, 53.1% said they had improved relations with family members, 39.0% learnt not to make their mothers angry and 32.2% improved relations with their neighbours.

To conclude we can quote a child who wrote: "I learned to appreciate life as it is and I also learned to help people, even not good people".

4. Conclusions: from Research to Action

The focus of the research was on emotions. The data collected reveal the profiles of children who are aware of the seriousness of the situation they are going through. Children have become more responsible and have understood the importance of rules, and have learned to appreciate things whose lack has made them recover their value. The data also revealed a strong sharing of the fear of Covid and, unexpectedly, the non-negligible presence of children who were bored and / or felt alone, despite the presence of siblings or family members.

Since the focus of Action Research is the psycho-social well-being of children, it is the teacher's duty to address not only the problems that emerge from the majority of children, but also those that may affect a small number of them or even just one. Therefore, the transition from Research to Action requires the involvement of the whole class and a participatory role of the teacher. The actions that the professor will implement will first of all be listening and sharing; the purpose of these actions is to overcome the negative emotional condition, which will be followed, at the end of the course, by a moment of evaluation of the effectiveness of the project.

Listening is the first rule that the teacher must use to explore the emotional experience of each child and it helps him realize what has happened and also it guides and supports him in his process towards resilience. The second strategy is sharing. It is important that the teacher makes children understand that adults also feel their own fears and concerns, and therefore it will be the teacher who will speak first about their own experiences; this will enable all children to do the same. It is reassuring to understand that we only feel certain emotions and it is important to be able to share not only the moods but also the strategies that everyone has used to overcome difficult moments.

To do all this, the teacher can use different tools and ways of working. For example, direct techniques such as circle time or spontaneous discussion or projective techniques such as drawing, inventing stories, completing cartoons or story endings, role playing simulations or theater workshops.

For example, in regards to the theme of fear, it could be addressed by inserting it into a broader discourse on emotions - that is, recognition and control of emotions. The teachers must talk first about their own experience during the lockdown and then let the children talk; this "normalizes" the fear by making it clear that everyone has gone through certain emotions and feelings. It is important not to minimize the pandemic problem nor to deny it but to recognize it and make it clear that when faced with a problem, a solution must be sought. Whatever the operational strategy chosen by the teacher (circle time, the box of emotions, drawing, dramatization, reality assignments, watching educational videos), it is important that children learn to recognize their emotions and difficulties in dealing with them. Sharing experiences can be a first step in learning emotional regulation (Gross, 1995).

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SUMMARY

Action research and Covid-19

School can play an important role in helping children to manage the general situation attributable to the Covid-19 epidemic. To bring out the emotional problems related to this period, the most suitable strategy seemed to be the start of an action research project. To proceed, a questionnaire divided into 20 questions was administered with reference to the experience of the spring 2020 lockdown and their current emotions.

The research was carried out between January and May 2021, in some provinces of northeastern Italy, and 533 children of the third, fourth and fifth grades of primary school were interviewed who all know what Covid-19 is.

In this work we have chosen to present the emotional reactions of children and the first feeling that emerges is the fear that a family member would get sick (81.4%), and still persists as the main fear (median 5 out of 5) and equally present is the fear of catching Covid themselves (median 5 out of 5) The presence of an anxious experience during quarantine is represented by 60.4% of children who went to sleep late, 32.3% who found it difficult to fall asleep or who he had many thoughts on the effects of Covid (31.5%) or woke up often (28.7%) or had bad dreams (22.3%). Only 14.2% said they always slept peacefully.

Two unpredictable results will have to lead to further exploration. First, 49.9% of children said they felt lonely during the lockdown, despite 77.7% of them having siblings and 83.0% of their parents stayed at home longer than usual in that period. The second figure concerns three quarters of the children who say they were bored during that period: 20.9% every day and 53.9% sometimes. Overall, 12.7% of all children felt lonely and bored every day and 27.4% felt lonely and bored at times.

But there are also positive aspects: 72.6% of children say they changed during the period of the lockdown. They matured personally: they learned to respect the rules (67.5%), to be more independent (56.5%), to appreciate school (47.5%) and to be alone (39.2%) and their family and social relations improved: 53.1% improved relations with their families, 39.0% learned not to make their mothers angry and 32.2% improved relations with neighbors.

Nidia BATIC, Department of Economics and Statistics, University of Udine, nidia.batic@uniud.it

THE DETERMINANTS OF LAND USE IN ITALY FROM A SPATIAL PERSPECTIVE: A RE-INTERPRETATION AT THE TIME OF COVID-19

Gennaro Punzo, Rosalia Castellano, Emma Bruno

1. Introduction

Since ancient times, mankind has radically transformed natural soil into artificial areas, exposing sustainability at risk due to the severe implications for the environment, the economy and society at large (Bajocco *et al.*, 2018). This irreversible loss reduces the ability of soils to provide support for the biotic component of the ecosystem and to ensure biodiversity and social enjoyment (Narducci *et al.*, 2019).

Only recently, the need for a systematic understanding of the resulting social and environmental problems has emerged as a prerequisite for designing sustainable policies to reverse current trends in land degradation (European Environmental Agency, 2017). The UN Sustainable Development Goals (SDGs) include strengthening inclusive urbanisation and promoting integrated management solutions for long-term sustainable land use by 2030.

However, due to the lack of coordinated land management background, many countries may not be able to achieve sustainable development objectives without changing their current policy frameworks and land-use practices (Wubie *et al.*, 2021). Moreover, given the pervasiveness of the impact of the Covid-19 pandemic on the different dimensions of sustainable development, urban planning programs and local development policies are likely to be rescheduled. In this respect, the question arises whether the Covid-19 pandemic will be a stimulus to change the current development model in the direction suggested by the SDGs, or whether the policies aimed at tackling the resulting economic damage will overshadow the environmental aspects.

Based on the above, this work aims to provide a deep understanding of the territorial factors that best quantitatively describe land use in Italy from a spatial perspective, investigating spillover effects both in the patterns of land use and in their socio-economic and institutional determinants (Mellino and Ulgiati, 2015; Irwin and Bockstael, 2002). Moreover, in an attempt to give useful insights for policymakers in the design of sustainable land management strategies, this work provides a reinterpretation of the results of spatial econometric models in light of the recent evolutions due to the Covid-19 pandemic.

The remainder of the work is organised as follows. Sections 2 and 3 illustrate methods and data, respectively. Section 4 shows the main results. Section 5 discusses some policy implications and concludes.

2. Method

In a preliminary step, spatial measures are used to assess spatial autocorrelation in land use levels in Italy. Having defined the spatial weight matrix (W), Moran' *I* allows us to evaluate the *global* spatial autocorrelation, i.e. how similar are the land use levels between neighbouring municipalities. Moran's *I* only offers averages in spatial proximity measurement that can hide interesting micro-concentrations of spatial dependence in the phenomenon being analysed. To detect the presence of significant clusters, we also perform *local* Moran's *I*. The local indicators of spatial autocorrelation (LISA) identify 'hot' (high-high) and 'cold' (low-low) spots where municipalities with similar land use levels are adjacent.

Subsequently, in the framework of spatial econometric models, we perform the Spatial Durbin Model (SDM), which includes the spatial lags of the exogenous variables as well as the spatial lags of the endogenous variable (LeSage and Pace, 2009). The SDM provides unbiased coefficient estimates even in the presence of spatial error dependence (Elhorst, 2010). Formally:

$$y = \rho Wy + \alpha \iota_N + X\beta + WX\theta + \varepsilon \qquad \text{with} \qquad \varepsilon \sim N(0_{nx1}, \sigma^2 I_n) \tag{1}$$

where:

- y: dependent variable given by land use rates (LURs, hereafter) observed on all Italian municipalities;
- X: matrix of own-municipality characteristics;
- β: vector of parameters associated with the set of covariates X;
- α: intercept (i_N is the vector of ones);
- W: spatial weight matrix;
- ρ: scalar for the endogenous interaction effects (Wy) known as spatial autoregressive;
- θ: vector of the parameters for the exogenous interaction effects (WX);
- ε: vector of independently and identically distributed error terms with zero mean and constant variance.

The change in a covariate in a given municipality *directly* affects the dependent variable in that municipality and *indirectly* affects the dependent variable (spillover effects) in all other municipalities. Both direct (2) and indirect (3) effects of a

particular covariate also depend on the coefficient θ_k of the spatially lagged value of that variable (Elhorst, 2010). Formally:

$$Diagonal\ elements\ of \quad (I - \rho W)^{-1}[\beta_k + W\theta_k] \tag{2}$$

$$Off - diagonal\ elements\ of \quad (I - \rho W)^{-1}[\beta_k + W\theta_k] \tag{3}$$

3. Data and variables

The analysis is carried out at the municipal level (*n*= 7,998 municipalities). This choice is justified in light of the national legislation that recognises the municipal authority, regardless of its size, as the main decision maker of territorial planning strategies. In addition, municipal data ensure very granular spatial resolution, a key advantage when using spatial econometrics.

According to the official definition (ISPRA-SNPA, 2018), LUR is expressed as the percentage value of existing land actually used for urban purposes (i.e. residential, industrial and commercial) on the total municipal area, net of water bodies. Land use data for 2016 are from ISPRA (Italian Institute for Environmental Protection and Research)[1].

Italy is an interesting case study both for the intense land use compared to other European countries (it ranks 5th in Europe) and for the high levels of heterogeneity across regions (European Environmental Agency, 2017). Five out of eight Italian regions with the highest land use rates are in the centre-north (Lombardy, Veneto, Emilia Romagna, Friuli-Venezia Giulia, Latium, Liguria), two in the South (Campania, Apulia).

The explanatory variables (2016), which concern four macro-areas (i.e. geomorphological, socio-demographic, economic, and institutional characteristics), are taken from SIEPI (Italian Society of Economics and Industrial Policy) and Istat (Italian Institute of Statistics)[2].

Regarding the geomorphological characteristics, we test the *overall surface* and the *altitude*, which are supposed to influence the operational complexity of land use activities. The overall surface is the total territorial area (land and water area) within the municipal boundaries (km^2) and allows controlling for the size heterogeneity of the municipalities. In line with studies demonstrating the existence of structural differences in the behaviour between large and small municipalities (Van Oosten *et*

[1] https://www.isprambiente.gov.it/it/attivita/suolo-e-territorio/il-consumo-di-suolo/i-dati-sul-consumo-di-suolo.

[2] https://www.istat.it/it/archivio/156224; http://asc.istat.it/ASC/asc.html.

al., 2018; Guastella *et al.*, 2017), the overall surface can help explain their different efficiency in land use management. Altitude is the elevation above mean sea level (meters) which inevitably affects land surface physiognomy and, therefore, the suitability of a place for urban use (Huang *et al.*, 2019).

The set of demographic variables concerns the size and composition of the population and households: *population density* (ratio between the total population and the total area of the municipality), *housing per capita* (ratio between the total number of houses and population), and *metropolitan area* (dummy variable: 1 if the municipality belongs to a metropolitan area and 0 otherwise)[3]. In densely populated areas, large-scale land development is usually required to meet the production and lifestyle needs (Pagliacci, 2019; Shu *et al.*, 2018; Culas, 2007). The house is often conceived as a primary asset and one of the main safe-haven investments, although the increase in housing demand does not necessarily translate into greater densification of urban centers (Guastella *et al.*, 2017; Broitman and Koomen, 2015). Metropolitan areas may play a key role in land use process, implying a revised land management and sustainable urban development (European Committee of the Regions, 2019; Mazzocchi *et al.*, 2013).

Moving on to the socio-economic dimension, we test the following variables: *education rate* (rate of people with at least the upper-secondary education), *employment rate* (share of employed people aged 16-64 out of the working-age population), *GDP per capita*, and *enterprises per capita* (total number of enterprises out of the total population). General knowledge and specific skills on environmental issues are generally acquired through formal education, better-educated people may be more aware of the harms resulting from over-exploitation of natural resources (Handavu *et al.*, 2019). Municipalities with high levels of economic activity are likely to exert more pressure on the soil due to the greater propensity of companies to invest in land for commercial and industrial activities (Shu *et al.*, 2018; Meyfroidt *et al.*, 2013; Culas, 2007).

Governance and the quality of institutions can be crucial in land use management (Barbier and Tesfaw, 2015; Galinato and Galinato, 2013). The quality of institutions is proxied by the *Institutional Quality Index* (*IQ*I), which considers five domains of the quality of local governments (corruption, government effectiveness, regulatory quality, rule of law, voice and accountability). IQI ranges between 0 and 1; the closer the IQI to 1, the higher the quality of the local institution (Nifo and Vecchione, 2014).

[3] In Italy there are 14 metropolitan areas (Rome, Milan, Naples, Turin, Bari, Florence, Bologna, Genoa, Venice, Reggio Calabria, Palermo, Catania, Messina, Cagliari).

4. Main results

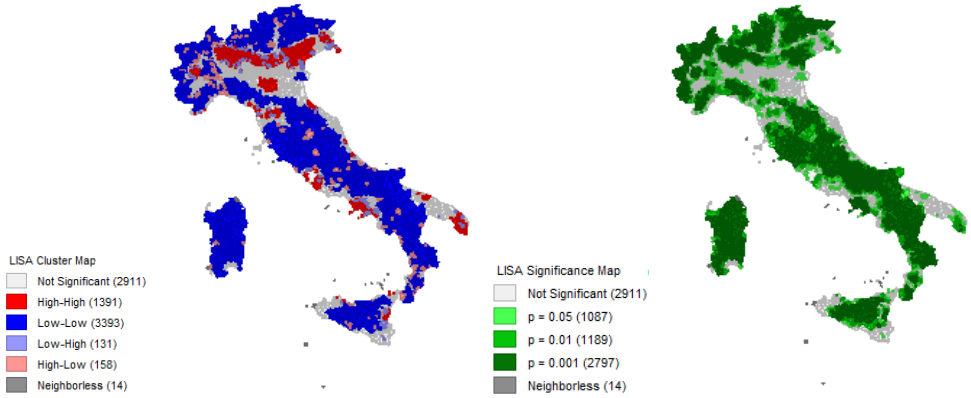
In this section, we first address the global and local spatial correlation in land use levels (4.1) and then discuss the results of the Spatial Durbin Model (4.2).

4.1 Global vs. local spatial correlation

To measure the intensity of the relationships in LURs among municipalities, we used a second order binary contiguity matrix (W) that also includes the first order neighbours. Therefore, two municipalities are adjacent (w_{ij} = 1) if they share an administrative boundary of non-zero length or have borders that touch the first-order neighbours. W is row standardised.

LURs are strongly spatially correlated (global Moran's *I* is 0.684). This means that land use in a municipality directly affects that of neighbouring municipalities. Figure 1 shows the LISA cluster map for LURs and the associated significance map. The 'high-high' cluster of municipalities (hot-spots, red) can be identified in specific areas of Italy – mainly in the North, in the metropolitan area of Naples (Campania) and in the province of Lecce (Apulia) – while the 'low-low' cluster of municipalities (cold-spots, blue) involves the rest of the country.

Figure 1 – *LISA cluster map (a), LISA significance map (b).*



4.2. Spatial Durbin Model results

The choice of SDM is statistically supported by the LM-lag test (LMρ=2,225.9) and its robust version (RLMρ=317.5) (Anselin, 1988; Anselin *et al.*, 1996). Both tests provide significant evidence of the autoregressive term (p-value<2.2e-16) due to the presence of spatial autocorrelation in LURs. The LR test ($\theta + \rho\beta \neq 0$) also detected significant spatial autocorrelation in the covariates (LR: 2,119.7, p-value=2.2e-16).

Table 1 shows the results of the SDM estimation using the spatial weight matrix already illustrated. Table 2 shows the direct, indirect and total effects for each explanatory variable.

Table 1 – *Spatial Durbin Model (SDM): estimation results.*

Variable	Coefficient	St. error
Intercept	0.1894	(.1841)
Geomorphological variables: Elevation above sea	-0.0001***	(.00001)
Demographic variables: Population density	0.5392***	(.0042)
Housing per capita	0.1507***	(.0103)
Metropolitan area	-0.0734***	(.0182)
Socio-demographic variables: Employment rate	0.1326***	(.0334)
GDP per capita	0.1387***	(.0209)
Enterprises p er capita	0.101***	(.0094)
Institutional variables: IQI	-0.1701***	(.0654)
Spatial lag variables: W* Elevation above sea	-0.000001	(.00001)
W*Population density	-0.437***	(.0091)
W*Housing per capita	-0.1574***	(.0168)
W*Metropolitan area	0.0476**	(.0211)
W*Employment rate	-0.1129**	(.05)
W*GDP per capita	-0.1157***	(.0212)
W*Enterprises per capita	0.0637***	(.0208)
W*IQI	0.1768**	(.0717)
ρ	0.8138***	(.0118)
Log likelihood	125.3751	
AIC	-212.75	

Second order binary contiguity matrix (including the first order neighbours), row standardised
**Significant at 10%; **Significant at 5%; ***Significant at 1%*

Table 2 – *Spatial Durbin Model (SDM): direct, indirect and total effects*.

Direct effects	
Elevation above sea	-0.0001***
Population density	0.5394***
Housing per capita	0.1470***
Metropolitan area	-0.0746***
Employment rate	0.1321***
GDP per capita	0.1384***
Enterprises per capita	0.103***
IQI	-0.166***
Indirect effects	
Elevation above sea	-0.0004***
Population density	0.0087
Housing per capita	-0.1828***
Metropolitan area	-0.0632
Employment rate	-0.0266
GDP per capita	-0.0151
Enterprises per capita	0.0969
IQI	0.2022
Total effects	
Elevation above sea	-0.0005***
Population density	0.5481***
Housing per capita	-0.0358
Metropolitan area	-0.1379**
Employment rate	0.1055
GDP per capita	0.1233
Enterprises per capita	0.1999**
IQI	0.0361

Second order binary contiguity matrix (including the first order neighbours), row standardised
**Significant at 10%; **Significant at 5%; ***Significant at 1%*

Overall, the results demonstrate the crucial role of the demographic, socio-economic and institutional characteristics in determining land use levels. As expected, the spatial autoregressive term (ρ) is highly significant and positive, showing the presence of spatial effects. This means that interactions between municipalities play a key role in sketching the land use profile in Italy and that local land use patterns are mutually dependent on those of neighbouring municipalities.

First, both direct and indirect effects show that land use levels decrease with increasing altimetry, which usually makes the territory more morphologically adverse and impairs people's ability to use land. Second, higher demographic pressure and more intense economic development lead to greater land use, in line with the strand of literature that recognises demographic and economic growth as some of the main

determinants of land use (Salvati *et al.*, 2018). It is worth noting that housing per capita acts in the opposite direction if coming from neighbouring areas. Third, the belonging of a municipality to a metropolitan area decreases land use. As an effective intermediate level between the region and the municipalities, metropolitan areas appear to be more integrated internally, fostering cooperation between municipalities to improve the positive effects of agglomeration advantages (ISPRA, 2017). Fourth, the direct effects of the quality of local institutions on land use levels are significantly negative, indicating that better institutions imply a tighter control of the territory and better enforcement of public policies aimed at virtuous management of public affairs and sustainable forward-looking behaviours.

5. Discussion and conclusion

The results suggest that: *i*) monitoring land use is the prerequisite for preserving the environment and ecosystem services throughout the country; *ii*) institutional cooperation, skill- and responsibility-sharing between municipalities should be promoted to reduce administrative fragmentation and develop holistic land use management; *iii*) the strengthening of the qualitative characteristics of local institutions can help narrow regional divides and better manage land use projects.

Such a high spatial resolution analysis is crucial when investigating land use, as it highlights the actual local characteristics that planners cannot ignore in managing the future of sustainable cities, especially in current times characterised by coexistence with the dreadful threat of Covid-19. As suggested by ASVIS (Italian Agency for Sustainable Development), given the key role of sustainable land use in attaining many SDGs, newly designed policies could help mitigate the inevitable slowdowns in their achievement caused by the pandemic. In other words, anti-pandemic policies can benefit from knowledge of how demographic and socio-economic characteristics impact the built environment. In recent months, for example, concerns have been raised about population and housing density, which are supposed to act as risk factors in the spread of Covid-19 (Cordes and Castro, 2020). Since many studies have shown associations between these characteristics and spread of the virus (see Khavarian-Garmsir *et al.*, 2021 for a review), it is inevitable that new land-use planning policies will have to deal with social distancing, which requires the design of new spaces or, at least, the re-organisation of existing ones to avoid overcrowding. In this field, to ensure healthy and more sustainable urban development, planners could support recent trends that see people moving to the suburbs or further afield due to concerns about the risks of living in high-density residential settlements and overcrowded urban areas. This would lead to a potential reduction in housing demand in highly-density municipalities (Liu and Su, 2021), while continuing to preserve rural areas.

The role of metropolitan areas should also be rethought in light of their usually higher infection and mortality rates due to greater connectivity and social contacts. However, it should also be considered that, in the more densely populated and economically developed municipalities, the risk of a faster spread of Covid-19 is usually offset by better access to healthcare facilities and the greater availability of infrastructures and services. As a result, given the crucial role that metropolitan areas play in effective land management, they safety can be preserved by simple rethinking crowding (i.e. through the relocation or decentralisation of industrial areas and activities). Rethinking residential and productive settlements – for example through the recovery of degraded land or the repurpose of those already occupied, the development of green infrastructures and the re-naturalisation of areas that could return to providing ecosystem services – would represent a rational and sustainable way of using the territory. This can help mitigate environmental degradation while safeguarding the health of citizens.

However, the difficulty of predicting the future scenario will likely require a learning-by-doing period in land use policies as well. The future development of the territories should be based on a neighbourhood-oriented plan with periodic adjustments in the awareness that any measures for sustainable land use are effective to the extent that local administrators know the dramatic consequences of a disproportionate use, regardless of the health emergency.

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SUMMARY

The determinants of land use in Italy from a spatial perspective: a re-interpretation at the time of Covid-19

Since the post-Second World War period, territorial development in Italy has been characterised by unsustainable settlement patterns, including the unplanned and wildfire growth of urban systems and the propensity to overbuilding. Systematic knowledge of the key aspects of land use patterns is the basis for planning sustainable land development. Furthermore, the outbreak of the COVID-19 pandemic has accentuated the need to re-address land management to ensure public safety and protection. By using the Spatial Durbin Model (SDM), this work aims to: *i*) analyse the determinants that best quantitatively describe land use patterns in Italian municipalities; *ii*) provide a re-interpretation of the main results in light of the territorial re-planned process required by the Covid-19 pandemic. The results suggest that monitoring land use and strengthening quality and cooperation between local institutions are needed to preserve the environment and ecosystem services that underlie more sustainable land use planning.

Gennaro PUNZO, University of Naples Parthenope, Department of Economic and Legal Studies, gennaro.punzo@uniparthenope.it

Rosalia CASTELLANO, University of Naples Parthenope, Department of Management and Quantitative Studies, lia.castellano@uniparthenope.it

Emma BRUNO, University of Naples Parthenope, Department of Economic and Legal Studies, emma.bruno@studenti.uniparthenope.it

COVID19, DIGITAL COMPETENCIES AND APPROACH TOWARD SUSTAINABILITY IN THE UK[1]

Gabriele Ruiu, Maria Laura Ruiu, Massimo Ragnedda, Giovanna Gonano

1. Introduction

This paper aims to investigate if, in the dramatic scenario caused by the recent pandemic, a new approach toward a more sustainable lifestyle has emerged in the UK. This could have happened for two main reasons. First of all, the restrictions to mobility associated with lockdown norms may have indeed, as an unexpected positive side-effect, convinced people that their digital competencies are vital to accomplishing their job just as effectively both remotely and face to face (Ragnedda and Ruiu 2020). This could, in turn, encourages new eco-friendly ways of working. Secondly, the COVID-19 pandemic occurred parallel to the Climate Change crisis and it was responsible for unintended, short-term, positive consequences on environmental systems due to, e.g., decreased pollution from industries and vehicle emissions (European Environment Agency, 2020). Therefore, the period of forced sedentary life might have triggered individual reflective practices concerning societal lifestyles, and the social impact on the environment and future generations.

Investigating this topic in the UK is particularly interesting since its population seems less concerned about climate change and its anthropogenic nature in comparison with other developed countries (EPCC, 2017). Moreover, despite increasing awareness of the climate change threat in the UK (Poushter and Huang, 2020), some studies show that people are less likely to be committed to solving the problem (BrightBlue, 2020; Steentjes *et al.*, 2020). Furthermore, the World Value Survey 2017-2020 (WVS 17-20) shows that among developed countries, the population of the UK seems to be among the less disposed to renounce economic growth in favour of better environmental protection. Indeed, considering the following WVS 17-20 question: "Here are two statements people sometimes make when discussing the environment and economic growth. Which of them comes closer to your own point of view? 1 Protecting the environment should be given priority, even if it causes slower economic growth and some loss of jobs; 2 Economic growth and creating jobs should be the top priority, even if the environment suffers to some

[1] The authors contributed equally to each section of the paper.

extent". Even though most of the respondents from the UK opt for option 1 (57%), there is a considerable gap concerning other Northern European Countries (for instance, in Sweden, more than 70% of people answer indicating their preference for option 1).

In this paper, we employ original data from an online survey carried out in the summer of 2020 on a sample of the UK population (1013 respondents) to propose[2] an indicator to capture the perception of Coronavirus as the starting point for a new approach toward environmental sustainability (from here on Cov_Sust_Index).

This paper is organised as follows: the next section presents data and method; in the third section, results are presented and discussed. Finally, some considerations will be drawn.

2. Data and Method

In July 2020, a quota sample of 1033 individuals aged 18 years and older, was recruited to complete an online survey through a national survey panel hosted by Toluna Inc.[3] Quotas were established based on the geographic distribution of the UK population among the following area: South, Midlands and Wales, Northern Ireland, North and Scotland. In table 1 sample quotas are confronted with those obtained from the official UK estimates of the mid-2019 population. The sample seems to fit quite precisely the distribution of the UK population among geographical areas. Other descriptive statistics are reported in the Appendix.

Table 1 – *Geographic composition of the sample*.

	Number of respondents	In %	Official mid -2019 Population composition
South	472	45.69%	44.91%
Midlands and Wales	216	20.91%	20.84%
North and Scotland	318	30.78%	31.40%
Northern Ireland	27	2.61%	2.83%

South includes the following regions: London, South-East, South-West, East
North and Scotland include: Yorkshire and the Humber, North East, North West, Scotland
Midlands and Wales include: West Midlands, East Midlands, Wales

[2] More exactly the survey was carried out in July 2020, when the UK had the first wave of COVID19 behind and the lockdown norms had just been relaxed.
[3] Toluna Inc is a marketing company specialised in furnishing data for market analysis. However, their data have been frequently used also for scientific works. See for instance Robbins *et al.* (2017).

Panellists are recruited into the Toluna sample using a variety of methods, including Web banners, public relations, Web site referrals, and others. Panellists are validated using GeoIP and postal codes, double opt-in procedures, and the use of cookies to prevent duplication.

One drawback of using Internet panels is the volunteer nature of recruiting panellists, allowing no basis to calculate sampling error. Therefore, all the results that are obtained in this paper must be interpreted as a first explorative analysis based on a qualitative sample. A representative sample constructed with a probabilistic design must be used to ensure the possibility of extending the results to the population.

Another frequent drawback of using online sampling is the over-representation of young individuals. This problem also affects our data (see Table 4 in the appendix). However, given the aims of the paper, it should be said that it is particularly important that younger generations have perceived Covid19 also as a turning point toward a more sustainable lifestyle since these cohorts will be the main actors in implementing the changes needed to tackle Climate Change.

We propose a four-item Likert scale to construct an indicator to capture the perception of Coronavirus as the starting point for a new approach toward environmental sustainability. In particular, the proposed items are the following:

To what extent do you agree or disagree with the following statements:

i) Coronavirus pandemic might be a chance for an eco-friendly world;
ii) We can Use Coronavirus to Reset our Life for Sustainability;
iii) I'll use my digital skills to reduce the impact of my lifestyle on the environment even after the Coronavirus crisis will be over;
iv) Coronavirus pandemic made me realise that digital skills are vital to reduce my environmental footprint.

Individuals were asked to provide their level of agreement on a five-point scale going from 1 "Strongly disagree" to 5 "Strongly agree".

We then construct the Cov_Sust_Index by summing the score obtained for each item. Higher scores indicate a higher degree of agreement with the idea that COVID19 may represent an occasion for a more sustainable lifestyle. Internal consistency among items is assessed using Cronbach's alpha.

As a first explorative analysis, we run a hierarchical cluster analysis (Euclidean distance is used as the distance metric, and the Ward algorithm is chosen to form the cluster). The final number of clusters is decided using the Calinski-Harabasz index.

After the following multivariate regression is estimated to investigate which socio-demographic characteristics are related to a higher propensity to believe that Covid19 has also been an opportunity to redirect one's lifestyle towards greater sustainability:

$$Cov\_Sust\_Index_i = \alpha + \beta_1 CC_i + \beta_2 X_i + \varepsilon_i \quad (1)$$

CC is a dummy equal to one when individuals have answered "Agree" or "Strongly Agree" to the following question: "Please indicate how much you agree or disagree with the following statements about climate change: Climate change is just a natural fluctuation in earth's temperatures". Respondents were allowed to graduate their answer from "Strongly disagree" to "Strongly Agree". The recognition that Climate Change is a consequence of human activity may be fundamental to strengthening the will to adopt new and more sustainable behaviour.

X is a set of socio-economic characteristics (age, gender, education, income, etc.). ε is a normally distributed random error with zero mean and constant variance.

3. Results

Good internal consistency was reached for the proposed Cov_Sust_Index given that the Cronbach's alpha associated with our scale is 0.815. The average score was 13.63 (st. dev. 3.33). Considering that the maximum value for the scale is 20, we confirm in our sample the difficulty of the UK population to accept lifestyle change even after the pandemic. Figure 1 shows the distribution of the answers to each of the four items used for our Index.

The majority of individuals tend to at least "agree" to item 1 and item 2. In contrast, a high percentage of individuals do not express a position for item 3 and item 4. It seems that most individuals in our sample have perceived the pandemic as an opportunity to change, but at the same time, are not fully convinced that the use of digital skills will drive this change.

Table 2 summarises the characteristics of the three groups individuated through the above describe cluster analysis. Table 2 also reports for each group the percentage of individuals for which CC is equal to one.

The three clusters numbered 1, 2, 3 may be labelled as "the Undecided ones", "the Sceptics" and the "Change drivers", respectively. The *Sceptics* is the smaller group. It is characterised by: the highest mean age of its components, the highest concentration of males, the highest percentage of people who believe that CC is not related to human activity. At the same time, this group is characterised by a low percentage of individuals with an elevated title of education and a particularly low mean score in the Cov_Sust_Index.

The *Change drivers* express a lower degree of scepticism toward the human origin of CC and, at the same time, are also characterised by a high mean score in the Cov_Sust_Index. They are, on average younger than the components of other groups, have an elevated title of education. This group is prevalently composed of females.

The *Undecided ones* represent the relative majority of the sample and are somehow in the middle between the other two groups: they tend to score an intermediate value

in the Cov_Sust_Index. The 12% of them is convinced that CC is only a natural phenomenon.

Figure 1 – *Distribution of the items used to construct the Cov-Sust_Index.*

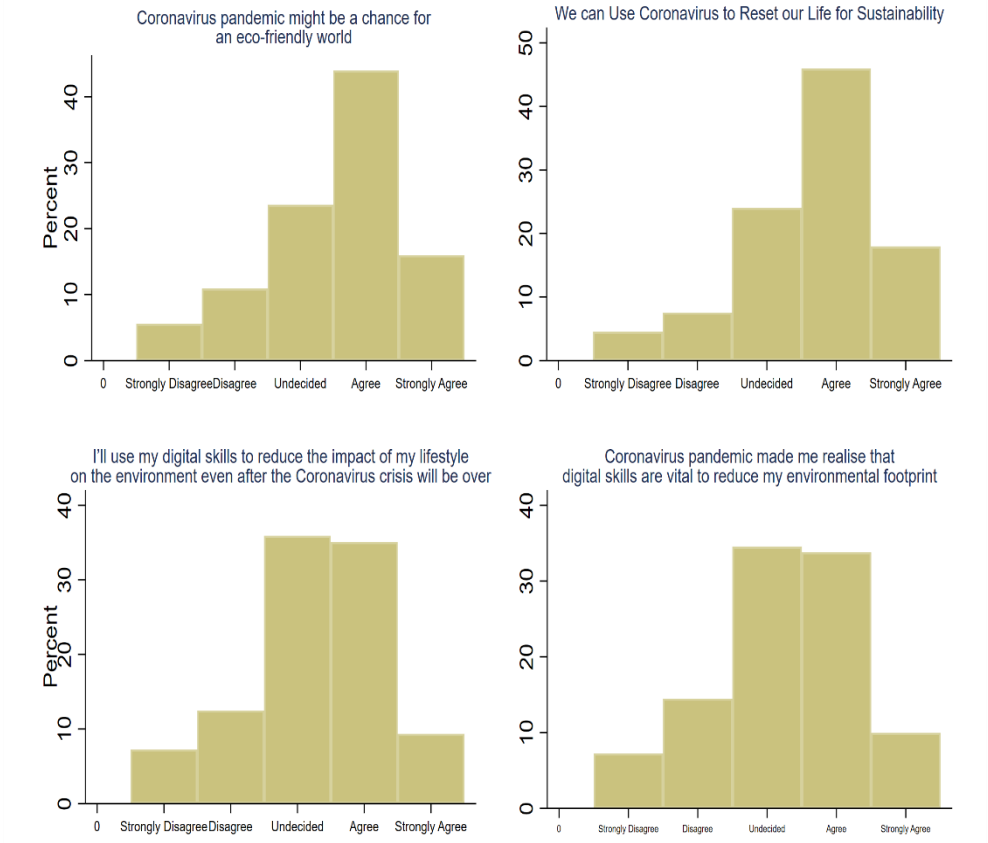

Table 2 – *Descriptive statistics for the individuated clusters.*

Cluster	N (%)	Mean age	Cov_Sust_Index	% Male	% CC sceptics	% MSC_PHD
1	429 (45)	48.4	13.3	45.9	11.6	9.3
2	51 (5.3)	51	8.39	56.7	27.7	7.0
3	369 (38.7)	44.5	16.41	44.7	4.9	14.6

Note: % MSC_PHD is the percentage of individuals with a Master of Science or a PhD.

Finally, Table 3 reports the results of the estimation of equation 1. Note that the sample size reported in table 3 is not 1033 because of several missing observations in

both the dependent and the independent variables. The names of the independent e variables are self-explicative.

First of all, note that R-square is particularly low. The linear relationship with our independent variables can explain only about 14% of the variability of the Cov_Sust_Index. This means that the heterogeneity in the positions about Covid19 as a possible turning point in the approach toward sustainability is far from being explained using the main socio-economic variables and the attitude toward Climate Change. This remarks the complexity of the issue under investigation.

Our results indicated that controlling for the effect of the other independent variables, an individual with a PhD is characterised on average by a score in the Cov_Sust_Index that is about 1.6 points higher than that associated with an individual with an incomplete secondary education.

Concerning income, we have that, keeping constant the value of the other right-hand side variables, only one dummy is highly significant from a statistical point of view, i.e. that associated with the highest level of income (a family income that is more than 100.000£ per annum). In particular, we have that the wealthiest individuals tend to report the lowest score on our dependent variable. One possible interpretation is that for these individuals is particularly difficult to modify their lifestyle toward a more sustainable one.

The multivariate regression results confirm that older individuals tend to be characterised by the lowest score on the Cov_Sust_Index. We believe that this is quite reasonable since older individuals may find it more challenging to modify their habits than the youngster. In addition, they are likely to have not perceived the potential role of digital skills in reducing the impact of mobility on the environment (Liu *et al.*, 2019; Desjardins *et al.*, 2013). Among demographic variables, also female respondents tend to be characterised by a score that is 0.5 points higher than male ones. This is in line with the findings obtained by McCright (2010) regarding the attitude toward climate change. Despite women tended to underestimate their scientific knowledge about this phenomenon, they were more informed than men. At the same time, they expressed a higher degree of concern on the issue, in line with what the the market research firm Mintel has termed an "eco-gender gap" (Mintel, 2018). Thus, we believe that it is quite reasonable that in the context of the pandemic, they may have more involvement in reflective reasoning about the impact of human activity on the environment.

Finally, those who perceive climate change as a natural event not related to human activity also tend to have a score that is 3 points lower than those who recognise the human role in this phenomenon. This is the most important effect in terms of magnitude and confirms the importance of improving the correct perception of Climate change for motivating people to change their behaviours (see Ruiu *et al.*, 2020).

Table 3 – *Socio-economic characteristics related to the Cov_Sust_Index.*

	β	s.e.
Education		
Bachelor	0.782*	(0.406)
PhD.	1.582**	(0.635)
High School	0.091	(0.418)
Master Degree	1.431***	(0.524)
Some University	0.065	(0.415)
Less than h. school	Ref	
Income		
<10000 £	-0.849	(0.531)
≥10000 - <15000 £	-0.443	(0.447)
≥15000- < 20000 £	-0.448	(0.456)
≥20000 - < 30000 £	-0.572	(0.356)
≥30000 - < 40000 £	-0.306	(0.380)
≥ 40000 - <50000 £	Ref	
≥50000 - <60000 £	0.284	(0.503)
≥ 60000 - <70000 £	-0.078	(0.467)
≥70000 -<100000 £	0.126	(0.470)
More than 100000 £	-1.311**	(0.625)
Age		
18 - 34	Ref	
35- 54	-0.513**	(0.254)
55+	-0.680***	(0.254)
Geographic area		
Midlands and Wales	-0.123	(0.272)
North and Scotland	-0.074	(0.240)
Northern Ireland	0.221	(0.638)
South	Ref	
Female=YES	0.485**	(0.207)
CC	-2.959***	(0.387)
Unemployed=YES	-0.010	(0.418)
Urban Context=YES	0.113	(0.206)
_cons	14.105***	(0.521)
N	953	
r2	0.143	

Heteroskedasticity robust standard errors in parentheses
Sign: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4. Discussion and Conclusions

This paper highlighted a need to promote awareness around the possibility of increasing individual environmental engagement through specific digital behaviour. On the one hand, the Covid crisis seems to have activated some reflective practices (Shove, 2004) around the necessity to break societal anti-environmental practices by showing an interest in using the crisis as a turning point. On the other hand, our respondents are not aware of the possibility of reducing their environmental impact through an increasing application of digital tools in their everyday life. Increasing interest has been devoted to the study of the effects produced by e-commerce on the environment. Despite contrasting results, depending e.g., by the delivery and return models and packaging materials (Gee *et al.*, 2020; Matthews *et al.*, 2001; Sievering, 2020; Siikavirta *et al.*, 2002), the reduced movement of people during the lockdowns - replaced by the use of technologies for shopping, socialising and working/studying - has contributed to produce benefits for the environment and the quality of air (European Environment Agency, 2020).

Therefore, the COVID-19 pandemic has shown a lesson that should be valorised to emphasise the positives and negatives of a new pro-environmental technological routine (Kirby, 2017; Shove and Warde, 2002) that might be kept also in the post-Covid era. This insight should be valuable for policymaking aimed at promoting digital inclusion by combining it with pro-environmental engagement, especially considering the "green recovery" from COVID-19 announced by the UK government and the COP26 climate summit in Glasgow in 2021. In this direction, creating the contextual conditions to valorise the positives, which might be also interpreted as "convenient" by digital users (because they might not cause discomfort, such as, e.g., in the case of having the choice to work from home) might support not only those who are already environmental advocate but also those who are sceptic and undecided about climate change. In fact, a specific increase in the use of technologies (such as e.g. for limiting physical movements) might produce beneficial effects on the environment voluntary and involuntary, if the technological practice is perceived as advantageous.

The exploration of the characteristics of these different groups, plus the understanding of their perception of technology, is pivotal for future studies that explore how to reduce the individual impact on the environment. However, the heterogeneity in the perception of COVID-19 as a possible turning point in the approach toward sustainability shows the complexity of the intersection between the crisis, the need for a pro-environmental shift and the potential contribution of technologies. However, younger generations might be more oriented to adapt their digital habits to more sustainable practice and their formal education might represent

an effective route to introduce the combination of digital and environmental awareness.

It should also be noted the individual changes (Shove, 2010) in both awareness and practice might not be sufficient if contextual changes at a macro-level (in terms of market orientation and policies implementation, Spaargaren, 2011) are not activated. The COVID-19 crisis and its related restrictions have imposed a new model for social interaction, which, despite disadvantages, has introduced a new technological routine. The creation and increase of opportunities at the contextual level structural (e.g., by ensuring that whenever possible people can work from home) in combination with an individual predisposition towards both environment and technologies might therefore trigger routinised pro-environmental behaviours.

Appendix

Table 4 – *Other descriptive statistics.*

Variables	N	In %	Official mid -2019 Population composition
Less than 18	0	0	
18 – 34	273	26.43%	21.9%
35 – 54	375	36.3%	26.2%
55 -64	200	19.36%	12.2%
65+	185	17.9%	18.5%
Av. Age	47.4		
Male	492	47.63%	49.04%
Female	541	52.37%	50.86%
Education			
Bachelor	327	31.66%	
PhD.	24	2.32%	
High School	269	26.04%	
Master Degree	104	10.07%	
Some University	219	21.20%	
Less than h. school	90	8.71%	
Average Score Item 1	3.53 (sd 1.05)		
Average Score Item 2	3.65 (sd 1.00)		
Average Score Item 3	3.27 (sd 1.03)		
Average Score Item 4	3.24 (sd 1.05)		

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SUMMARY

Covid19, Digital competencies and approach toward sustainability in the UK

In this paper, we employ original data from a survey carried out in the summer of 2020 on an online sample of the UK population (1013 respondents) to investigate if, in the dramatic scenario caused by the recent pandemic, a new approach toward a more sustainable lifestyle has emerged in this Country. Our results indicate that, on average the individuals in our sample are not very convinced that the recent pandemic could be an opportunity to rethink our lifestyles in a sustainable way. Considering socio-demographic groups, We find that young individuals, predominantly female individuals and those with an elevated title of study, tend to perceive Covid19 also as an opportunity for a new approach toward sustainability.

Gabriele RUIU, Department of Economics and Business, University of Sassari, gruiu@uniss.it

Maria Laura RUIU, Department of Social Science, Northumbria University, maria.ruiu@northumbria.ac.uk

Massimo RAGNEDDA, Department of Arts, Northumbria University, massimo.ragnedda@northumbria.ac.uk

Giovanna GONANO, Department of Economics and Business, University of Sassari, mggonano@uniss.it

RISK FACTORS FOR CONTAGION OF SARS-COV-2: A STATISTICAL COMPARISON

Alessandra Battisti, Chiara Coluccia, Maria Clelia Romano, Simona Staffieri, Marco D. Terribili[1]

1. Introduction

The outbreak of COVID-19, caused by the novel infectious disease agent *Severe Acute Respiratory Syndrome Corona Virus 2* (SARS-CoV-2), began around December 2019 in Wuhan Hubei Province China. In March 2020, the World Health Organization declared the COVID-19 pandemic. Italy was one of the first Western countries severely affected by the coronavirus pandemic, with the first devastating wave affecting mainly the northern and central regions of the country, and afterwards spreading nationwide.

Since the start of this pandemic, it was clear that the range of disease manifestations and immune responses, which occur after infection with SARS-CoV-2, vary significantly. Many individuals present with either asymptomatic or mild disease. Therefore, the true extent of the pandemic may be underestimated. Globally researchers and public health organizations explored strategies to better understand the spread of SARS-CoV-2 disease, using seroprevalence as a critical measure. A seroprevalence survey uses antibody tests to estimate the percentage of people in a population who, at a specific time point, have antibodies against SARS-CoV-2. The results can tell us how many people in a specific population may have been previously infected with SARS-CoV-2 (Larremore *et al.*, 2021).

Just to estimate the seroprevalence rate in Italy, the Health ministry, and the National Institute of Statistics (Istat) launched a seroprevalence survey of the SARS-CoV-2 virus, carried out between May and July 2020, in collaboration with the Italian Red Cross. In this paper, the aims pursued by this study and the main achieved results will be shown. Through descriptive analysis and statistical models, the factors playing the main roles in having a positive IgG outcome have been studied.

[1] The article is the result of a collective work, but M. C. Romano wrote paragraphs (par.) 1 and 2, S. Staffieri par. 3, C. Coluccia par. 3.1, 3.2, 3.3, A. Battisti par. 4 and 6, M. D. Terribili par. 5.

2. Seroprevalence survey in Italy

Considering the urgent need for reliable and complete epidemiological studies, the statistics on the immune status of the population, and to guarantee protection from the health emergency inherent in the SARS-CoV-2 virus infection, the Ministry of Health promoted a population seroprevalence survey, carried out with Istat. The realization of the study was foreseen by the decree-law 10 May 2020 n. 30, which defines the main study's goals and the roles of all the involved institutions.

The main objective of the study was to evaluate the antibody response reached a few months after the start of the pandemic testing a representative sample of the population for the presence of specific SARS-CoV-2 antibodies in serum and finding the fraction of asymptomatic or subclinical infections. The study, therefore, aimed also to:

- *(i)* evaluate the seroprevalence rate for SARS-CoV-2 in the population and the differences by age group, sex, region, economic activity, and other risk factors;
- *(ii)* assess the development of the antibody response following the first wave of the pandemic and the subsequent period;
- *(iii)* have a population biological bank for further evaluations.

The sample consists of 150,000 individuals and it was designed by Istat to guarantee representativeness, both at a national and regional level. The sampling design is a two-stage selection with stratification of both the Primary Stage Units (PSUs) and the Secondary Stage Units (SSUs). PSUs are the municipalities stratified within each province according to the demographic size (about 2,000, almost 25.0% of the Italian municipalities). SSUs are individuals stratified by age, sex and economic activity (Istat, 2020, 2021a).

The survey methodology envisaged the realization of the fieldwork in three successive phases. In the first phase, the survey units have been contacted by telephone for availability to participate in the survey and to fill out a short questionnaire. During the telephone was also set up an appointment for the blood test (second phase) to find the anti-SARS-CoV-2 antibodies (IgG). The third phase concerned the result of the test, the transmission of the relative outcome, and the delivery of the collected samples to the biological bank of the National Institute for Infectious Diseases "L. Spallanzani".

The complexity of the survey joined with a large number of actors involved, and the steady attention to containing the risk of non-sampling error in each phase of data collection, led to adopt some measures as an accurate training of the interviewers' network, a simple questionnaire focused only on a few indispensable variables, fieldwork supervision through a detailed monitoring system. All these adopted measures made it possible to guarantee a high quality of collected data.

The results presented are related to 65,000 respondent individuals, whose blood samples were collected in time with the end of the survey. The survey management in emergency conditions did not allow to fully reaching the whole sample, so total non-response treatment and calibration techniques have been used to correct the bias and inefficiency introduced by non-respondent units (Istat, 2021b).

Total non-response treatment aims to increase the respondents' sampling weight to consider also non-respondents. Then, calibration allows the final estimates to respect totals on the whole population, known for a set of available variables, such as age class, sex, geographical area, educational level.

3. Observed seroprevalence rates

During the first pandemic wave, estimates pointed out that about 1.5 million individuals (2.5% whole resident population) tested positive to the IgG (IgG+). Positive people are six times those officially noticed, and the same occurred in several other countries (Bajema et al., 2020).

There are marked differences among geographical areas: Lombardy is the region with the highest seroprevalence ratio (7.4%). The case of Lombardy is unique: this region alone includes 49.4% of people who developed antibodies. In the regional ranking, after Lombardy follows the Valle d'Aosta (3.7%) and Piemonte (3.5%), and a group of regions around 3%: Trento, Bolzano, Liguria, Emilia-Romagna, and Marche. Eight Regions, all the South except for Abruzzo (1.5%), have a seroprevalence rate of less than 1.0%, with the lowest values in Sicily (0.4 %), Calabria and Sardinia (0.5%).

Looking at the demographic size of the municipality of residence, the lowest seroprevalence rate is recorded both in municipalities with more than 50,000 inhabitants (1.9%) and in the suburbs of the metropolitan area (2.1%). In small municipalities with up to 2,000 inhabitants, the seroprevalence rate doubles, reaching 4.4%. In Lombardy, there are 14.1% of positives people in small municipalities and 4.7% in the municipality of Milan. Men and women were equally affected by SARS-CoV-2, but with slightly higher seroprevalence among women (2.6% versus 2.4% for men). As for age, seroprevalence remains substantially stable, but with the highest value between 50 and 59 years (3%) and among people 60-69 years (2.7%). Similar results emerged also from other studies, such as Stringhini et al. (2020). Concerning the level of education, the lowest rate is observed for people with at least a Bachelor, Master, PhD (2.1%) (Table 1).

Table 1 – *Sars-CoV-2 Seroprevalence rates and confidence intervals by gender, age class, education qualification and employment condition (2020) absolute values and percentages.*

Variables	IgG positive outcome				
	% of people with the same characteristics	lower extreme 95% confidence interval	upper extreme 95% confidence interval	% of people tested positive	absolute values
Sex					
Male	2.6	2.3	2.8	52.7	791,407
Female	2.4	2.2	2.7	47.3	710,130
Age classes					
up to 17	2.2	1.7	2.8	13.8	207,105
18-34	2.2	1.8	2.6	15.5	232,864
35-49	2.4	2.0	2.9	20.4	306,371
50-59	3.0	2.6	3.5	19.1	287,165
60-69	2.7	2.3	3.2	13.7	205,809
70 and over	2.4	2.0	2.9	17.5	262,223
Educational qualification					
No qualification, or primary education	2.5	2.2	2.8	26.9	403,582
Lower secondary education	2.6	2.3	2.9	28.7	431,307
Upper secondary education	2.5	2.3	2.7	33.1	497,724
Bachelor, Master, PhD	2.1	1.7	2.6	11.3	168,923
Employment condition (a)					
Employed	2.7	2.5	3.0	52.9	621,317
Other conditions	2.3	2.1	2.6	47.1	699,236
Total	**2.5**	**2.4**	**2.6**	**100.0**	**1,501,530**

(a) data referring to the population aged 15 and over Source: Istat-Ministry of Health, Survey of the seroprevalence survey on SARS-CoV-2, Year 2020

3.1. Contacts and type of relationship

The results of the survey also made it possible to observe the relationship's type of contact with positive persons: 17.4% of those who report having had contact with a person with SARS-CoV-2 then tested positive.

The highest values correspond to cases in which the contacts concerned cohabiting family members. Those who had contact with a cohabiting family member infected with SARS-CoV-2 developed antibodies in 42.1% of cases; the prevalence is lowered to 16.1% if the family member is not cohabiting, however, remaining properly above

the average value that characterizes the entire population (2.5%). A substantial increase in prevalence is also observed when there have been contacts with work colleagues affected by the virus or with patients in the same condition (11.2%).

3.2. Symptoms

It was also possible to reconstruct a picture of the main symptoms reported by positive people: 31.3% of the people who developed antibodies did not have any symptoms, in perfect analogy with what has been observed in other countries (Pollán *et al.*, 2020). In addition to the asymptomatic, the remainder of those who have had symptoms is divided between people with one or two symptoms representing 20.3% and 10.5% respectively and people with at least three symptoms (37.9%).

As found also in other studies (Grant *et al.*, 2020), the most common symptoms in symptomatic subjects include fever (34.7%), flu syndrome (27.6%), fatigue (27.3%), cough (27.0%), loss of taste (25.2%). Some symptoms are more associated with positivity in the seroprevalence survey. Out of 100 people who presented the symptom of loss of taste, 27.7% tested positive; similarly, out of 100 people who presented the symptom of loss of smell, 25.5% were positive. This confirms the discriminating power of these symptoms, unlike other more generic ones. For example, only 5.2% of those who experienced a sense of fatigue tested positive.

3.3. Lifestyle

The results were also analyzed concerning some indicators relating to the lifestyle. The seroprevalence rate for overweight adults is 2.7%, compared to 2.5% for the rest of the population.

Having travelled to a foreign country starting from 1 February 2020 has slightly increased the risk of contagion. The seroprevalence rate is equal to 2.8 among those who have made at least one trip since the beginning of the pandemic compared to those who have not travelled (2.5%). For smokers, as in other studies (Wenzl, 2020), the seroprevalence rate stands at 1.5%, rises to 2.8% for non-smokers and 3.0% among former smokers. This data can be better interpreted given the models' results which will be presented in the next paragraph.

4. Multivariate analysis through a Logit model

A logistic model has been applied to detect which factors played the main roles in having a positive IgG outcome.

The logistic regression analysis is used mostly to investigate the relationship between binary or ordinal response probability and P explanatory variables. The method usually fits linear logistic regression models for binary or ordinal response data by the method of maximum likelihood (Agresti, 2018).

In logistic regression, there are many exogenous variables, many predictors and one criterion variable. If P denotes the number of independent variables, then the equation that describes the relationship between the independent variables and the dependent variable can be written as

$$logit(\Pr(Y_i = 1 \mid X = x)) = \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_P X_{Pi} + e_i \,, \qquad (1)$$

where $\beta_1, \beta_2, \ldots, \beta_P$ are the partial regression coefficients and reflect the fact that each of the considered predictors $X_1, X_2, \ldots, X_P$ provides a partial explanation (or prediction) of the endogenous binary variable Y, observed on the i^{th} statistical unit.

The interpretation of the coefficients β depends on sign and entity. The sign expresses the type of relationship existing between the independent variable and the dependent variable: when the coefficient is positive it indicates a positive relationship, so the variables tend to covariate in the same direction, when it is negative it indicates that the variables have an inverse relationship. The entity is evaluated based on the magnitude of the coefficient.

A stepwise logistic model was applied in this paper to confirm the results described in the previous paragraph. The logistic model has been applied to detect which factors played the main roles in having a positive IgG, the independent variables were educational qualification, economic activity, people with whom he/she have had contact, employment status, body mass index, smoking, number of chronic diseases, type of chronic disease, citizenship, region.

In all regions the probability of having a positive IGG is higher than that of Sicilian citizens: however, while in Lombardy the probability that a citizen had a positive IGG outcome in the period May-July 2020 is approximately 16 times higher than that of Sicilian citizens, the ratio drops to about 8 to 1 for people who lived in Piemonte and Valle D'Aosta.

Living with an infected person means that the probability of being positive is 24 times that of those who are not in the same situation. If it is a non-cohabiting family member, the ratio, while remaining high, drops to 5 to 1. Similar effect, although more subdued in the case of intercourse with other infected people (e.g.: colleagues or patients).

The educational level seems to play also a key role, having achieved a high educational level (Bachelor, Master, PhD) is confirmed to be a protective factor. People with a Bachelor, Master, PhD significantly reduces the risk of getting infected. Individuals who attended compulsory school have a 57% higher probability of testing positive than graduates.

Having foreign citizenship, under the same conditions, doubles the risk of being infected.

Economic activity, employment status, do not have any effect on the probability of having an IGG positive

It has been introduced in the model some variables regarding the health status too: the number and the type of chronic disease. All the variables do not affect the probability of being positive, with the only exception of cancer pathologies which halve the probability of being infected. This result could be due to a more prudential behaviour adopted by people with oncological pathologies.

As a proxy of lifestyle, the body mass index and smoking habit information have been included. Only smoking habits affect being IGG positive. The logistic regression shows a probability of half for smokers to get infected.

The strong regional effect and some of the results listed before suggest that a multilevel model should be applied.

Table 2 - *Logistic model: odds ratio, regression coefficients, std. error and p-value.*

Variables	**Mode**	**Logistic model**			
		Odds ratio	**Coeff.**	**Std. error**	**p-value**
Intercept			-7.37	0.3909	<.0001
Region of residence	Piemonte	8.15	2.10	0.2400	<.0001
	Valle d'Aosta	7.85	2.06	0.5209	<.0001
	Lombardia	16.03	2.77	0.2293	<.0001
	Bolzano	6.04	1.80	0.3390	<.0001
	Trento	6.91	1.93	0.3277	<.0001
	Veneto	4.21	1.44	0.2477	<.0001
	Friuli-Venezia Giulia	2.48	0.91	0.3567	0.0108
	Liguria	7.12	1.96	0.2665	<.0001
	Emilia-Romagna	5.74	1.75	0.2432	<.0001
	Toscana	2.07	0.73	0.2820	0.0098
	Marche	6.15	1.82	0.2754	<.0001
	Lazio	2.56	0.94	0.2585	0.0003
	Abruzzo	3.21	1.17	0.3273	0.0004
	Campania	2.51	0.92	0.2627	0.0005
	Puglia	2.24	0.81	0.2788	0.0038
	Sicilia	Reference mode			

Table 2 - *Logistic model: odds ratio, regression coefficients, std. error and p-value – continued.*

Variables	Mode	Logistic model			
		Odds ratio	**Coeff.**	**Std. error**	**p-value**
Age classes	1-5	Reference mode			
	6-10	3.05	1.12	0.2349	<.0001
	11-17	2.47	0.90	0.2569	0.0004
	18-34	3.78	1.33	0.3154	<.0001
	35-49	4.23	1.44	0.3138	<.0001
	50-59	5.45	1.70	0.3136	<.0001
	60-69	5.27	1.66	0.3154	<.0001
	70-84	4.54	1.51	0.3137	<.0001
	85 and over	4.04	1.40	0.3594	0.0001
Educational qualification	No qualification/Primary and lower secondary education	1.57	0.45	0.0930	<.0001
	Upper secondary education	1.33	0.28	0.0916	0.002
	Bachelor, Master, PhD	Reference mode			
Citizenship	Italian	Reference mode			
	Stranger	1.92	0.65	0.0764	<.0001
Person with whom he/she have had contact	Cohabiting family member-Yes	24.27	3.19	0.1100	<.0001
	Cohabiting family member-No	Reference mode			
	Non-cohabiting family member-Yes	5.23	1.65	0.1407	<.0001
	Non-cohabiting family member-No	Reference mode			
	Colleague-Yes	2.88	1.06	0.1750	<.0001
	Colleague-No	Reference mode			
	Patient-Yes	3.67	1.30	0.1923	<.0001
	Patient-No	Reference mode			
	Another person-Yes	3.96	1.38	0.1227	<.0001
	Another person -No	Reference mode			
Smoke	Yes	0.51	-0.68	0.0836	<.0001
	No, never smoke	Reference mode			
Cancer	Yes	0.53	-0.63	0.1697	0.0002
	No	Reference mode			

5. Introducing the regional effect with the multi-level model

The multilevel model can be considered the proper statistical tool to study a regression model on data hierarchically nested in level, such as students in class, patients in hospitals or, as in our case study, individuals living in Italian regions.

The fundamental idea underlying these models is the introduction of a further intercept β_{0j}, linked to the level j, which could absorb the variability not attributable to the units' characteristics, but to the j^{th} level to which they belong (Snijders and Bosker, 2011).

When the dependent variable Y is binary, we can formalize this kind of model with this generic formula:

$$logit(\Pr(Y_{ij} = 1 \mid X = x)) = \beta_{0j} + \beta_1 X_{1ij} + \beta_2 X_{2ij} + \cdots + \beta_P X_{Pij} + e_{ij} \quad (2)$$

Actually, multilevel models are often called random-effects models too, because we could be not interested in the specific value of each intercept, regarding every j^{th} level, but just to their functional distribution.

In our case, we studied a multilevel model to isolate the regional distribution of the independent variables (X) introduced in the model.

Conversely to the simple logistic model previously described, in the table below regional coefficients have not been estimated; their contribution to the Y explanation is considered as intercept instead of covariates.

Table 3 - *Multilevel logistic model: odds ratio, regression coefficients, std. error and p-value.*

Variables	**Mode**	**Logistic model**			
		Odds ratio	**Coeff.**	**Std. error**	**p-value**
Intercept			-6.07	0.4476	<.0000
Age classes	1-5	Reference mode			
	6-10	3.18	1.16	0.2380	0.0000
	11-17	2.49	0.91	0.2616	0.0005
	18-34	3.69	1.31	0.3233	0.0001
	35-49	4.12	1.42	0.3217	0.0000
	50-59	5.44	1.69	0.3215	0.0000
	60-69	5.24	1.66	0.3237	0.0000
	70-84	4.53	1.51	0.3214	0.0000
	85 e più	4.05	1.40	0.3680	0.0001
Educational qualification	No qualification/ Primary and lower secondary education	Reference mode			
	Upper secondary education	0.84	-0.17	0.0674	0.0107
	Bachelor, Master, PhD	0.63	-0.46	0.0981	0.0000

Table 3 - *Multilevel logistic model: odds ratio, regression coefficients, std. error and p-value – continued.*

Variables	Mode	Logistic model			
		Odds ratio	**Coeff.**	**Std. error**	**p-value**
Person with whom he/she have had contact	Cohabiting family member-Yes	24.24	3.19	0.1146	<.0000
	Cohabiting family member-No	Reference mode			
	Non-cohabiting family member-Yes	5.51	1.71	0.1459	<.0000
	Non-cohabiting family member-No	Reference mode			
	Colleague-Yes	3.15	1.15	0.1820	0.0000
	Colleague-No	Reference mode			
	Patient-Yes	3.70	1.31	0.2058	0.0000
	Patient-No	Reference mode			
	Another person-Yes	3.97	1.38	0.1290	<.0000
	Another person -No	Reference mode			
Smoke	No information	Reference mode			
	Yes	0.80	-0.22	0.3100	0.4767
	No, but I have smoke in the past	1.78	0.58	0.3100	0.0627
	No, never smoke	1.62	0.48	0.3100	0.1162
	Not applicable	2.06	0.72	0.3800	0.0577
Cancer	Don't know/No information	Reference mode			
	Yes	0.46	-0.78	0.2698	0.0039
	No	0.88	-0.13	0.2130	0.5552
Citizenship	Italian	Reference mode			
	Stranger	1.94	0.66	0.0772	<.001

Applying a multilevel model, which introduces a regional random effect, the variable regarding smoking habit and having a cancer pathology completely loses its significance. In other words, neutralizing the smokers and the cancer pathologies' distributions among regions, variables have no more a statistically significant effect on the IGG outcome. On the contrary, every other evidence pointed out by the simple logistic model are confirmed.

6. Conclusions and implications

The Seroprevalence survey is referred to a period, from 25 May to 15 July, during which the epidemy had strong territorial characterization. It estimates 1.5 million individuals (2.5% whole resident population) tested positive to the IgG (IgG+), six times those officially intercepted by the Italian National Institute of Health (ISS).

The use of multivariate statistics and in particular the application of the model (logistic and multilevel) helps to clearly interpret the relationship between the variables studied and the seroprevalence rate.

The multilevel model, compared to the logistic one, allowed to control the territory, introducing a random effect of the region. It confirmed the strongest relationships for several variables as type of contact, educational qualification and citizenship and it highlighted the loss of significance for other variables such as smoking and cancer pathologies. Both models confirmed the absence of a relationship with variables related to health conditions and occupational status.

The results of the multilevel model made it possible to have a complete picture of the relationships and in particular to keep under control the variables strongly linked to the territory, characterized by significantly different levels of diffusion of the phenomenon, especially in the reference period of the survey (May-July 2020).

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SUMMARY

Risk factors for contagion of SARS-COV-2: a statistical comparison

From 25 May to 15 July 2020, Istat and the Ministry of Health carried out a seroprevalence survey on SARS-CoV-2. The survey aimed to understand how many people developed antibodies to the SARS-CoV-2, even in the absence of symptoms. The survey collected all the necessary information to estimate the infection size in the population and to describe its frequency about several sociodemographic factors.

The sample consists of 150,000 individuals and it was designed by Istat to guarantee representativeness, both at a national and regional level. The results presented in the paper are related to 65,000 respondent individuals, whose blood samples were collected. The survey management in emergency conditions did not allow to fully reaching the whole sample, so post-stratification techniques were used to correct the distortion factors.

Estimates pointed out that about 1.5 million individuals (2.5% whole resident population) tested positive to the IgG (IgG+) having developed antibodies to SARS-CoV-2. The number of positive people is six times those officially intercepted by identification of the RNA viral.

The descriptive analysis allows highlighting the statistically significant relationships between every single variable and the seroprevalence rate.

Logistic and multilevel models have been studied to detect which factors played the main roles in having a positive IgG outcome. The estimation of logistic regression coefficients reveals interesting differences between the different risk factors.

Alessandra BATTISTI, Istat, albattis@istat.it
Chiara COLUCCIA, Istat, coluccia@istat.it
Maria Clelia ROMANO, Istat, romano@istat.it
Simona STAFFIERI, Istat, staffier@istat.it
Marco Dionisio TERRIBILI, Istat, terribili@istat.it

NEW TRAVEL HABITS OF UNIVERSITY STUDENTS IN RELATION TO COVID-19

Alexandra Patrizi, Livia Celardo

1. Introduction

Over the last decade, many tourist destinations have experienced crises, involving terrorist attacks, natural disasters or health crises, e.g. SARS (Chebli and Said, 2020). Nevertheless, the tourism industry has been able to recover, as it has an incomparable capacity for resilience (Tejan and Safaa, 2018). However, the world is now facing an unprecedented crisis. By definition, a crisis is "a low-probability, high-frequency event that develops very rapidly and involves ambiguous situations with unknown causes and effects" (Roberts *et al.*, 2007). Faced with the unexpected, the tourism sector remains vulnerable and faces several challenges to recover, including understanding consumer behavior in response to catastrophic events (Mair *et al.*, 2016).

Since its emergence in late 2019, Covid-19 has rapidly spread beyond nations' borders and caused significant impacts to the livelihoods of people around the world. The spread of this pandemic disease and their intensified impacts have also caused the lock-down of several cities by the authorities and the cancellation of flights and other transport services (Jittrapirom and Tanaksaranond, 2020).

Driven by a relatively strong global economy, a growing middle class in emerging economies, technological advances, new business models, affordable travel costs and visa facilitation, international tourist arrivals grew 4% in 2019 to reach the 1.46 billion. This figure was reached two years ahead of UNWTO forecast. This made the sector a true global force for economic growth and development (Celardo and Iezzi, 2017), driving the creation of more and better jobs and serving as catalyst for innovation and entrepreneurship. In short, tourism helped build better lives for millions of individuals and transforming whole communities (UNWTO, 2020).

2020 turned out to be the worst year for tourism - globally - in terms of international arrivals (-74% compared to the previous year), returning to the levels of 30 years ago. This collapse corresponds to a loss of approximately 1.3 trillion USD - 11 times greater than the decrease recorded during the world crisis of 2009 (UNWTO, 2021).

The customer flow in 2019 in Italy was approximately 436.7 million admissions, up by 1.8 percent compared to 2018, with an average stay of 3.32 nights. In the same year the turnover index in the sector of housing marked an increase of 0.8 per cent (ISTAT, 2019).

In the Italian context, the National Institute of Statistics (ISTAT, 2021) has estimated that the travel of residents in 2020 has reached an all-time low: there are 178 million nights lost compared to 2019 (-43.5%), with a drastic decline in holidays (-44.8%) and business trips (-67.9%).

Most experts think that international tourism levels will not return to pre-Covid levels before 2023. In fact, 43% of respondents point to 2023, while 41% expect a return to 2019 levels will only happen in 2024 or later. Extended scenarios for 2021-2024 indicate that it could take two-and-a-half to four years for international tourism to return to 2019 levels (UNWTO, 2021).

An increase in domestic tourism, close to home, more sustainable and local, is assumed. The brief summer recovery of tourism observed in 2020, due to a temporary relaxation of restrictions, was greater in the younger categories. After months of closed national borders and grounded flights, some countries slowly started to re-open for tourism (Boffey, 2020).

Looking at different studies that have been proposed in the last year, there is optimism that tourism will recover fast. According to them, most people have planned when and where they will travel, that is immediately (0-6 months) after the Covid-19 pandemic ends. Nature tourism will be the most popular attraction with important aspects of safety, cleanliness, and beauty to fulfill tourist demand and the next trend is short-time period tourism (Wachyuni and Kusumaningrum, 2020).

It is generally thought that Covid-19 will influence travel habits, and people will avoid travelling in groups and being surrounded by a group of people. This pandemic has drawn the attention of the public to the issue of hygiene and health, which will become important factors in travel decisions. Faced with a worried clientele, tourism businesses (transport, accommodation, catering, tourist attraction facilities) should further improve their hygiene conditions, to regain confidence (Chebli and Said, 2020). Medical scholars have already developed several scales to monitor "coronaphobia", however, we need tailored scales to measure travel anxiety. Existing tourism-scales on health risk perception are not specific enough. Therefore, with the help of PATS (Pandemic Anxiety Travel Scale), researchers and practitioners could measure how tourists are psychologically affected by pandemic anxiety (Zenker *et al.*, 2021). The hospitality sector's future in this unprecedented time depends on the perception of the shock of the disaster, consumers' beliefs, anticipated emotions and future desires. Consumers' behaviour has been reformed to adapt to the new lifestyle very quickly. The high level of social uncertainty caused by the Covid-19 outbreak leads customers to a higher risk judgement (Foroudi *et al.*, 2021). In addition, these

studies provide the view that basically traveling is currently a human need. Respondents showed a positive response to interest in traveling after a pandemic and showed a negative response to travel anxiety. Therefore, after the end of the pandemics, hygiene-issues must be considered as an important factor in tourists' decision-making process and in the destination choice. The strategy needs to be built to enhance the tourist's trust in the security and health of the destination (Wachyuni and Kusumaningrum, 2020).

Thus, a question arises: once travel resumes, what will be the new trends in travel for the next few years? And how could these categories respond to a change in habits imposed by the current pandemic? As experienced in other cases, after a crisis, new tourist concerns, apprehensions and demands emerge. Therefore, it is considered imperative to predict the trajectory of change in tourist behavior to help tourism managers identify the basis of a strategy to ideally respond to the situation.

This paper presents a descriptive study describing the perception on the current situation, as well as future travel intentions and university students' travel behaviors using statistical analyses. The main objective of this study is to provide a general overview of students' perception on Covid-19 pandemics in relation to tourism behavior, as well as to make predictions about future behaviors in terms of travel choices. Young people are one of the categories that could move back to travelling sooner, in relation to the current pandemic caused by Covid-19. Understanding tourist behavior is a context that guides strategies and actions to provide adequate response measures for the recovery of the tourism industry. The present study therefore also aims to give a practical aid to the hospitality sector, to understand strategies and the best ways to react to the pandemic.

2. Data and methods

According to the purpose of the survey, its target population consist of Italian and foreign university students. Data were collected in a period between April and June 2021. The total of respondents was 232 students, with all data valid to be analyzed in the study. A non-probabilistic sample was chosen, so respondents participated to the survey on the basis of their voluntary engagement. The main limit in collecting the data was that people was not always willing or available to answer to the questionnaire, leading to a non-response bias. Anyway, all questions were mandatory, avoiding bias due to missing data. Concerning the questionnaire administration, it was decided to conduct the survey through a Computer-assisted web interviewing. In fact, considering the selected target, this had many advantages: nowadays more or less all young people have the possibility to connect to the web quickly, it is a cheap method of data-collecting, it was very quick to receive the results and it was possible also to

reach people outside the country. The data collection was implemented by distributing an online questionnaire (implemented on Google Forms platform) through social media, word of mouth and a QR Code. The last-mentioned method was the best considering the difficulties in this period to reach people due to social distancing, therefore the fact to let people scan a code and fill the questionnaire by themselves felt as the less invasive. The authors went to different faculties at the University of Rome "Tor Vergata" and asked random people to scan the code and give their personal contribution. This is why, even without knowing the authors and without direct contacts, using the QR code was the quickest and easiest way to reach most students. The writing of the questionnaire included a test-phase in which all people, except the target, were invited to fill in the questionnaire and give personal opinions about the structure, the understandability of the questions and they were asked to give suggestions.

The questionnaire consists of four sections (Appendix): personal questions, a section concerning the level of information about the current health situation, one about future perceptions and intentions and finally a section concerning a hypothetical future trip, for a total number of 20 questions. The responses were processed and analyzed, in order to identify the main socio-demographic characteristics of the sample and the main perceptions of students about the future travel behaviors in connection with the current sanitary condition. Moreover, we applied Multiple Correspondence Analysis (MCA – Greenacre & Blasius, 2006) to detect and represent underlying structures in the dataset. In particular, we used 10 active variables (see Figure 4). We employed FactoMineR an R package dedicated to multivariate data analysis (Husson *et al.*, 2015).

3. Results

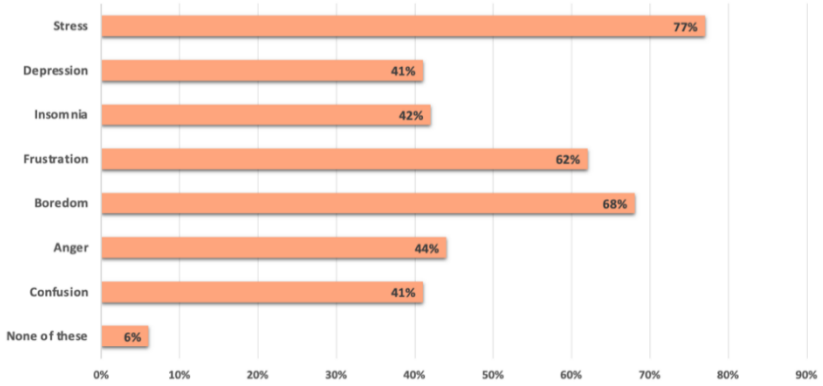
Regarding the first section of the questionnaire, 32% of the respondents were males, while the 68% were females. The majority of people were between 21 and 24 years old (55%), a minor part was between 18 and 20 (16%), between 25 and 29 (19%), 30 or older (10%). Most people that answered to the questionnaire were Italian (80%), but also a share of students of other nationalities was reached (20%).

The section concerning the level of information about the current health situation included a question about the level of information about the Covid-19 issue. Most people said that they feel sufficiently informed to make decisions for their future (54%), or partially informed (30%). A minor part does feel uncertain about so many different sources of information (15%), and just a small percentage does not feel informed at all (1%). If asked about the duration of the current pandemic situation, understood as the duration of the restrictions and the spread of the virus, most people

think that it will last at least one year (41%) or few months (35%), followed by those who think that it will last over one year (22%). A minimal part think that it will last just a few weeks (2%). Students were quite optimistic concerning the scenario for summer 2021, thinking it would be possible to travel, but with significant restrictions (75%). Someone thought that it would be possible to travel without or with very few restrictions (23%) and a small part thought that it would not be possible to travel at all (2%).

The third section, related to future perceptions and intentions, included a question about the manifestation of some emotional states, from March 2020 and for a period of at least two consecutive weeks, due to the health situation and the pandemic. As shown in Figure 1, most people experienced stress (77%), boredom (68%) and frustration (62%). Many people also felt anger (44%), insomnia (42%), depression (41%) and confusion (41%). Only a few people said they didn't feel any of these emotional states (6%).

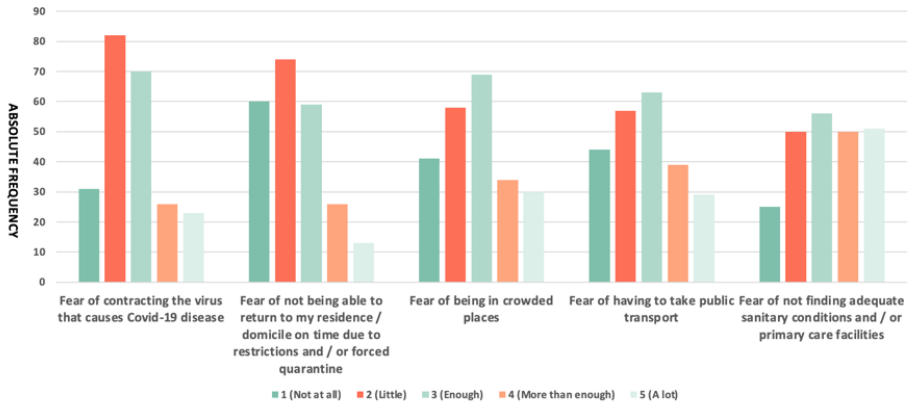
Figure 1 – *Manifestation of some emotional states due to the health situation and the pandemic.*



Source: our elaboration.

Another question investigated how much a list of elements, based on a scale from 1 (not at all) to 5 (a lot), could negatively affect the willingness to return to travel. As shown in Figure 2, the fear of not finding adequate sanitary conditions and/or primary care facilities, the fear of having to take public transport and the fear of being in crowded places are the factors that could most affect negatively the willingness to travel.

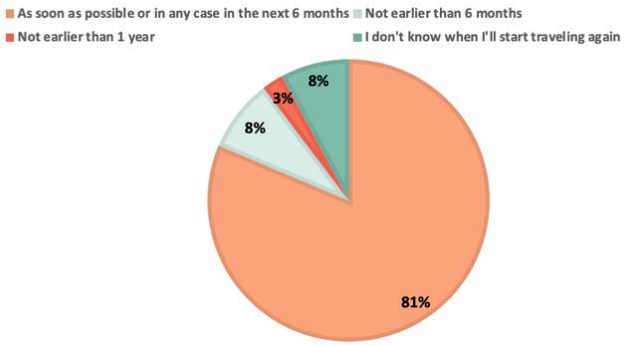
Figure 2 – *Scale of factors that could negatively affect the willingness to travel.*



Source: our elaboration.

The final section concerned a hypothetical future trip. First of all, people were asked if the idea of travelling in the near future, or in the next 12 months, made them feel anxious. The major part said that they don't feel anxious about travelling (72%), while others responded affirmatively (28%). The next question asked if they thought they would travel in the next 12 months. Here, most people said yes (88%), while just a small part said no (12%). The following questions were answered just by those who said they thought they would travel in the next 12 months and regarded the hypothetical future trip. As shown in Figure 3, the majority of people will travel as soon as possible, or in any case in the next 6 months (81%), while the others will start traveling not earlier than 6 months (8%), 1 year (3%) or just don't know when they'll travel again (8%).

Figure 3 – *When people will return to travel.*



Source: our elaboration.

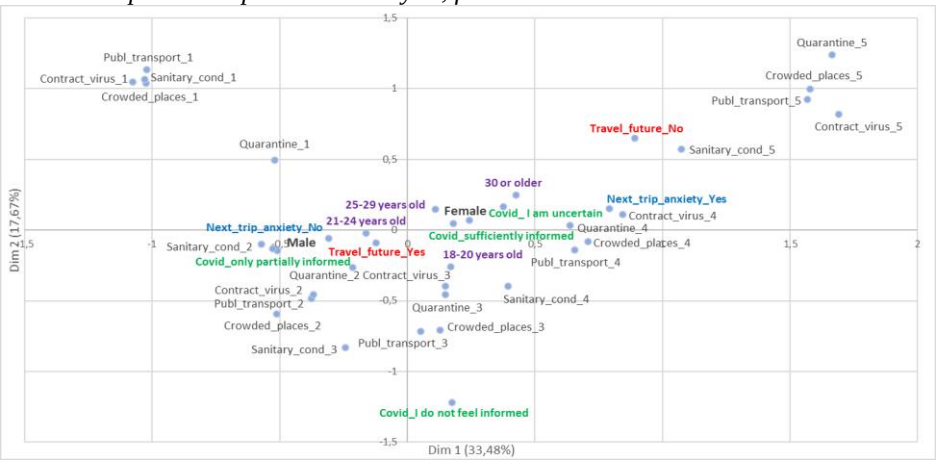
Concerning the destination of the next trip, most people will travel in the country of residence (54%) or within the European Union (36%). Less people will travel in the region of residence or domicile, enhancing the proximity tourism issue (6%) or outside the European Union (4%). The most chosen destination will be a sea / cruise location (46%), followed by city (25%) and country / lake / river location (23%). Just few people will choose mountain / hill location (4%) or other (2%). Most people will travel with family and/or partner (51%) or with friends (41%). Just a few people will travel alone (5%) or in solutions organizes for groups (3%). The main duration of the trips will be between 4 and 7 days (59%), followed by those who will travel for more than 7 days (31%) and those who will travel from 1 to 3 days (10%). The main means of transport will be plane (40%) and own vehicle (40%). These two are followed by the train (14%), bus (3%) and ship (3%). Regarding the accommodation, most people will choose a house or room for rent (30%), other kind of accommodation facility such as B&B or hostel (28%), or hotel or similar (27%). Less people will choose the home of relatives or friends (8%) or their own home (7%).

3.1 Multivariate statistical analysis

As mentioned before, we implemented Multiple Correspondence Analysis on several variables in order to identify associations among multiple dimensions. The objective was to identify how the future travel propensity of students is connected to the perception of the actual Covid-19 pandemic situation, meaning that we wanted to investigate if the fear of the virus determinates a change in the student travel behavior.

Figure 4 shows the results of the Multiple Correspondence Analysis: females and people between 18 and 20 years old and over 30 years old seem to be more affected by the fear of quarantine, crowded places, taking public transport, sanitary conditions and the fear of contracting the virus that causes Covid-19. They are also less willing to travel again in the next 12 months. On the contrary, males and people in the middle age groups, seems to feel less the impact of these factors. The analysis also enhanced that the level of awareness about the Covid-19 issue does not directly affect the willingness to go back to traveling. In fact, those who do not have anxiety at the idea of traveling in the next 12 months, are also mainly those who feel partially informed, while those who feel sufficiently informed are more affected by the precedent factors.

Figure 4 – *Multiple Correspondence Analysis, first two dimensions.*



Source: our elaboration.

4. Conclusions

The main objective of this paper was to provide an overview of university students' perception on Covid-19 related to touristic behavior. As results showed, females and generally the younger or the older students could go back to traveling after, as they seem to be more affected by the hygiene-issue and the Covid-19-related restrictions in the decision-making process. However, from the analysis we observed that most people (81%) will return to travel as soon as possible, or at least in the next 6 months. The level of information about the current health situation and the pandemic seems not to be decisive, as most of the people feels sufficiently informed, but those who feel only partially informed are less affected by anxiety at the idea of traveling in the next 12 months.

There are some factors that the hospitality sector has to keep in mind to recover in the best way from this crisis: people will be influenced in their decision-making by the health issue, because the fear of not finding adequate sanitary conditions and/or primary care facilities could affect their willingness to travel. Public transports, and in general crowded spaces, need an increased attention for social distancing and hygiene too, to allow people to feel safe.

Another important aim of this study was to understand tourist behavior in order to make predictions for the future. As shown in the results, people will probably travel in their country of residence or within the European Union, still not getting too far from their residence or domicile, choosing mainly sea or cruise locations. As before the

pandemic due to Covid-19, people will continue traveling with family, partner or with friends, maintaining social distancing and moving in small groups. There will be the trend to make medium-long trips, mainly between 4 and 7 days, mainly using plane or own vehicle as means of transport. According to the accommodation, most people will choose a house or room for rent, decreasing the choice for hotels or similar.

The rationale of this study is to understand the changes in the tourist behaviors, especially among young people. In fact, understanding tourist behavior is a context that guides strategies and actions to provide adequate response measures for the recovery of the tourism industry. The present study therefore also aims to give a practical aid to the hospitality sector, to understand strategies and the best ways to react to the pandemic.

The theoretical contribution of this research is to understand the tourism tendences in relation to Covid-19 pandemic while the implications for practice of the results of this study are to become a source of information and help for the hospitality industry, that could use these elements to understand how to reorganize and recover in the best way. In fact, the results obtained through this work could help both the hospitality sector and active participants in the industry to understand the main issues and how to move to recover in the quickest and best way from this unforeseen crisis.

Appendix

Questionnaire

Section 1 - Personal questions		
Q1	*Gender:*	Female/Male
Q2	*What age group do you belong to?*	18-20 years old/ 21-24 years old/ 25-29 years old/ 25-29 years old/ 30 or older
Q3	*What is your Nationality?*	
Q4	*Which area does your faculty of study belong to?*	Humanities sciences/ Medicine and Pharmacy / Engineering and Architecture / Law, Political and Social Sciences / Economics and Statistics / Scientific area / Other
Q5	*How many trips for vacation purposes, with an overnight stay of at least one night in accommodation facilities or private paid accommodation, did you on average do every year before 2020?*	None / 1 / 2 / 3 / 4 / 5 or more

Section 2 - Information about the health situation		
Q6	*Based on your personal opinion, how informed do you feel about the Covid-19 issue?*	Sufficiently informed/Only partially informed/ Uncertain about many different sources of information / Not informed at all
Q7	*What do you think will be the duration of the current pandemic situation, understood as the duration of the restrictions and the progress of the spread of the virus?*	Few weeks/ A few months / At least one year / Over one year
Q8	*Considering the current global pandemic situation, what do you think will be the scenario for summer 2021?*	Travel without or with very few restrictions / without restrictions / It won't be possible to travel
Q9	*Do you think that in the future, when it is possible to return to travel without or with minimal restrictions, the average cost of travel will increase?*	Yes, a lot / Yes, but a little / No
Q9a	*Do you think it is right that the average cost of travel could increase?*	Yes, due to restriction costs / Yes, as service providers will have to recover losses due to the pandemics / No
Section 3 - Perceptions and intentions		
Q10	*From March 2020 to today, have you ever manifested any of the emotional states listed below for a period of at least two consecutive weeks, due to the current health situation and the pandemic?*	Stress/ Depression / Insomnia / Frustration / Boredom / Anger / Confusion / None
Q11	*On a scale of 1 (not at all) to 5 (a lot), please indicate how much each of these factors could negatively affect your willingness to return to travel:*	Fear of: (1) contracting the virus that causes Covid-19 / (2) of not being able to return to domicile due to restrictions / (3) of being in crowded places / (4) of public transport / (5) of not finding adequate sanitary conditions
Q12	*Does the idea of traveling in the near future make you feel anxious?*	Yes / No
Q13	*Do you think you will travel in the next 12 months?*	Yes / No
Section 4 - Hypothetical future trip		
Q14	*When will you make your next trip?*	As soon as possible or in the next 6 months / Not before 6 months / Not before 1 year / I don't know when I will travel again
Q15	*What will be the destination of your next trip?*	Region of residence / Country of residence / In EU / Outside EU
Q16	*What will be the main type of destination for your next trip?*	Sea / Mountain / City / Country / Other location
Q17	*Who will you be making your next trip with?*	Groups / Family or partner / Alone / Friends
Q18	*What will be the duration of your next trip?*	1-3 days / 4-7 days / More than 7 days
Q19	*What will be the main means of transport used for your next trip?*	Plane / Train / Bus / Ship / Own vehicle
Q20	*What will be the main type of accommodation used for your next trip?*	Hotel / Other accommodation / House for rent / Own home / Home of friends

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SUMMARY

New travel habits of university students in relation to Covid-19

Since its emergence, Covid-19 has caused significant impacts to the livelihoods of people around the world. Thus, a question arises: once travel resumes, what will be the new trends? The main objective of this study is to provide a general overview of students' perception on Covid-19 pandemic in relation to tourism behavior, as well as to make predictions about future behaviors in terms of travel choices. The data collection was conducted through a questionnaire, the responses were processed and analyzed using statistical analyses. This study could be useful is to understand the changes in the tourist behaviors, especially among young people. The theoretical contribution of this research is to understand the tourism tendences in relation to Covid-19 pandemic, while the implications for practice of the results of this study are to become a source of information and help for the hospitality industry, that could use these elements to understand how to reorganize and recover in the best way.

Alexandra, PATRIZI, Università degli Studi di Roma "Tor Vergata", alexandrapatrizi@libero.it

Livia, CELARDO, Università degli Studi di Roma "Tor Vergata", livia.celardo@uniroma2.it

IN-PERSON SCHOOLING AND SARS-COV-2 TRANSMISSION ACROSS ITALIAN REGIONS[1] [2]

Daniela Ghio, Massimiliano Bratti, Nikolaos I. Stilianakis,
Simona Bignami-Van Assche, Yacine Boujija, John Sandberg,

1. Introduction

After worldwide school closures during the first wave of the corona virus disease (COVID-19) pandemic in spring 2020, the Fall school term has marked the return to in-person instruction for millions of children in Europe and North America. Nevertheless, this period has also coincided with the second pandemic wave in these regions, sparking a public debate about the role of in-person schooling for community transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).

Although prolonged school closures have serious negative implications for children's health and educational development (Kuhfeld *et al*., 2020; Hertz and Barrios, 2020; ECDC, 2020; Chanchlani *et al*., 2020), the existing literature is not conclusive about the role in-person schooling for SARS-CoV-2 transmission plays.

Scholars (Goldstein and Lipsitch, 2020; Viner *et al.*, 2020) have focused on differences in susceptibility to infection along age groups concluding that children are less likely to become infected compared to adults. Using the cumulative incidence of SARS-CoV-2 infections, school re-opening effects have been assessed to identify the role of in-person schooling as pandemic amplifier (Alfano *et al.*, 2021, Riley *et al.*, 2020, Zamir *et al.*, 2020, Tosi and Campi, 2021). Specifically, Fenga and Galli (2021) have captured dynamics in the time series of the cumulative COVID-19 positive tested cases across Italian regions. However, only few scholars have assessed the effectiveness of school closing measures in reducing the spreading of SARS-CoV-2 and reproduction number of infected people (Brauner *et al.*, 2020; Li *et al.*, 2021).

Our contribution to the scientific literature is twofold. Firstly, we outline homogenous empirical evidence across Italian regions in the trends of SARS-CoV-2 weekly incidence among school-aged children vis-à-vis other age groups, from September 2020 to April 2021. Secondly, we deepen the statistical analysis for regions where associations between aggregated age group infections among children and

[1] **Disclaimer:** The opinions expressed by the authors do not necessarily reflect the opinions of the European Commission or the institutions with which the authors are affiliated.

[2] The authors are solely responsible for all aspects of this article including the research, the interpretation and the writing thereof. DG is the corresponding author.

parents are more marked. Results point to substantial regional variations in the role of school opening for second and third pandemic waves. In Lombardy, Emilia Romagna and Piedmont regions, we find that the decision to close schools has been associated with a medium-term significant decrease in infections of parents' age groups. Whereas further investigations are needed to definitely assert causality, our findings highlight the potential of school closing effects for limiting the spreading of SARS-CoV-2. These results support the argumentation that the decision to close or re-open schools should be guided by a comprehensive risk-assessment based both on the wellbeing of children and accounting for demographic and epidemiologic patterns of local communities (WHO, 2020). Therefore, the prioritization of in-person schooling should be planned and coherently implemented as part of a contextual setting to limit school related secondary infection transmissions.

2. The role of in-person schooling

Large-scale population-based studies on the determinants in the spreading of SARS-CoV-2 between school settings and surrounding communities, come primarily from the United States (US) (Honein *et al*., 2021). Notably, a national assessment found that increases in COVID-19 incidence and percentage of positive test results among adults were not preceded by increases in infections among the school-aged population 0-24 years old (US Department of Health and Human Services / Center for Disease Control, 2020). In other terms, the levels of COVID-19 transmission in school settings were not a contributing factor of community transmission, but rather reflected it, given that recommended mitigation strategies were widely adopted. Studies on the effects of school re-opening in Italy have underlined that the risk of infection among students is higher outside than inside the educational settings, where students are triggered to respect rules during in-person school hours (Buonsenso *et al.*, 2020). The relevance of social interactions occurring around school attendances (e.g. transportation services used for reaching schools) has also been reported in Catalonia (Spain), where, similarly to Lombardy, COVID-19 case-fatality achieved one of highest rates in Europa (Llupia *et al*., 2021). Gandini *et al.* (2021) argued that school opening was not the driver of the second COVID-19 wave in Italy. Notwithstanding, these conclusions are in contrast with observations from other zoonotic infections (namely H5N1 influenza virus) where a larger proportion of transmission clusters were identified among children (Zhu *et al.*, 2020). Using a stochastic model, Fenga and Galli (2021) found a statistically significant increase in the cumulative number of COVID-19 positive tested cases in all Italian regions due to the school re-opening. Similar conclusions were achieved by Casini and Roccetti (2021), demonstrating that in 15 out of 21 Italian regions, the Fall re-opening of schools was related to a 16-day

delay growth in the cumulative number of positive cases. Given regional differentials in the evolution of the pandemic and the public health measures implemented, more evidence is needed to properly assess the role of in-person schooling for SARS-CoV-2 transmission in Italy during the 2020-21 school year.

3. Data and Method

The age-specific incidence of confirmed SARS-CoV-2 infections were obtained from COVID-19 monitoring datasets, managed by the Italian Epidemiological Association (2021). As descriptive results, COVID-19 positive cases are presented using heatmap graphs to tracking regional trends in the weekly incidence of the disease by age-group, between September 13, 2020 and April 30, 2021, across Italian regions. We select three regions where the incidence among children (0-18) and adults (25-59) results more evident, Lombardy Emilia Romagna and Piedmont, for further statistical investigations. Since the mean age of mother at childbirth is around 32 years in the selected regions, 31.9 in Emilia Romagna, 32.1 in Piedmont and 32.2 in Lombardy, respectively (EUROSTAT, 2021), we formulate the following hypothesis of intergenerational links between children's and parents' behaviours:

Assuming 25-44 age group adults as theoretical parents of 0-13 age group children, and 45-59 age group adults as theoretical parents of 14-18 age group children, SARS-CoV-2 infections among parents are likely to be associated – albeit specificities of other contextual factors - with SARS-CoV-2 infections of children. Thus implies that the effectiveness of school closing, as a policy measure adopted to limit infections, should result in the decrease of the intergenerational transmission between children and parents.

We start investigating this hypothesis by estimating the following regression model by region:

$$\ln(parents_{t+2,c}) = \alpha + \beta \ln(children_{t,c}) + \gamma\, closed_{t,c} + \phi(\ln(children_{t,c}) \times closed_{t,c}) + \mu_c + \lambda_{j+1} + \epsilon_{t+1} \quad (1)$$

where:
t and c are time (week) and parents' cohort subscripts;
$\ln(parents_{t+2})$ and $\ln(children_t)$ are the number of positively tested infections between parents of cohort c and their children, respectively, accounting for the time lag in transmission;

$closed_{t,c}$ is an indicator for school closure at time *t* for children of parental cohort *c* and $\ln(children_{t,c}) \times closed_{t,c}$ an interaction term. Thus β captures the intergenerational correlation between parents' and children's infections at the baseline (i.e. when schools are open), while ϕ the change in this correlation when schools are closed. According to our hypothesis, we expect $\beta > 0$ and $\phi < 0$. λ_{j+1} is a time (week) fixed effect. Model (1) is estimated both pooling all parents' cohorts together, in which case we also include a cohort fixed effect (μ_c), and separately by cohort of parents (23-44, 45-59), in which case the cohort fixed effect is absorbed in the model intercept.
ϵ_{t+1} is an error term.

To investigate the dynamic of infections after/before school closures, we define a second model, which aims to capture impacts on *secondary* infections, based on demographic associations between age groups of children and related parents, accounting for the average delay of approximately 2 weeks (16 days according to Fenga and Galli, 2021) between the SARS-CoV-2 infections among children (*primary infections*) and the positive laboratory tested cases among parents (*secondary infections*). We apply the event-study approach, as a generalization of the difference-in-differences method (Clarke and Schythe, 2021), to include the time-varying controls of regional COVID-19 school policy and associated intergenerational (children to parents) infection transmissions. Our empirical strategy is motivated by the heterogeneity in weekly intensity of infections over time, when compared with a baseline reference period. Hence, changes do not homogeneously occur during the reference period, but could have rather different impacts along age-groups before and after the school closures. We carry out the cohort analyses using the log of cases by age group, due to the exponential nature of the COVID-19 pandemic evolution. The model reads as follows:

$$\ln(parents_{t+2,c,r}) = \alpha + \beta\ln(children_{t,c,r}) + \emptyset(\ln(children_{t,c,r}) \times closed_{t,c,r}) + \sum_{j=2}^{J} \beta_j \, Lag_{j,c,r} + \sum_{k=1}^{K} \gamma_k \, Lead_{k,c,r} + \mu_c + \lambda_{j+1} + \theta_r + \varepsilon_{t+1,r} \quad (2)$$

where:

θ_r is a region fixed effect;
$Lag_{j,c,r}$, and $Lead_{k,c,r}$, are binary variables indicating the number of periods before and after the school closing occurrence, which is considered as the event of interest in the reference time period. *Lag 1* serves as baseline and therefore is omitted from the model; therefore, leads and lags capture differences with respect to the baseline. We expect $Lag_{j,c,r}$, to capture the growing trend of transmissions which motivate school closures. Contrarily, $Lead_{k,c,r}$, is expected to be negative in case of effectiveness of

school closures, and increase (in absolute value, meaning a larger reduction of cases) over time;
J and *K* are the maximum number of lags and leads, respectively.

This model is estimated pooling all regions together and results are presented for all parents' cohorts. Statistically significant and negative lead-coefficients would indicate that school closures mitigate the transmission among parents, measured as weekly case incidence of SARS-CoV-2 infections among parents.
Regression results' graphical representations are obtained by applying the Stata routine `eventdd` (Clarke and Schythe, 2020).

4. Results

Since March 2020, national authorities opted for a school closure policy as one of the key interventions to control COVID-19 pandemic, but as of September 2020, the majority of governments decided to re-open schools. UNESCO (2021) reports that in Italy, from September 13, 2020 to March 30, 2021, all schools remained closed at national-wide level for 13 weeks, and partially closed for 21 weeks (where partially refers to school closures restricted to some regions or some educational grades). Comparing Italy with other European countries, a similar school policy was adopted in Germany, where schools were fully closed for 14 weeks and partially closed for 13 weeks. By contrast in Spain, where COVID-19 epidemic evolution presents strong similarities with Italy, full school closures were limited to 10 weeks. Nevertheless, in Italy school opening follows a regional scheduling. For instance, in Lombardy Emilia Romagna and Piedmont, schools started on September 14, 2020, whereas Campania and Calabria postponed the opening day to September 24.

We detect increases in infections among 14-18 age-groups (primary infections) preceded that of adults age 45-54 (potentially as secondary infections) in Emilia-Romagna, Lazio, Lombardy, Marche, Piedmont, and Tuscany, representing more than half of national infections (Bignami Van-Assche *et al.*, 2021). Lombardy, Piedmont and Tuscany were the first to be declared red zones as of November 6, 2020 (DPCM, 2020) and, following mandatory high school closing, COVID-19 weekly incidence among 14-18 years old dropped before older age groups. A similar effect was observed in Emilia-Romagna, Piedmont and Tuscany after high schools opening in late January 2021. Results are confirmed by official figures indicating that, nationally, the rise in incidence among high school students age 14-18 has preceded that of adults age 45+ after school opening in Fall 2020 and January 2021 (ISS, 2021).

Descriptive results give evidence that the role of school openings across Italian regions on both the second and third COVID-19 waves should not be minimized.

Table 1 summarizes main measures adopted by regional authorities to limit school-related infection transmissions in Lombardy, Emilia Romagna and Piedmont.

Table 1 – *School-related measures adopted to contrast SARS-CoV-2 transmission.*

Measures adopted by National and Regional Authorities	**Lombardy**	**Emilia Romagna**	**Piedmont**
All school levels go back in person	14-Sep-20	14-Sep-20	14-Sep-20
Secondary and high schools move 50% -75% online			Oct 24-26, 2020
High-schools and university move online	6-Nov-20	6-Nov-20	2-Nov-20
Orange zone		14-Nov-20	
Red zone			19-Nov-02
Yellow zone		6-Dec-20	
National-wide red zone, all schools closed	24 Dec-6 Jan 6-21	24 Dec- 7-Jan-21	24 Dec-8 Jan-21
Elementary schools go back in person	7-Jan-21	7-Jan-21	7-Jan-21
Orange zone		8-Jan-21	17-Jan-21
Red zone, high-schools and university stay online	16-Jan-21		
High schools go back in person 50-75%		18-Jan-21	
Orange zone, middle schools go back in person	25-Jan-21		
High schools go back in person 75%	1-Feb-21		1-Feb-21
High schools and university move online		1-Feb-21	
Yellow zone	21-Feb-21		1-Feb-21
Orange zone		Feb 21st	
Dark orange zone, all school levels move online	Mar 5-14, 2021	3-Mar-21	Mar 5-14, 2021
National red zone, all school levels close	Mar15-Apr 6, 2021	Mar15-Apr 6, 2021	Mar15-Apr 6, 2021
Red zone extension for 14 days			2-Apr-21
High schools stay on line 50%		12-Apr-21	

Sources: http: www.regione.lombardia.it , www.regione.emilia-romagan.it, www.regione.piemonte.it .

We check the statistical significance of changes in infections among children and parents when school restrictions occurred.

Table 2 shows regression coefficients by region, and cohort of parents (Model 1, Section 3). Results clearly show a statistically significant positive correlation between adults' and children's incidence of SARS-CoV-2, which is higher for the older cohort of parents in all regions but Piedmont, in which the correlation in the two cohorts is very similar.

Table 2 – *Regression coefficients by region.*

	Lombardy			Emilia Romagna			Piedmont		
Ln-parents		Age			Age			Age	
		25-44	44-59		25-44	44-59		25-44	44-59
School-closure	1.495**	-0.253	0.080	1.904***	-0.715	-0.003	1.816***	1.000	0.433
	(0.578)	(1.320)	(0.648)	(0.548)	(1.500)	(0.950)	(0.650)	(1.169)	(0.731)
Ln-child	0.698***			0.561***			0.803***		
	(0.076)			(0.065)			(0.090)		
Ln-child 0-13		0.779***			0.613***			0.933***	
		(0.120)			(0.094)			(0.117)	
Ln-child 14-18			0.924***			0.896***			0.954***
			(0.066)			(0.066)			(0.086)
Interaction between School-closure and Ln-child	-0.214**	0.036	-0.039	-0.251***	0.104	-0.023	-0.263**	-0.170	-0.071
	(0.104)	(0.204)	(0.119)	(0.088)	(0.212)	(0.164)	(0.118)	(0.185)	(0.137)
Constant	1.183**	0.539	0.607	1.849***	1.432**	0.609*	0.630	-0.282	0.331
	(0.452)	(0.750)	(0.385)	(0.407)	(0.612)	(0.356)	(0.518)	(0.683)	(0.475)
Observations	62	31	31	62	31	31	62	31	31
R-squared	0.642	0.697	0.924	0.678	0.717	0.878	0.678	0.766	0.880

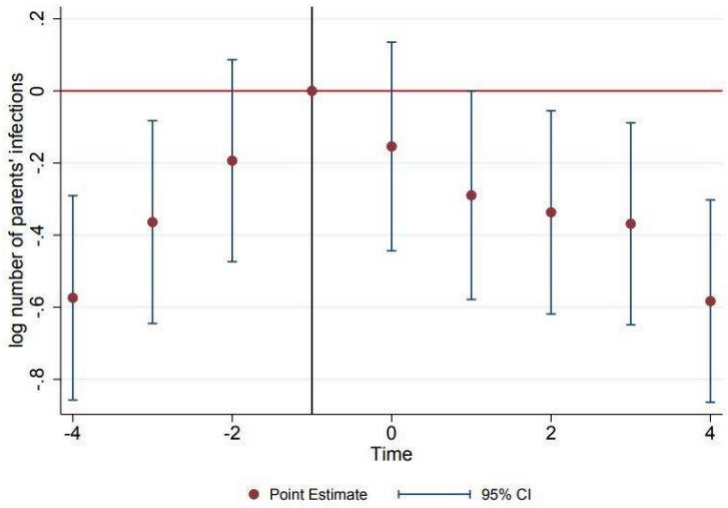
Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Given the log-log specification, our model shows a 0.9 elasticity of adults' cases with respect to children's cases (i.e. a 1% increase in the latter increases the former by 0.9%). Interestingly, this intergenerational correlation is reduced after school closing by about 0.21-0.26 log points depending on the region (higher for Piedmont and Emilia Romagna, lower for Lombardy), albeit the estimate is statistically significant only in the models pooling all cohorts of parents together. In order to better look at the dynamic of infections around school closure, we carried out an event-study analysis (Model 2, Section 3).

The time pattern of the school closure coefficients is plotted in Figure 1, where the coefficients of leads and lags are on the x-axis, starting from 4 weeks before the school closures (after the re-opening on September 2020) occurred for the first time in November 2020. The coefficients of leads are negative and increase in their absolute magnitude, meaning that the event *school closure* (taking place at week -1) is associated with a decreasing number of SARS-CoV-2 positive tested cases among parents. After 3 weeks, the decrease stabilizes. Expectedly, the coefficients of the lags, i.e. the incidence of cases before the school closure, is getting larger approaching the event-time *school closure*, which represents the peak of cases.

Figure 1 – *Event cohort study; plot of lead and lags for all cohort of parents.*



We also estimated Model (2) keeping in the sample only the older cohort of parents (45-59), who exhibited the higher intergenerational transmission (Table 2). In Lombardy, Emilia Romagna and Piedmont, the weekly incidence decrease of SARS-CoV-2 infections in the 45-59 age group is statistically associated with school closures, and the related changes in SARS-CoV-2 infections among 14-18 age groups, from September 2020 to April 2021.

These results are consistent with Fenga and Galli (20210 that highlight the association between the re-opening of schools and the peak of the epidemic curve; yet, a careful assessment of causality would require further investigations.

5. Conclusion

Empirical analyses have revealed that schools can operate safely as the pandemic unfolds by adopting appropriate public health measures to maintain low levels of COVID-19 community transmission and recommended mitigation strategies in schools. As embedded in the World Health Organization's recommendations, two main conditions need to be satisfied: community transmission of COVID-19 should be maintained at low levels; recommended mitigation strategies in schools should be in place (WHO, 2020). These measures include: cohorting and keeping students and staff in small groups or bubbles that do not mix; the universal use of masks; limiting

physical presence in classrooms in order to reduce crowding; and ensuring adequate and appropriate ventilation.

Our findings complement the available evidence regarding transmissions associated with in-person schooling in two important ways. First, we compare age-specific incidence of SARS-CoV-2 infections across Italian regions from September 2020 to April 2021, tracking how trends in parents' (*secondary*) infections has been 2-week preceded by children's (*primary*) infections. Second, using an event cohort study, we find that the school closure is associated with the decrease of *secondary* infections which remains statistically significant until 4 weeks from the event occurrence. These results highlight the importance of minimizing community transmission to ensure a safe environment for in-person learning, especially when the prevalence of new variants might rise COVID-19 incidence in school-age children sharply.

Our study has a number of limitations that should be borne in mind. First, being a comparative case study, it is inherently limited by heterogeneity in the regional application of mitigation measures and testing, that might be biased from higher fractions of asymptomatic infections especially among the youngest population age-groups (Fisman et al., 2021). Second, the study presents limitations due to the lack of data availability, since we could not evaluate trends in COVID-19 incidence by individual demographic and epidemiologic profiles, but only by stratified age-group. Notably, high school is attended by children up to 19 years of age, while the available aggregation, excluding age 19, does not align perfectly with school levels. Yet, because effects about these groups are underestimated, this constraint presumably does not amend but strengthens validity of our conclusions.

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SUMMARY

In-person schooling and SARS-CoV-2 transmission across Italian regions

BACKGROUND. The role of in-person schooling for community transmission of SARS-CoV-2 has immediate policy relevance for deciding how to operate schools safely as the pandemic unfolds, new variants of SARS-CoV-2 are circulating, and immunization coverage remains limited among children.

OBJECTIVES. We compare trends in SARS-CoV-2 weekly incidence among school-aged children vis-à-vis other age groups, during Fall 2020 and Spring 2021, by analysing empirical evidence across all Italian regions. Looking at regions where intergenerational effects are more evident, Lombardy, Emilia Romagna and Piedmont regions, we detect impacts of secondary infections based on intergenerational dynamics between children and parents.

METHODS. COVID-19 case data are analysed using a standard descriptive methodology to capture dynamics in weekly incidence of the disease among children, adolescents and young adults between September 2020 and April, 2021. Statistical analyses are then extended adopting an event cohort method to quantify the impacts of school closures on COVID-19 positive laboratory tested cases among parents, *secondary infections*, accounting for changes in SARS-CoV-2 infections among children, *primary infections*, over time.

RESULTS. Increases in weekly incidence among school-aged children 14-18 have preceded increases in other age groups in several Italian regions during the second and third waves. In Lombardy, Emilia Romagna and Piedmont regions, we find that the decision to close schools has been associated with a medium-term significant decrease in infections of parents' age groups. Whereas further investigations are needed to definitely assert causality, our findings highlight the potential of school closing effects as last resort to limit the resurgence of SARS-COv-2 viral transmission.

Daniela GHIO, European Commission, Joint Research Centre (JRC), Daniela.Ghio@ec.europa.eu

Massimiliano BRATTI, Università degli Studi di Milano, massimiliano.bratti@unimi.it

Nikolaos I. STILIANAKIS, European Commission, Joint Research Centre (JRC) and University of Erlangen-Nuremberg, Nikolaos.Stilianakis@ec.europa.eu

Simona BIGNAMI-VAN ASSCHE, Université de Montréal, simona.bignami@umontreal.ca

Yacine BOUJIJA, Université de Montréal, yacine.boujija@umontreal.ca

John SANDBERG, George Washington University, jsandber@gwu.edu

PANDEMIC MANAGEMENT IN THE EU THROUGH GENDERED LENSES: A COMPARATIVE ANALYSIS USING THE OXFORD COVID--19 GOVERNMENT RESPONSE TRACKER

Daniele Grechi, Matilde Ceron

1. Introduction

The Covid-19 pandemic and outbreak containment measures have reshaped substantially our daily lives. At the same time, marked heterogeneities - even within the EU - have characterised the strength of the outbreak and the stringency of the restrictions across the Member States. The scholarly debate has devoted extensive attention to the consequences of the pandemic across several dimensions, from the narrow economic one to the threats to democratic institutions. Restrictions generally have a role to play in such an assessment, especially in view of the cross-country heterogeneities highlighted above.

In this context, gender parity has emerged in the early literature of the pandemic as a visible casualty of the health crisis. While the negative impact of women is likewise heterogeneous cross-country, the havoc of stay-at-home restrictions has overburdened women multidimensionally. On the employment front, increased care work has fallen predominantly on women's shoulders. Similarly, confinement in the home has increased the isolation of vulnerable women, reducing the accessibility of support services and conversely increasing that to violent partners. The literature has put forward linkages between such negative gendered outcomes and policy measures such as school closures and lockdowns.

Nevertheless, analyses so fare are often case-based, with limited effort in comparatively assessing cross-country containment efforts from a gendered perspective. The work contributes such a comparison within the EU27, providing a gendered scoreboard of pandemic responses based on cross-country data from the Oxford Covid-19 Government Response Tracker (Hale *et al.*, 2021) for 2020. Variable choice for the scoreboard is supported by the review of the early literature on the gendered impact of the pandemic, highlighting the linkages between specific indicators within the response tracker - namely school closures and lockdown - and negative implication for women. In doing so we contribute an early assessment of the research question of how outbreak responses across the EU compare for their gendered implications.

2. Policy measures with gendered implications

There is a growing body of literature dedicated to gender parity in light of the unbalanced additional burden of the pandemic together with the danger of confinement for vulnerable women. We survey the literature to highlight the linkage between detrimental outcomes for gender parity in terms of employment and violence and policy measures in response to the pandemic.

2.1 Gendered care and employment

Considering gender implications of the Covid-19 a major area of concern in the emergency relates to closures (Sun *et al.*, 2021; Ziedan *et al.*, 2020) halting various working and leisure activities, including schools and childcare or their relocation to within the homes with the support of digital technologies. Together with virtual learning, many workplaces turned to distance working during and following the first lockdown. Technologies supported continuation of work during lockdowns, shielding – unequally – some employees from risk of Covid exposure (Bonacini *et al.*, 2021). In parallel, lockdowns limited outsourcing of care work (e.g., schools or other extracurriculars) increasing the burden on parents – in particular mothers (Hupkau and Petrongolo, 2020). As such, the pandemic worsened problematic pre-existing challenges for female employment, markedly in Italy already displaying the lowest participation rate (less than 50%) in Europe before the outbreak (Lagomarsino *et al.*, 2020). Before looking closely at the Italian example, it should be noted that in numerous countries the incidence of the suspension of work activities, the reduction of hours and wages and unemployment affected disproportionally female workers. The Bureau of Labour Statistics data (2020) in the US showed that 59% of applications for unemployment benefit came from women in March and April 2020.

In Italy, after the strict lockdown exiting restrictions in May 2020 men returned to work overwhelmingly more than women (72.4% compared to 27.6%) – partially linked to their concentration in restarting manufacturing activities - while the return to the labour market was slower for women (Casarico and Lattanzio, 2020). Istat data in the second quarter of 2020 record a decrease of 470 thousand units among employed women compared to the same period of the previous year, of which the majority is composed by people employed with fixed-term contracts, and the rate of employment under the 50%. The risk is therefore that the - albeit slow - trend of a growing labour participation of women in the last ten years will be interrupted and reversed. Considering the last available data for the 2020 (Istat, 2020a), the percentage of women who lost their jobs in 2020 was double than males. Focusing

on new hires, women are also penalized: in the first nine months of 2020 compared to the same period of the 2019 there was a decrease of more than 26% for new job position for women compared to a 20.7% decrease in contracts activated for men (Istat, 2020b). Moreover, women are the category with the lowest number of re-entries into the labour market. Considering the period from 4 May to 30 September 2020, 67,000 people, who had lost their jobs during the period 1 February - 3 May, returned into the labour market but only the 42.2% of women had this opportunity (Istat, 2021). Furthermore, the reduction in women's working hours can generate a decrease spiral that can leads to exit from the job market (Berardi *et al.*, 2020) or penalties in terms of career and salary (Rhubart, 2020). A survey conducted in Italy by Antonietti *et al.* (2021) highlighted how 30% of women with school-age children considered the option of leaving work if the children did not return to the classroom in the new school year and that 65% considered online teaching to be not compatible with their job. Another factor affecting work during the pandemic, with specific gender repercussions with substantial implications for the future is the "home-family-work" relationship. For many women the crisis has generated a serious challenge of reconciliation between family and working needs, changing the trend of the recent decades with an increasingly consistent outsourcing of domestic and care work to the market and public agencies (Alon *et al.*, 2020). Schools closures has significantly increased the burden of domestic work and care of younger children, especially in helping with distance learning, redefining the balance within the household also on the basis of the work of women and men, nonetheless with linkages to the pre-existing division of labour (Waddell *et al.*, 2020).

As argued by Rhubart (2020) in the US about 80% of adults who did not work because they had to take care of children at home from school or kindergarten were women. The Italian data likewise show how domestic and care activities have continued to be a women responsibility in the majority of the cases. Even before the crisis the burden fell exclusively on women in 74% of cases (IPSOS Mori, 2019) in 27% of cases resulting in leaving their jobs to take care of children. The increase in care responsibilities of employed parents has pushed many to change their working hours in order to respond to the changing needs of their family. Data from international research (Hjálmsdóttir and Bjarnadóttir, 2021) but also from Istat surveys, highlight how women have had to redefine, more than men, their schedules and other aspects of their employment, with inevitable implications also in terms of the wage gap (Istat, 2020b). For example, a survey conducted by Del Boca *et al.* (2020) showed that 68% of working women with partners spent more time on housework during the lockdown than before, 29% the same time, only 3% have less commitment than in the past. Looking towards the future, it is clear that these repercussions on the job market will be relevant for a long period. In

particular, the scenario is that of an increase of imbalances to the detriment of women, linked in particular to different dimensions such as precariousness, difficulties in work-life balance, lack of support services (including in particular those for early childhood) and the greater rigidity of women's job market (Istat, 2020b).

2.2 Gender based violence in lockdown

Confinement and social isolation may be essential for pandemic management, while bearing substantial psychological and social consequences. Past natural disaster such as the eruption of Mount st. helens, Hurricane Katrine and the earthquake in Haiti have linked stay-at-home restrictions with gender-based violence (Palermo and Peterman, 2011; Enarson and Fordhman, 2001). Globally, similar patterns emerge for the Covid-19 pandemic (Waksman and Blank, 2020). Spain, France, India, Australia, United Kingdom, USA, Argentina reported a 60% increase in calls to victim support lines: "upwards of 25% in some countries and in other ones the reported cases have doubled" (United Nations, 2020). Table 1 to follow presents a cross-country overview during the first wave of 2020.

Table 1 – *Increase in gender-based violence in selected countries*

Nation	Gender-based violence trends
Spain	+30% in domestic violence (Sharifi *et al.*, 2020)
France	+18% in domestic violence (Sharifi *et al.*, 2020)
United Kingdom	there was a 25% increase in phone calls to anti-violence lines in the first 2 weeks of the lockdown (Bradbury-Jones and Isham, 2020)
Mexico	March was the month with the most violence against women, on average in 2020 there was an increase of 25%. (De la Miyar *et al.*, 2021).
Brazil	Registered an increment of 17% in the number of calls denouncing violence against women in March 2020 (Marques *et al.*, 2020).

As emerged from the table, domestic violence has grown all over the world during forced segregation at home as it becomes very difficult for victims to report and flee their homes. In Italy, according to Istat statistics (Istat, 2020c), calls in the first two weeks of March – compared to those of the same period of 2019 – decreased by 55.1% to reverse upward during the second half of March. As argued by Ruspini, using Di.Re data (Istat, 2020c) there was an exponential growth with

about 2900 cases of women who turned to anti-violence centres in March – more than 74% compared to the monthly average recorded in 2018. A further element emerged from these data it is that 98% of the women who have asked for help are Italian: migrant women could be invisible to this control system. Intersectional challenges – such as migrant background, socio-economic disadvantage or disability can further compound discrimination and difficulty in escaping violence. During the first full pandemic period – 1 March-16 April 2020 – the Italian toll-free anti-violence and stalking number (1522) received over five thousand calls, 73% more than in the same period of 2019 (Istat, 2020a). Between March and June 2020, the number of calls recorded compared to the same period of the previous year increased by 119.6%, going from 6956 to 15280 cases. A further change potentially linked to is important that communications using chats compared to calls have increased fivefold starting from 417 (2019 data) to 2666 messages (Istat, 2020d).

The resulting picture evidences the negative gendered implications of lockdowns for gender-based violence and of school closures for the labour market prospects.

3. Data and methodology

The Oxford COVID-19 Government Response Tracker (OxCGRT) methodically collects data on different common policy responses deriving from governments' pandemic management (Hale *et al.*, 2021). It is based on 20 indicators with data from more than 180 countries, measuring the severity of the outbreak (e.g., deaths and cases), enacted restrictions (e.g., lockdowns, travel bans, school closures, etc.), non-medical health interventions (e.g., testing and tracing policies) and economic support measures. Additionally, it provides several indices aggregating – for example – all containment and health measures, described in Table 2 below, together with indicators selected on the basis of the literature evidence on the impact of given restrictions on gender equality.

The selected variables allow to map the two key gendered dimensions of containment measures, while comparing it through the indices to the overall strictness of restrictions (Stringency and Containment) and to the severity of the outbreak (cases and deaths). The analysis employs a scoreboard methodology well-established for comparative policy analysis across the EU Member States, ranging from the longstanding and widely known Digital Economy and Society Index and European Innovation Scoreboard to most recent efforts such as the EU Justice Scoreboard and the Social Scoreboard which is included in the assessment of National Recovery and Resilience Plans.

Table 2 – *Variable description.*

Variables	Mean	Max	Min	Description
Stringency	56.86	67.95	43.52	Index aggregating all eight restrictions (e.g., schools, stay-at-home, workplace closures, travel limitations, etc.) indicators and information campaigns
Containment	54.50	66.71	39.72	Index aggregating all contained in stringency plus additional health measures indicators (e.g., testing, tracing, facial covering; vaccination, etc.)
Schools	1.85	2.59	1.23	Coding: 0 - no measure; 1 - recommended; 2 - required some; 3 required all
Lockdowns	0.91	1.46	0.33	Coding: 0 - no measure; 1 - recommended; 2 - required some exceptions; 3 required minimal exceptions
Cases	36773	74148	6516	Cumulative cases per million people from March 1 to December 31, 2020,
Deaths	721	1684	101	Cumulative deaths per million people from March 1 to December 31, 2020,

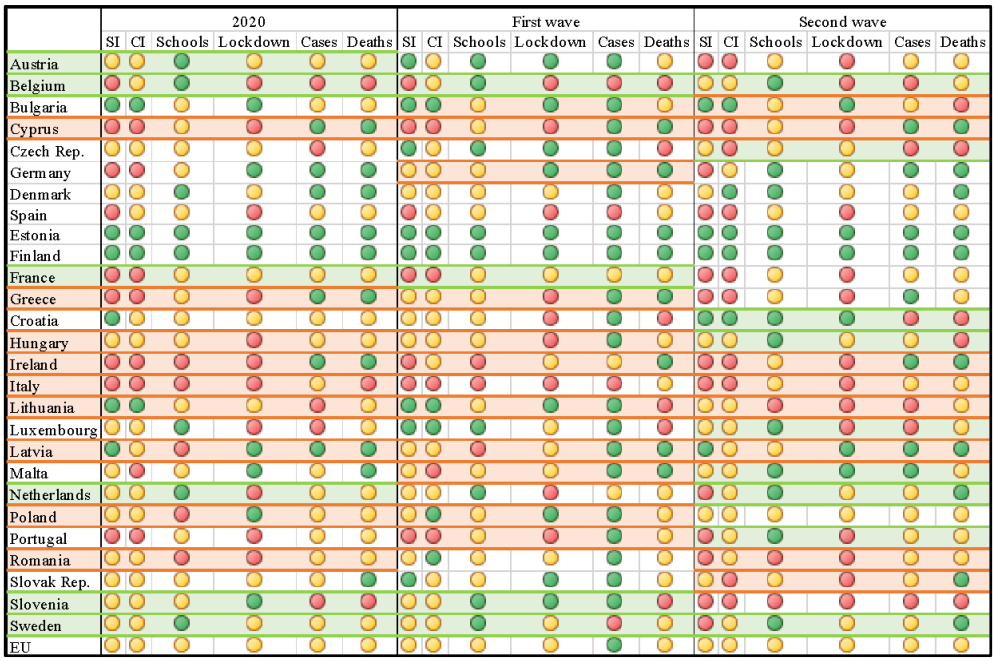
Our scoreboard is generated by mapping across each variable the relative comparative position in the top, middle or bottom third marked visually through a traffic light indicator. On such a basis, we single out and mark as "green" countries that comparatively (considering outbreak severity and stringency of restrictions) rely less on measure with a particularly negative gendered implication – giving a higher relevance to school closures when conflicting with performance in terms of lockdown given the broader audience affected. Countries over relying on such problematic measures are conversely market as "red". The analysis considers the pandemic over 2020, starting from March to guarantee full coverage across the EU27, while also differentiating across the two waves with August 31 as a cut-off.

4. Covid-19 restriction in the EU: gender scoreboarding

Figure 1 below maps the severity of the outbreak, restrictions and specific containment measures carrying extensive gendered implications: school closures and lockdowns. As shown in Table 2, providing variable descriptive statistics, heterogeneities are substantial on all accounts. Countries range from suffering as little as 101 deaths per million in the full timeframe considered to the staggering 1684. Similarly, responses vary. Cross-country, the Containment index average over 2020 varies from below 40 to well over 65. Composition of the policy mix chosen to contain the pandemic is also heterogeneous: lockdowns average from as low as 0.33 to 1.46, while school closures from 1.22 to 2.59. Figure 1 below shows

how differences across all indicators do not necessarily align: some countries experiencing severe outbreaks display comparatively more limited stringency of containment efforts while others enact draconian restrictions for relatively limited contagion.

Figure 1 – *Scoreboard of gendered pandemic responses across the EU27.*

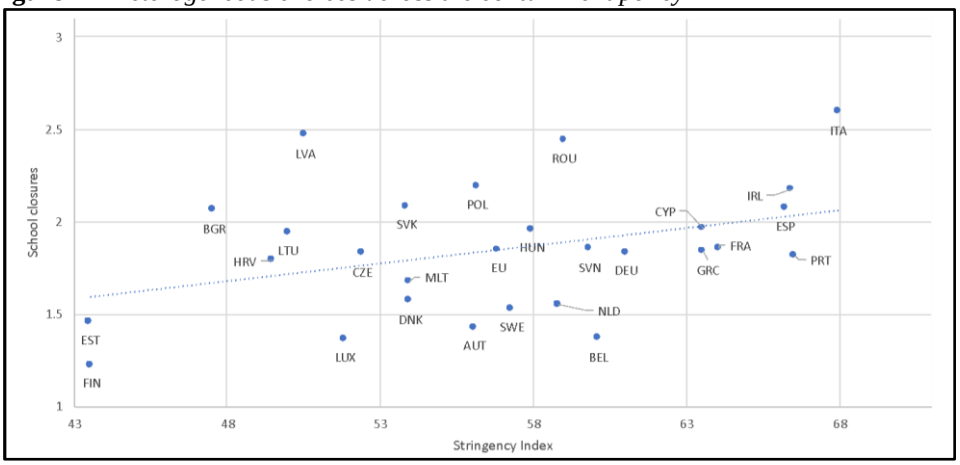


The data considers the period of 2020 from the first of March to the end of the year with August 31 as the cut-off between the two waves. SI and CI reflect Stringency and Containment Indices.

A similar reasoning applies to the key variables of interest, lockdowns, and school closures. A country like Belgium, with among the most severe outbreak is on the lower end of the school closure spectrum among the EU27. The exact opposite is the case for a country like Latvia, with a low outbreak and high school closures. From the perspective of how school closures compare to overall restrictions, Lithuania performs similarly to the other Baltic country: low for Stringency and Containment indices while middling for school closures. The opposite is the case for France among the highest for overall restrictions but not quite as much for school closures. In comparing the traffic-lights of the variables of interest – favouring the assessment of school closures when conflicting with lockdowns given the broader audience affected from a gendered perspective – Figure 1 singles out countries that by the level of their outbreak and restrictions

over-relied on such measures problematic for equality, marked with a red background. Those countries putting a premium on keeping school open compared to their ranking for outbreak severity and over-all containment measures are conversely singled out through a green background. Beyond the full length of the sample in 2020 a parallel reasoning is carried out across the first and second wave to pinpoint an evolution of approaches – as arguably more options to manage the pandemic without generalised school closures were available later into the crisis – and policy learning. Fewer countries over-rely on school closure in the second wave compared to the first, while there is an increase in the number of Member States sparing gendered measures compared to outbreak strength and other interventions. Hungary, Malta, and Portugal even move from the red to the green group regardless of the stability or worsening of their outbreaks. A few countries remain consistently in the high (Cyprus, Ireland, Latvia, Lithuania) and low (Belgium and Sweden) gendered implication groups.

Figure 2 – *Heterogeneous choices across the containment policy mix*



The data reflects the full timeframe of the analysis in 2020

Results highlight heterogeneity across policy choices along two dimensions: how stringently to respond for a given level of the outbreak and how much in obtaining a given level of containment to rely on measures of school closures and lockdowns. As shown in the literature review, the implication of resorting heavily to distance learning or rather preserving in-person attendance comes with substantial cost for women employment and hence gender equality. Figure 2 offers at first glance a comparison of how countries score across the preponderance of school closures among their policy choices to contain the spread of Covid-19 comparing scores in this measure to the overall Stringency index. When only

considering the choice among different policy options, problematic over-reliance emerges for several Central and Easter European and (i.e., Slovakia, Poland, Romania, Latvia, Lithuania, Bulgaria, Czech Republic) as well as Southern European (i.e., Italy, Spain, Croatia) Member States across very different levels of containment (and outbreak). The only Member States not belonging to the two groups is Ireland, suggesting a geographical divide.

5. A gendered pandemic response outlook

Mapping pandemic responses across the EU27 from gendered lenses reveals substantial heterogeneities in policy choices across the Member States. Countries vary for different levels of outbreak and containment responses in the extent to which they resort extensively to lockdowns – dangerously increasing the risk of gender-based violence – and school closures – negatively affecting women labour market prospects. Comparing results across the two pandemic waves signals partial improvement in the over-reliance on containment measures with negative gendered implications. Nevertheless, the cost of policy choices potentially pressuring women with care responsibilities out of the labour market may be substantial and long-lasting and vary substantially within the EU27. The marked cross-country differences show some geographical cohesion indicating the gendered outlook may be especially negative in the South and East of Europe. Such a pattern overlaps with pre-pandemic heterogeneities in progress in gender parity as progress towards equal societies lags especially in the European periphery. Further research should consider whether less equal societies enacted pandemic crisis management policy choices especially detrimental to women. There is a risk, linked to countries already lagging behind for gender equality will further slow or revert their progress at the hands of the pandemic. Results underline how policy choices such as pandemic management should carefully consider gender implications, while heavily correcting the course in the Covid-19 recovery effort. The question remains of whether countries with widened gendered gaps from the pandemic will compensate through higher salience of equality in their recovery or as suggested by our scoreboard, progress in gender parity may act as a precondition for sensitivity to gendered implications. Such a crucial question is particularly timely as Next Generation EU, enacted nationally by the Member States through National Recovery and Resilience plans, foresees gender mainstreaming across its priorities. Our findings highlight the importance of drafting and assessing the plans through the lenses of gender equality.

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SUMMARY

Pandemic management in the EU through gendered lenses: a comparative analysis using the Oxford Covid--19 government response tracker

The Covid-19 crisis has led to unprecedented containment measures, often at the expense of allegedly less urgent priorities, such as gender parity, raising a substantial risk of reversing the recent progress even in contexts – such as that of the European Union – which have long made female empowerment and an equal society a mainstreamed objective in all areas of policymaking. The contribution considers pandemic responses through gendered lenses to provide a cross-country comparison within the EU27 during the first year of the pandemic health crisis. On the basis of the early literature on the gendered impact of the pandemic, we single out particularly problematic containment measures for equality (school closures and lockdowns). Accordingly, we develop a scoreboard of the over-reliance on such measures across the EU27, showing heterogeneities which cannot be reduced to the different severity of the outbreak and containment effort. Results show best and worst performers from the perspective of a gendered response outlook, pinpointing how such negative dynamics are especially concentrated in the South and East of Europe. The work highlights the importance of evaluating gendered implications of all policy measures and the urgency to mitigate the legacy of Covid-19 restrictions by putting equality at the centre stage of the pandemic recovery effort.

Daniele GRECHI, Università degli Studi dell'Insubria – DiSUIT, grechi.daniele@uninsubria.it

Matilde CERON, Università degli Studi di Pavia – DSPS, matilde.ceron@coleurope.eu

A STUDY OF THE PHENOMENON OF COVID-19 EPIDEMIOLOGICAL RISK

Tommaso Brancati, Francesco Dell'Orco, Stefania Fivizzani,
Veronica Iacono, Luana Sbardella

1. Introduction

The world population, between the end of the year 2019 and the beginning of 2020, has been affected by an epidemic, still in progress, known as "new coronavirus disease". Coronavirus are a large virus family giving having effects going to a common cold to harder diseases like Middle-East Respiratory Syndrome (MERS) or Severe Acute Respiratory Syndrome (SARS). The virus that causes the current coronavirus epidemic has been called "Severe Acute Respiratory Syndrome-CoronaVirus-2" (SARS-CoV-2), as told by the I*nternational Committee on Taxonomy of Viruses* (ICTV) that deals with the classification and the naming convention of the viruses in terms of species, genus, family etc. thanking to a group of experts in charge of studying the new coronavirus family. The disease caused by the new Coronavirus has been announced on 11th February of 2020 by the WHO General Director Tedros Adhanom Ghebreyesus, during a press briefing within a pause of the extraordinary forum dedicated to the virus[1].

The first cases have been found in Wuhan, in China, but the disease has been so quickly spread world-wide that WHO (World Health Organization) has declared that the coronavirus is a public health emergency of international concern and on 2020 11th of March has classified the emergency as pandemic.

COVID-19 symptoms are very similar to the flu: dry cough, breathing difficulty, weakness, fever. But in people with previous pathologies there have been found more severe symptoms like pneumonia and kidney failures often bringing to death.

Italy, hardly affected by the coronavirus, has fought the quick spreading of the epidemic by measures of containment, distancing and social isolation.

The purpose of this work is to build a composite index to analyze the COIVD-19 epidemiological risk. In particular it aims to describe the Sars-Cov-2 virus spreading and the related risk factors in Italy referred to a group of indicators measured prior to the spread of the virus and comparing the final result with an

[1] http://www.salute.gov.it/portale/nuovocoronavirus/dettaglioFaqNuovoCoronavirus.jsp?id=228.

index representing the disease spread in the moment the infection has started to have a severe impact (on 03/26/2020, when the number of deaths from COVID-19 on Italian territory compared to the previous day, reached the absolute maximum).

The risk factors considered in this study to analyze the disease spread are air pollution, mobility, population density and people seniority, found in the provincial capital municipalities.

2. Synthesis of methodology

The selection of the elementary indicators, namely risk factors, has been dictated both by subjective considerations and by studies now in progress about the phenomenon being analyzed.

The data matrix contains the following elementary indicators.

- Rate of PM_{10} (particulate matter with a size less than or equal to 10 micrometers), which is the yearly average concentration of PM_{10} in μg/m^3 (it refers to year 2018) [2].
- Rate of NO_2 (nitrogen bioxide) , which is the yearly average concentration of NO_2 in μg/m^3 (it refers to year 2018)[3].
- Rate of passengers transported, which is the ratio between the number of passengers transported by local public transport in the provincial capital municipalities and the average resident population in the year (it refers to year 2017) [4].
- Vehicular density, which is the amount of vehicles per km^2 of urbanized area (it refers to year 2018). [5]
- Seniority rate, which is the ratio between the number of inhabitants over the age of 65 and the number of inhabitants over the age of 14, expressed as a percentage.
- Population density, which is the number of inhabitants per km^2.[6]

The selection of the elementary indicators comes from the following considerations.

- The areas the virus has shown the greatest impact have a high population density and a high productivity. In these lands there is the greatest number of high-growth and present in the international market companies.

[2] Data Source ISTAT.
[3] Data Source ISTAT.
[4] Data Source ISTAT.
[5] Data Source ISTAT.
[6] Data Source ISTAT.

- The air pollution is a risk factor for the lower respiratory tract infections, in particular in vulnerable subjects, the elderly and people with previous pathologies and these conditions are also those that have characterized the Covid-19 epidemic. Some preliminary studies made by some Harvard University researchers show that an increase of the Pm levels affects the complications of coronavirus disease. Since the study is at a preliminary phase, it must be taken with due caution and it will need to be deepened.
- Mobility is a sure risk factor of disease spreading. La mobilità è sicuramente un fattore di rischio di diffusione della malattia. Think of how much a large concentration of people in a means of public transport, for example, can affect the contagion and spread of the disease.
- Data from the Italian Istituto Superiore di Sanità regarding the Covid-19 epidemic in Italy show how the elderly are the most affected people by the disease. In particular we have observed an increased mortality in the ages between 70 and 90 years old, confirmed all over the world by the WHO.

Table 1 - *Table of elementary indicators.*

Provincial capitalities	Rate of passengers transported	Density of population	Vehicular density	Rate of NO_2	Rate of PM_{10}	Seniority index	Incidence rate
Alessandria	14,6	203,6	2786,7	31,0	37,0	208,3	0,23
Ancona	107,6	124,8	3631,4	17,0	25,0	216,0	0,183
Andria	11,4	402,9	6846,6	23,0	23,0	120,0	
Aosta	12,6	21,4	3821,0	28,0	18,0	221,4	0,322
Arezzo	40,6	384,7	2355,6	36,0	23,0	205,2	0,072
Ascoli Piceno	13,1	158,0	2865,3	15,0	20,0	262,7	0,053
Asti	36,5	151,3	2774,2	31,0	36,0	205,6	0,13
Avellino	52,5	30,6	3980,4	24,0	35,0	199,5	0,043
Bari	75,6	117,4	3980,3	37,0	27,0	198,9	0,031
Barletta	6,0	149,4	5968,5	19,0	22,0	132,9	0,022
Belluno	81,0	147,2	2310,2	27,0	22,0	234,2	0,152
Benevento	21,7	130,8	4074,8	16,0	10,0	188,8	0,005
Bergamo	153,2	40,2	4068,5	41,0	30,0	197,9	0,672
Biella	12,5	46,7	2429,9	22,0	25,0	264,2	0,188
Bologna	289,5	140,9	3785,9	49,0	26,0	211,0	0,124
Bolzano - Bozen	112,3	52,3	6894,1	40,0	20,0	167,4	0,173
Brescia	276,0	90,3	2947,6	57,0	33,0	189,8	0,549
Brindisi	18,8	333,0	4018,7	23,0	25,0	174,5	0,031
Cagliari	158,4	85,0	4876,9	30,0	36,0	283,3	0,015
Caltanissetta	5,2	421,3	3781,0	30,0	26,0	162,5	0,019
Campobasso	50,7	56,1	4718,6	34,0	17,0	215,4	0,038
Catania	54,0	182,9	5186,5	50,0	27,0	152,0	0,031

Provincial capitalities	Rate of passengers transported	Density of population	Vehicular density	Rate of NO_2	Rate of PM_{10}	Seniority index	Incidence rate
Catanzaro	38,9	112,7	2759,8	21,0	26,0	174,6	0,015
Chieti	50,1	59,6	2924,6	16,0	24,0	239,9	0,045
Como	88,8	37,1	2323,4	44,0	29,0	208,4	0,127
Cosenza	68,6	37,9	4569,2	26,0	23,0	196,2	0,015
Cremona	18,9	70,5	3467,4	33,0	34,0	227,7	0,938
Crotone	15,7	182,0	2403,7	25,0	30,0	123,8	0,046
Cuneo	40,0	119,7	2557,1	23,0	21,0	204,1	0,083
Enna	40,1	358,8	4034,4	3,0	15,0	217,4	0,079
Ferrara	63,9	405,2	2022,0	38,0	31,0	266,9	0,061
Firenze	246,3	102,3	4897,3	60,0	30,0	217,7	0,075
Foggia	23,6	509,3	6282,5	18,0	16,0	163,3	0,049
Forlì	53,2	228,2	2502,7	29,0	26,0	194,2	0,13
Frosinone	17,6	46,9	2065,8	41,0	41,0	189,9	0,032
Genova	233,9	240,3	5706,7	60,0	25,0	255,5	0,09
Gorizia	21,4	41,3	2168,2	23,0	18,0	249,4	0,054
Grosseto	12,6	473,6	3472,9	37,0	27,0	199,5	0,078
La Spezia	134,0	51,4	4010,5	42,0	22,0	226,4	0,098
L'Aquila	41,5	473,9	1934,9	17,0	17,0	190,4	0,068
Latina	7,8	277,6	2388,3	27,0	23,0	153,5	0,021
Lecce	14,0	241,0	2357,1	29,0	23,0	201,6	0,036
Lecco	51,9	45,1	3776,5	37,0	23,0	206,2	0,022
Livorno	56,4	104,5	3838,9	39,0	23,0	216,9	0,06
Lodi	14,7	41,4	3988,2	34,0	38,0	188,7	0,858
Lucca	20,9	185,8	1550,7	25,0	25,0	205,8	0,123
Macerata	35,2	92,5	3606,4	13,0	17,0	214,6	0,127
Mantova	98,6	63,8	3525,1	28,0	30,0	225,7	0,303
Massa	16,2	93,8	1864,1	15,0	14,0	217,6	0,17
Messina	46,5	213,8	4528,8	30,0	23,0	179,5	0,024
Milano	480,1	181,7	6521,3	59,0	35,0	178,0	0,035
Modena	83,7	183,2	3258,6	40,0	33,0	177,7	0,215
Monza	29,0	33,1	5158,5	37,0	33,0	196,2	0,239
Napoli	112,6	119,0	7120,7	57,0	35,0	139,1	0,201
Novara	79,0	103,1	2978,7	45,0	27,0	184,8	0,021
Nuoro	27,8	192,1	4233,7	24,0	19,0	207,2	0,156
Oristano	4,7	84,6	3401,1	24,0	22,0	264,6	0,033
Padova	126,9	93,0	2265,9	38,0	37,0	216,6	0,004
Palermo	42,3	160,6	6373,2	52,0	36,0	145,3	0,19
Parma	124,8	260,6	3355,0	36,0	32,0	171,9	0,016
Pavia	63,7	63,2	3425,7	35,0	35,0	235,3	0,359
Perugia	120,0	449,5	2350,7	25,0	25,0	183,0	0,308
Pesaro	24,1	126,8	4174,6	19,0	26,0	214,8	0,091

Provincial capitalities	Rate of passengers transported	Density of population	Vehicular density	Rate of NO_2	Rate of PM_{10}	Seniority index	Incidence rate
Pescara	76,8	34,4	3801,2	34,0	28,0	208,7	0,409
Piacenza	89,7	118,2	2801,9	37,0	33,0	187,3	0,138
Pisa	74,6	185,2	2786,2	32,0	26,0	229,5	0,772
Pistoia	44,6	236,2	2528,0	22,0	19,0	218,1	0,083
Pordenone	50,2	38,2	2363,4	27,0	23,0	200,1	0,09
Potenza	26,7	175,4	2507,9	6,0	19,0	198,1	0,095
Prato	38,7	97,4	3563,7	30,0	25,0	153,5	0,023
Ragusa	6,8	444,7	2957,9	12,0	30,0	171,9	0,074
Ravenna	46,1	653,8	3198,7	30,0	27,0	202,1	0,009
Reggio Calabria	32,4	239,0	2518,0	19,0	21,0	165,4	0,115
Reggio Emilia	85,0	230,7	2789,2	35,0	35,0	143,8	0,022
Rieti	40,0	206,5	2486,5	21,0	19,0	217,3	0,319
Rimini	98,8	135,7	3996,4	39,0	31,0	181,9	0,026
Roma	331,6	1287,4	4658,9	58,0	30,0	170,0	0,353
Rovigo	12,2	108,8	2216,0	30,0	32,0	228,0	0,036
Salerno	42,6	59,9	5109,3	18,0	31,0	210,1	0,046
Sassari	95,6	547,0	2664,7	30,0	25,0	202,4	0,022
Savona	69,1	65,3	4989,6	32,0	21,0	256,2	0,099
Siena	213,9	118,5	2683,3	36,0	18,0	243,0	0,075
Siracusa	4,0	207,8	3772,6	23,0	35,0	162,9	0,08
Sondrio	3,7	20,9	3756,3	24,0	23,0	224,8	0,019
Taranto	55,2	249,9	3194,3	29,0	28,0	187,4	0,179
Teramo	34,8	152,8	3773,6	21,0	24,0	195,6	0,085
Terni	41,1	212,4	2921,3	29,0	35,0	229,0	0,078
Torino	320,1	130,0	6469,2	56,0	39,0	213,5	0,136
Trapani	25,7	273,1	2754,9	26,0	19,0	176,8	0,011
Trento	180,7	157,9	3998,2	44,0	24,0	167,5	0,241
Treviso	111,3	55,6	2470,8	30,0	34,0	212,9	0,142
Trieste	327,7	85,1	4116,1	28,0	20,0	255,9	0,164
Udine	110,6	57,2	1766,7	24,0	21,0	223,8	0,087
Varese	71,7	54,8	2401,0	36,0	24,0	222,5	0,056
Venezia	822,6	415,9	1913,1	51,0	37,0	244,2	0,108
Verbania	45,7	37,5	2700,2	28,0	15,0	244,5	0,16
Vercelli	11,7	79,8	3557,9	26,0	30,0	218,3	0,193
Verona	188,7	198,9	3822,9	26,0	31,0	203,5	0,152
Vibo Valentia	8,0	46,6	2326,3	21,0	23,0	157,5	0,017
Vicenza	79,7	80,6	3090,1	34,0	34,0	195,0	0,104
Viterbo	21,8	406,2	4608,0	23,0	18,0	183,1	0,038

There have not been considered the cities of Trani, Isernia, Cesena, Carbonia, Agrigento and Fermo because they are not included in each data source, Imperia because the rate of NO_2 is missing, Matera because the rate of PM_{10} is missing.Only for the city of Benevento the rate of NO_2 has been reported as the maximum among the yearly averages of the control units at the URL http://www.arpacampania.it/web/guest/dati-validati-annuali.

To deal with the data matrix it has been used COMIC (COMposite Indices Creator), a program made at Italian Statistical Institute (Istat), within the BES (Benessere Equo e Sostenibile) group.

This software calculates composite indicators choosing among various several synthesis methods, build rankings and output reports with the main achieved results.

After the definition of the starting theoretical framework and the selection of the elementary indicators, the procedure to create a composite index involves the normalization of the elementary indicators to make them comparable (they are often expressed in different units of measure and may have different polarities, so in the case of this phenomenon, each indicator has a negative polarity and the phenomenon is negative itself, so the polarity of the phenomenon matches the polarity of the indicators), the aggregation of the normalized indices with the assignment of a weight (in the case under study, weight 1 was given to all the indicators), the choice of the synthesis technique and the validation of the composite index, i.e. the verification of consistency with the theoretical framework of reference.

In this program there have been implemented functions that allow to perform the operations described above.

In particular to create, analyze and validate the composite index we are dealing with there have been done

- an exploratory data analysis,
- the rankings construction of statistical units,
- the influence analysis.

The synthesis method used is the Mazziotta-Pareto Index (MPI).

MPI purpose is to give a synthetic measure of a multidimensional phenomenon, in the hypothesis each component is not replaceable with the other ones. This takes to the insertion of a 'penalty' for the units not having balanced values. It is a composite index that guarantees high robustness against each other existing indexes because it is invariant when input data vary.

In order to implement MPI the following steps are performed.

1) Standardization:

starting from X matrix having its elements x_{ij} we calculate the normalized values, having i as its row index, j as its column index and n its number of statistical units

$$z_{ij} = \frac{x_{ij} - M_{x_j}}{S_{x_j}} S + M \quad (1)$$

where

$$S=10,\ M=100,\ M_{x_j} = \frac{\sum_{i=1}^{n} x_{ij}}{n},\ S_{x_j} = \sqrt{\frac{\sum_{i=1}^{n} (x_{ij} - M_{x_j})^2}{n}}$$

2) Aggregation.

Starting from the normalized values matrix Z, called m the number of elementary indicators, we can define the vector

$$cv_i = \frac{S_{z_i}}{M_{z_i}} \quad (2)$$

where $M_{z_i} = \frac{\sum_{j=1}^{m} z_{ij}}{m}$, $S_{z_i} = \sqrt{\frac{\sum_{j=1}^{m} \left(z_{ij} - M_{z_i}\right)^2}{m}}$

3) Calculation of the composite index.

$$MPI_i^{+/-} = M_{z_i}(1 \pm cv_i^2) = M_{z_i} \pm S_{z_i} cv_i \quad (3)$$

where + or – sign depends on the polarity of the indicator. If it is positive, the indicator growth is linked to a positive perception and the other way round.

3. Results

The correlation matrix does not show significant correlations between the indicators analyzed apart from the NO_2 rate which has a slight correlation with the PM_{10} rate (r=0.500) and the rate of transported passengers (r=0.586). Please see how the seniority index is negatively correlated with each other analyzed indicators apart from the rate of transported passengers.

The influence analysis describes the indicators that have the greatest influence on the composition of the rankings of the provincial capitals. From Table 2, the macroareas that “weigh” most in the epidemiological risk phenomenon are the

vehichular density (Root Mean Squared Error 10.551), PM_{10}rate (RMSE 10.181) and the density of population (RMSE 8.920).

Table 2 - *Matrix of correlation among the indicators.*

Base indicator removed	Mean	Standard deviation	C.V.
Rate of transported passengers	4.515	4.930	1.092
Density of population	7.980	8.920	1.118
Vehicular density	9.248	10.551	1.141
NO2 rate	7.673	7.631	0.995
PM10 rate	10.277	10.181	0.991
Seniority index	8.832	7.893	0.894
Mean	8.087	8.351	
Standard deviation	1.809	1.868	

In Table 3 the value of the composite indicator in the Italian provincial capitals is shown, followed by a map representation of the index. In particular the best 10, the worst 10 in this special ranking and some relevant provincial capitals are shown.

Table 3 - *Result IC.*

Province Capitals	MPI	Province Capitals	MPI
Vibo Valentia	108.492	Catania	96.808
Massa	108.112	Bologna	93.39
Potenza	107.389	Brescia	92.735
Benevento	106.83	Palermo	92.39
Reggio di Calabria	106.249	Cagliari	90.398
Crotone	105.622	Napoli	89.91
Macerata	105.261	Firenze	89.778
Latina	105.246	Genova	86.869
Catanzaro	105.165	Torino	84.492
Pordenone	104.84	Milano	82.628
Bari	99.176	Roma	74.574
		Venezia	74.391

4. Conclusion

The spread of Covid-19 does not seem to be linked to the risk factors taken in count in the analysis because the epidemiological risk does not allow for predictions about the spread of the disease. From the analysis through MPIs it has been found that the epidemiological risk is not an exhaustive dimension to explain the dynamics of the contagion spread across Italy. From the graph in figure 1 it can be seen that there is an uneven concentration of points that does not follow a linear trend, further supporting the demonstration that there is no correlation between the composite index and the incidence rate.

Figure 1 – *Scatter Plot of MPI vs. Covid Incidence Rate*.

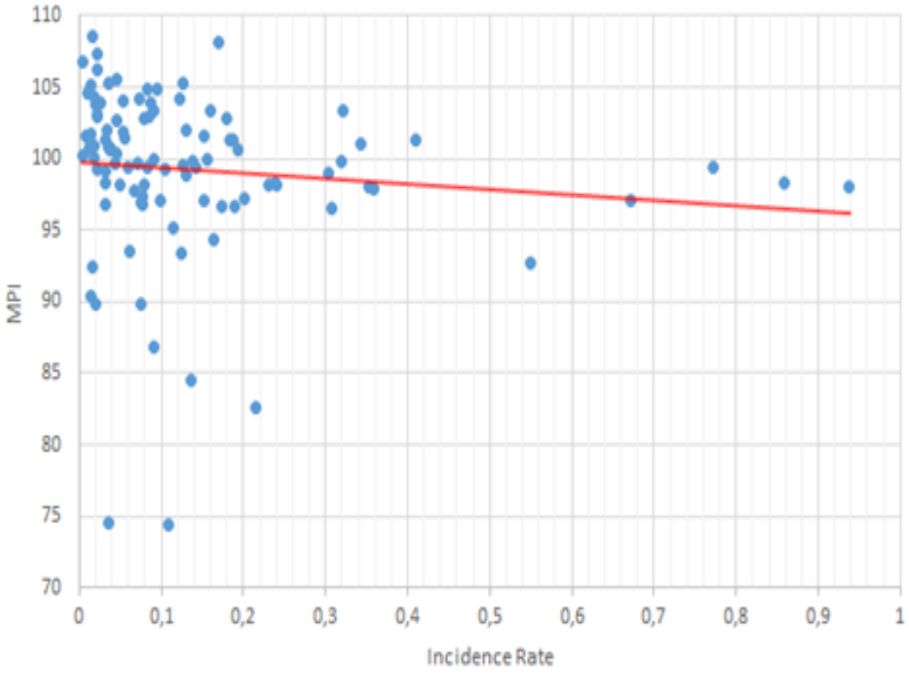
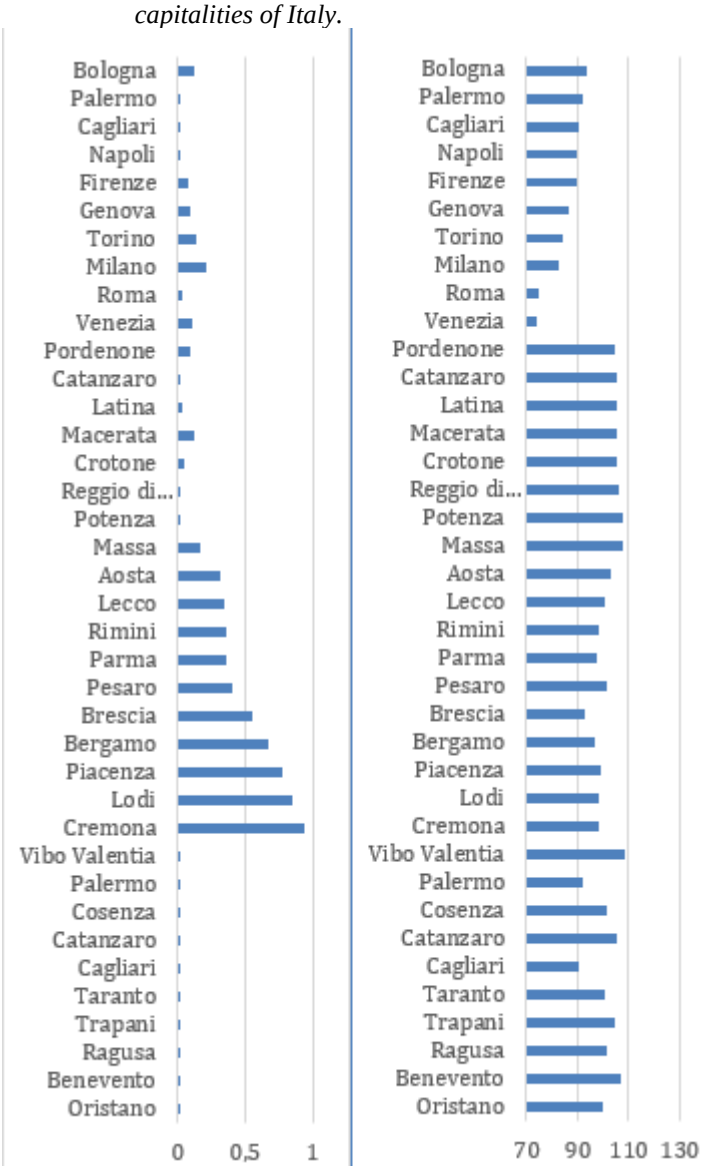


Figure 2 – *Incidence rate (on the left) and MPI calculated (on the right) in province capitalities of Italy.*



According to the graphics in figure 2 some of the provincial capitals with a higher epidemiological risk have a relatively low incidence rate from Covid (Benevento,

Oristano, Potenza and Vibo Valentia). There are also cities such as Bergamo, Brescia and Cremona with a high incidence rate and a low epidemiological risk.
A definitive proof of the lack of correlation between the composite index created and the incidence rate, is provided by the calculation of the Pearson index whose value, equal to -0.11, demonstrates the total lack of correlation.

The lack of correlation makes the spread of the virus escape from the intuitive logic represented by the indicators we have selected, considering the Covid incidence rate related to the period it has been taken in. The global crisis coming from the pandemic also rises up from the lack of understanding the factors that most influence the contagion and, in general, the context in which the virus takes root.

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SUMMARY

A study of the phenomenon of covid-19 epidemiological risk

Epidemiology is a word coming from the greek ἐπί, «over», δῆμος, «people», and λόγος, «speech, study» therefore it literally means "study of everything happens over the people". According to the explanation of the World Health Organization, "epidemiology is the study of the distribution and determinants of health-related states and events, and the e the application of this study to the control of diseases and other health problems[7]". Primary goals of epidemiology are:

- Limiting the disease spread within a community;
- Studying the disease etiology and the contagion modes.

The purpose of this paper is to proof that some of the facts the common man thinks to be the most common epidemiological risk factors, like air pollution, mobility, population density and seniority, observed within the italian province capital cities, are not related to the covid 19 spread. To reach this goal a composite index has been realized and it has been compared with a covid incidence rate, proofing that a correlation between these two indexes does not exist. The composite index has been realized using the PM10 rate, the NO_2 rate, the carried passengers rate, the vehicular density, the seniority rate, the population density. The synthesis method used for the creation of the composite index has been the Mazziotta-Pareto Index (MPI).

Tommaso BRANCATI, Author, brancatit@gmail.com
Francesco DELL'ORCO, Author, francesco.dellorco@gmail.com
Stefania FIVIZZANI, Author, stefania.fivizzani@gmail.com
Veronica IACONO, Author, iacono.veronica@gmail.com
Luana SBARDELLA, Author, luana.sbardella@gmail.com

[7] http://www.who.int/topics/epidemiology/en/.

THE DENIERS ON TWITTER. THE NO MASK GROUPS AND THEIR COMMUNICATION[1]

Rosario D'Agata, Simona Gozzo

1. Introduction

The Sars-CoV-2 pandemic caused millions of deaths all over the world but, despite this, a lot of people still claim that it is only the result of a plan of "strong powers" to control people, or, worse, that the virus does not even exist but it is a media invention to scare and control people. A current problem is that, nowadays, deniers find support for their ideas through social networks, an echo chamber for their messages. This implies a huge problem of public health. In fact, disinformation can trigger rule braking: suffice to think about social distancing, wearing masks, distrust towards institutions and vaccines.

Paradoxically, considering that the specific purpose of the web is spreading news and information to a wide audience, it is showing messages of disinformation and/or incorrect information, producing as effect the moral panic (Thompson, 2006). This was a specific feature of social-network communication related to the issue of the pandemic crisis. An important aspect, currently at the heart of the academic debate, is the individual tendency to approve disinformation, avoiding factual control. Some studies point out that improving scientific knowledge could help reduce susceptibility to disinformation. These types of solicitations begin, today, to be incorporated into the design of social media platforms or messages from health organizations to make the public more attentive to the content they are reading and sharing. Other strategies identified to limit this phenomenon are:

- showing the techniques used to spread misinformation (Schmid and Betsch, 2019);
- engaging social media companies by asking to verify the accounts of credible experts and organizations and mark them as "authenticated" (Trivedi *et al*., 2020);

[1] This work is the result of the joint efforts of both authors. However, Simona Gozzo wrote paragraphs 1, 2 and 5 while Rosario D'Agata wrote paragraphs 3 and 4. Researcb program "Programma di Ricerca di Ateneo Unict 2020-22 – linea 2".

- promoting wider environmental changes (Lewandowsky *et al.*, 2012) and changes in social norms (Paynter *et al.*, 2019)

Some studies show that, unfortunately, the attempts to change individual acts with rational arguments rarely produces large-scale behavioural changes, as we need. It emerges, in fact, that the cognitive mechanisms linked to mistrust of scientifically validated communications derive from non-rational mechanisms and, in particular:

- crisis, fear and uncertainty increase the likelihood of conspiratorial thoughts, and so sites and conspiratorial articles generate greater user engagement than more reliable sources (Stein *et al.*, 2021);

- the belief in conspiracy theories is not attributable to the desire to acquire information from multiple sources or more reliable ones but to states of anger and frustration, rather than detecting a close association with the justification of the use of violence (Jolley *et al*., 2020);

- although, overall, social media hosts a larger volume of accurate information than fake information, misinformation seems to be more popular and spreads faster, farther, and deeper (Miller *et al*., 2020);

- no-mask groups base their thesis precisely on a lack of confidence in information from official sources and not on rational arguments. As a result, people who reject vaccines and refuse the use of masks are more confident to obtain information from social networks than from verified health care professionals or health care websites (Ortiz-Sànchez *et al.*, 2020). So, the question that drove this research is: what information does the no-mask movement use in social networks? Are there any differences with respect to specific languages and contingencies? Given that Twitter seems to be the most used social network by the movement, we have chosen this social network to monitor communication, analysing then the available data through the triangulation of different techniques. Certainly, it has emerged that, although no-vax users are fewer than those in favour of vaccines, their on-line communication is strongly visible because they are very active.

2. Method

In this paper we used web tools to extract tweets containing the lemma ‘No-mask’. The choice to monitor the use of this lemma depends on several considerations. First of all, the protest movement was initially named as ‘no-mask’ and only later the term ‘no-vax’ emerged. Then, the lemma no-vax is not always used as hashtag but many of its variants are distinguished (no-vaccine, notest, novaccineforme, stopvaccine, vaccinkill etc.). Besides, on a theoretical plane, ‘nomask’ is useful for pointing out, in general, the position of the deniers. The all-

encompassing extension of "no-mask" as hashtag allows, in fact, to identify a huger amount of comments. Finally, a strong association is found between the two lemmas, overlapping in Italian co-occurrences.

Specifically, a samples of tweets were extracted every two weeks from November, 30th 2020 to the February, 6th 2021, by means of NodeXL Pro Twitter data importers (Smith *et al.*, 2009), an excel plug-in which binds the extraction of tweets to a time limit of approximately 2 weeks. So, we monitored the communication on twitter during these four months, every week. However, we couldn't extract all comments because queries cannot return more than 18,000 tweets per extraction (twitter controls its API and throttles it based on unknowable parameters).

After collecting edges and comments in 5 waves, we observed different features of the nets representing links among users. Then we extracted the 10 most popular tweets for each wave. This was only the first step of our analysis. Technically, we propose a three steps procedure applied to obtain complementary information about data extracted from social networks. This approach captures and integrates information and it includes:

1) An in-depth qualitative analysis about the top 10 tweets extracted for each wave. The qualitative study carried out at this stage allowed us to exclude tweets in Portuguese, as they often refer to Brazilian issues and problems. Furthermore, during this step we noticed that the major part of tweets extracted are in English, Italian or French languages. This information led us to identify these three languages to build three corpus used for content analysis (step three).

2) A quantitative study about all comments, based on network analysis tools (Borgatti and Halgin, 2011). This step allowed us to select – for each week – the whole structure of web communications and the main groups as sub-networks obtained by extracting clusters mutually connected, with higher internal homogeneity and external heterogeneity in terms of links. Differences on web communities are also detected, both as quantitative structures and linkages.

3) An Automatic analysis of the content on tweets extracted during the five waves, selected distinguishing the main languages (see first point). This last step shows differences on topics and discussions both looking at languages (Italian, English and French) and time periods.

2.1 The Qualitative features

The first step's aim is a reasoned in-depth study of the content, operated only on the main comments (10-top tweets automatically extracted for each monitored week). This is a "qualitative" phase, useful for identifying problems in attributing

the language to a particular area and for the selection of categories, messages and users. The tweets are selected by the greatest weight in the page-rank index.

The communication on Twitter was monitored extracting tweets containing the word "no-mask" in the period November 30th - February 5th. Five extractions were carried out, repeating the operation every two weeks. This period goes through at least three specific moments of tension: a first distribution of the vaccine, the growing spread of the infection, the need to close shops, restaurants and attractions in many parts of the world.

Finally, it was built a matrix containing 50 main tweets (10 for each extraction) useful to identify information that requires an evaluation of the communicative content. The analysts have identified (when possible) information on the geographical origin of the tweets, senders (politicians, newspapers, private citizens, etc.), sentiment of tweets (i.e. the message is in favour, against or neutral with respect to the no-mask movement), main themes, tweets' addressees (political institutions, people or parties). Thanks to this qualitative analysis, all tweets that came from countries outside the European Union (excluding United Kingdom) were excluded.

2.2 The Quantitative features

After a preliminary qualitative step, in a second phase we focused on the analysis of the network obtained by selecting - for each extraction - the entire structure of the communication and the main sub-graphs with high internal homogeneity and external heterogeneity in terms of connections. Finally, the third step involved the automatic analysis of the content of all comments extracted during the reference period, in the main languages preliminarily identified.

While the first two steps required an analysis on the main tweets extracted in all languages (first step) or about the network structure of all the extracted tweets, the last phase - as analysis of content - needed the selection of specific languages (as corpus). So, we decided to build three corpus selecting all comments in the main languages used by users.

3. Findings

By means of traditional tools of network analysis applied in social media studies (Hansen *et al.*, 2010; Hansen *et al*., 2012; Smith *et al.*, 2009) we examined in depth the links among twitter users. Our aim was to identifying the aggregative power of the comments, the specificity of the issue and the existence of clusters.

3.1 The network structures

Table 1 shows the values of mains network measures. As we can notice, the higher number of comments is observed in the second half of December. It needs to be kept in mind that on December 27th the whole Europe proclaimed the 'Vaccine day' that represented an important moment both for vaccine's supporters but, at the same time, for deniers and no vax groups too.

Table 1 – *Network measures employed in the analysis.*

Network measures	30th-Nov	14th-Dec	30th-Dec	5th-Jan	05th-Feb
Vertices (number of tweets)	1,352	1,749	2,923	901	606
Unique Edges	1,336	1,674	2,938	1,466	545
Edges With Duplicates	190	161	117	189	630
Total Edges	1,526	1,835	3,055	1,655	1,175
Self-Loops	355	291	219	136	298
Connected Components	444	381	309	183	219
N. max of vertices in Connected Components	45	665	1,826	212	51
Maximum Geodesic Distance (Diameter)	8	10	6	13	6
Average Geodesic Distance	2.28	2.05	2.00	3.64	2.05
Modularity	0.801	0.728	0.583	0.793	0.469
Degree Centrality (average)	1.04	0.99	1.02	1.72	1.11
Closeness Centrality (average)	0.26	0.18	0.09	0.17	0.33
Betweenness Centrality (average)	14.05	278.28	1,155.3	183	11.81

The number of vertices goes along with the number of edges. It's noteworthy, however, the difference between the unique edges and the edges with duplicates. These latter, in fact, while in the third period show the lowest value, in the fifth one they reach the peak. In other words, we note a decrease of broad communication (probably aimed to acquire information) over time and the rise, in the last observed period, of a more 'closed' communication as the number of vertices (606) suggests. This assumption appears supported by the high number (298) of isolated cases (self-loops) on February and the maximum number of vertices in connected components observed on 30th of December. A connected component is a subgraph in which any two nodes are connected to each other by a path. In our study we can identify connected components as 'discussion groups'. The highest number of connected components is detected on the first period (444) but these components appear to be very small (max 45 vertices). The number of the nodes increases in the first half of December (max 665 vertices) and reaches the maximum (1.826) in the second half of December when the communication about Sars-CoV-2 on twitter became increasingly pervasive.

Considering the third period, if – on the one hand, the communication appears strong and pervasive, on the other - it is also true that it does not seem to be embracing many topics. In other words, we note the rise of components with a large number of nodes, close to each other (Average Geodesic Distance =2) but with a low Modularity (0.583). Modularity, whose range varies from -1 to 1, quantifies the quality of the division of the network into modules or communities[2]. So, the more the value approaches to 1, the more different groups are. In the first period (0.801) and in the fourth one (0.793) we observed the highest values. This means that, in these periods, we registered different and opposite subject groups (i.e. vaccine supporter vs. no-vax groups, etc…).

In order to analyse the links among twitter users we used network centrality measures (Hansen *et al.*, 2010; Hansen *et al.*, 2012; Smith *et al.*, 2009); specifically, *degree*, *closeness* and *betweenness* (Junlong and Yu, 2017). The standardised centrality degree (1) of node *d* - C'_d- is based on the number of links held by node *d* - *d*(n_i) - on the total of all possible links *(g-1*).

$$C'_d = \frac{d(n_i)}{g-1} \quad (1)$$

In our study, the *degree* measures the number of nodes linked with the each other through a reaction, i.e., visualizations, retweets, likes, answers, etc. The highest average value of Degree (1.72) is observed in the fourth period (Tab.1). In the first two weeks of January, therefore, the highest proportion (out of the total) of users communicating without intermediaries is found. This fact appears in line with the information about modularity previously descripted. In other words, the increase of subject groups (especially in small groups) increases the likelihood of direct contacts within it.

The *closeness* of *i*-th node - $C_c(n_i)$- can be defined as the reciprocal of the sum of the distances between the *i*-th node and other *g* nodes (2).

$$C_c(n_i) = \left[\sum_{j=1}^{g} d(n_i, n_j)\right]^{-1} \quad (2)$$

Closeness, whose range varies between 0 and 1, gives information about the relevance of peripheric nodes. The highest value of closeness is observed in the last wave. In this period, we noted a lowest number of vertices, the highest number of edges with duplicates and the lower value of modularity. The *closeness*

[2] Modularity in NodeXl is computed through the number of edges that move from a group to connect themselves to vertices in a different group. If modularity is high, the clusters or groups created may be of low quality. If modularity is low, the groups are well defined.

highlights the presence of small groups, with similar themes of discussion and, therefore, the average *closeness* among the nodes tends to be higher.

The *betweenness* centrality of *i*-th node - $C_b(n_i)$ - is the sum of all partial betweenness computed for each couple of nodes. So, in the (2), $g_{jk}(n_i)$ is the number of geodesics connecting two nodes that include *i*-th node.

$$C_b(n_i) = \sum_{j<k} g_{jk}(n_i)/g_{jk} \quad (3)$$

From a substantive point of view, the *betweenness* reports a high presence of users acting as intermediaries between other users or groups. The higher is the *betweenness*, the less redundant communication is. The highest value of *betweenness* (Table 1) is observed in the third wave (1,155.3). In the second half of December, so, communication is wide, homogeneous, as the low value of modularity suggests and seems, above all, as an attempting to search for information in a period of worrying uncertainty.

3.2 The Content analysis

So far, we have considered the structural features of communication on twitter in the periods under analysis. In the next pages, we analysed the content of the tweets in order to identify the deniers and their messages. For this sake, we detected all the tweets extracted in the main languages (Table 2). Nevertheless, in this paper, we chose to only deal with Italian tweets.

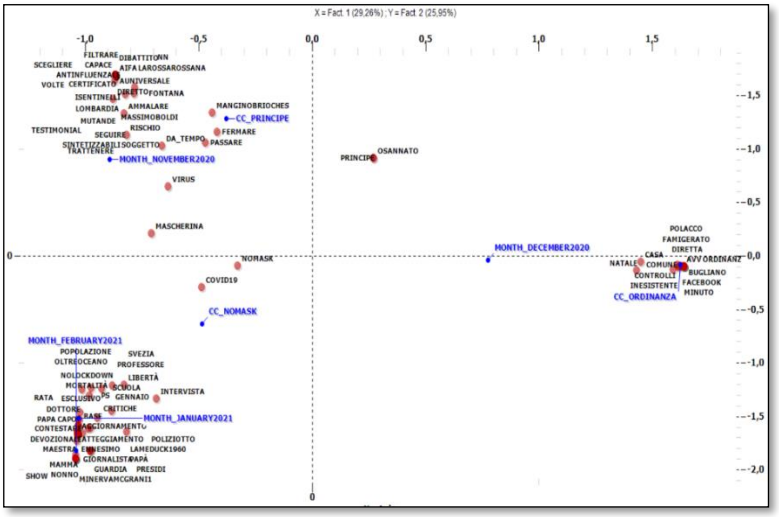
Table 2 – *Descriptive information about the comments collected.*

	Italian	English	French
Types	4762	7369	1795
Tokens	47407	96470	29373
Hapax	1914	2849	662
Types/Token	0,1	0,07	0,06
Root TTR	21,876	23,725	10,473
Corrected TTR	15,465	16,776	7,406
Log TTR	0,787	0,776	0,728
Hapax/Types	0,402	0,387	0,369

The analysis was applied using T-lab. A segmentation of the *corpus* in elementary contests is carried on. In our case the elementary contest is a single tweet. Then, thematic analysis allowed to identify the main themes and to clusters them. Doing so, it was possible to identify three thematic clusters corresponding to

three communication features: fake news and comments to these (cluster NOMASK, 47%), political debates and irony (cluster ORDINANZA, 27%), threats and insults (cluster PRINCIPE[3], 26%). In the next step, a multiple correspondence analysis was carried out selecting as variables both thematic clusters and periods of extraction, identifying two dimensions on which the lemmas have been projected. Figure 1 shows the thematic clusters obtained considering also the periods[4] of tweets' scraping and the main lemmas.

Figure 1. - *Correspondence analysis. Plot of clusters***.**



The first cluster is characterized by the lemmas related to juridical aspects, polemic against deniers and statistical information, summarised with the lemma 'no-mask'. This is the largest cluster and is observed in January and February. Many tweets within this cluster are ironic comments against deniers, but it is also possible to identify polemic tweets against restrictions. The second cluster (ORDINANZA) contains mainly ironic issues and it is observed in December when, as we saw before by means of Network Analysis, the communication is pervasive and widespread. Comments within the last cluster (PRINCIPE) are

[3] It needs to be specified that the Italian word "PRINCIPE" - "PRINCIPE DEL FORO" (prince of the forum) – is often referred to a great lawyer. In this case, however, the great lawyer Mr. Polacco did not revealed to be such because it was defending a cause which did not exist in the reality. Particularly, the cause was linked to a fake news announcing strict control measures in respect to COVID19 in the municipality of Bugliano, not existing in the reality but emerging in social network fake news.

[4] We aggregated all the periods in 4 mouths, namely, November (TEXT 001), December (TEXT002), January (TEXT 003) and February (TEXT 004).

widespread in November, when the communication on twitter about COVID 19 appears sectorial and mainly subject of discussion groups (see Modularity in Tab. 1). These comments are often filled with hate, implying disputes between individuals or groups and often use vulgar and offensive language.

4. Discussion

Our results show that the weight of deniers' communication increased sharply during December 2020 while it becomes sparser and specific in January and February. Evaluating the different structure of the communicative flows, we notice that the most representative groups in November were rather unstructured, with self-referential messages, while the first part of December shows a network with greater aggregating power and, during Christmas, the highest mobilization emerges, with very limited distance between vertexes (which implies a redundancy in information). Heterogeneity characterizes the communication flow in January, with an increasing number of groups, despite the reduction in the number of vertexes. If these considerations concern the structure of the network, further observations concern the meaning of the comments that convey the debate in the different languages. Although the work focuses on communication in Italian, it is worth noting that the topics are similar even in the tweets in English and French and, in particular, a connotation linked to the critique of the rules always emerges (the English cluster 'norms', Italian 'principe', French 'souffle') and one related to the generic theme (no mask, coronavirus, liberté). This last cluster can be split into two topics: strongly critical comments due to the economic situation and others that refer to anti-vaccination rhetoric (Miller *et al*., 2020; Stein *et al.*, 2021).

The no-vax issues are surprisingly similar, although the most intense and numerous protests emerge at different times, depending on the languages. The most common topics are distrust of doctors or governments, repulsion at the idea of introducing unknown substances into the body and the suspicion that the real motivations behind vaccines are to make people sick or to control the population (Jolley *et al*., 2020; Stein *et al.*, 2021). However, we can detect differences too. The Italian comments are often ironic. One of the two ironic clusters is characterized by vulgar and offensive language. The largest cluster is 'No-mask' (which also use ironic but even critical or aggressive-offensive language) and prevails in January.

English comments don't show irony at all. The main topic is the contestation of the norms, concerning the two minor clusters, which characterize the communication of January (cluster 'exemption') and the first weeks of February (cluster 'woman-shop'). The largest cluster is (such as in Italian) 'no-mask' but this

term prevails in December as English comments and in January/February for the Italian ones.

Finally, French tweets often refer to the emotional communication, especially in December (cluster 'souffle') but here the most consistent cluster ('no-mask') characterizes the communication in November while February and it is mainly associated with protests (also with offensive language and vulgarity) and to the defense of freedom as value ('liberté').

5. Conclusions

The procedure we proposed is particularly useful when you need to extract main information and you are analyzing the on line communication. The extraction of the Top-10-tweets allows an in-depth analysis on a low number of relevant comments. In so doing, it is possible to quickly identify errors, problems and new topics. Besides, the Network Analysis tools allow to identify the structure of communities and how it changes over time, while the content analysis permits to evaluate (with attention) the content of comments and the importance of each cluster (also in terms of debate and construction of parallel communities). Finally, it is possible to compare communication through main topics, languages and time periods.

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SUMMARY

The deniers on Twitter. The No Vax groups and their communication title

The Sars-CoV-2 pandemic caused millions of deaths all over the world but, despite this, a lot of people still claim that the virus does not exist. This implies a huge problem public health is at stake. In this paper we aim to analyse the way deniers communicate on twitter. Using web scraping tools, we extracted the tweets containing the lemma “Nomask”. Tweet’s collection was run every two weeks from November, 30th 2020 to the February, 6th 2021. After collecting tweets in 5 waves, through Social Network Analysis measures, we observed the features of networks. Then, taking into account the weight of the "retweet count" index, we selected the first 10 tweets for each extraction. Once the tweets were selected, they have been analysed by means of both cluster and textual analysis. Analysis of the most representative groups of the various networks showed that communication in November was rather unstructured. It did not generate a network but rather self-referential messages. The second wave shows a network with greater aggregating power. In the groups in the third wave, we may notice a mobilization with very limited distance between vertexes which implies a redundancy of information. The fourth wave, instead, highlights an increase in the number of groups, despite the reduction in the number of vertexes. Finally, the fifth wave has four groups with a limited number of nodes.

Rosario D’AGATA, Dipartimento di Scienze Politiche e Sociali. Università di Catania, rodagata@unict.it

Simona GOZZO, Dipartimento di Scienze Politiche e Sociali. Università di Catania, simonagozzo@.yahoo.it

PRINCIPIO DEL DIRITTO ALLA DISCONNESSIONE:IL CASO STUDIO ISTAT[1]

Francesca Orecchini, Fabrizio Monteleone, Anna Calabria, Patrizia Grossi

1. Lavoro agile e diritto alla disconnessione

Lo scopo del presente lavoro è approfondire il diritto alla disconnessione nella sua evoluzione, anche alla luce della recente pandemia, ed analizzare l'esperienza dell'Istituto Nazionale di Statistica.

Negli ultimi anni l'introduzione di diverse forme flessibili di lavoro ha modificato i tradizionali confini tra vita professionale e vita privata. Dal perseguimento del *work-life balance,* ovvero l'equilibrio ideale tra vita lavorativa e vita privata, si è passati al *work-life blend*, cioè a una sovrapposizione casa-ufficio.

Gli strumenti informatici attualmente utilizzati permettono infatti di essere costantemente connessi e reperibili. Se da un lato questo rappresenta un vantaggio è vero anche che la connessione continua sta generando nuove tipologie di rischio professionale.

Il *tecnostress* è una malattia professionale causata da un utilizzo eccessivo, smodato e disfunzionale delle ITC con impatti negativi a livello psichico, comportamentale, cognitivo, fisiologico e lavorativo. L'INAIL lo definisce come stress lavoro-correlato in funzione dei cambiamenti delle nuove organizzazioni del lavoro e dei nuovi strumenti di lavoro. Nel periodo attuale di emergenza epidemiologica da Covid - 19, durante il quale molte persone si sono trovate costrette a lavorare da remoto, questa patologia si è diffusa maggiormente.

In base ai risultati dell'indagine di Eurofound (2020), la fondazione europea per il miglioramento delle condizioni di vita e di lavoro, l'Italia, tra aprile e luglio, è stata uno dei paesi europei che ha fatto più massicciamente ricorso al lavoro agile per poter arrestare la diffusione del contagio. Secondo L'Osservatorio sullo Smart Working del Politecnico di Milano durante il primo lockdown, hanno lavorato da remoto 6,6 milioni di italiani (oltre dieci volte in più dei 570.000 lavoratori agili censiti nel 2019) per poi scendere a 5 milioni nel mese di settembre 2020 (Osservatorio Smart Working, 2020).

[1] Anna CALABRIA ha scritto il paragrafo 1, Patrizia GROSSI il paragrafo 2, Francesca ORECCHINI il paragrafo 3, Fabrizio MONTELEONE il paragrafo 4. Tuttavia, il presente documento è il risultato di un lavoro congiunto.

In questo quadro si inserisce il diritto alla disconnessione, ovvero il diritto al "mancato esercizio di attività o comunicazioni lavorative per mezzo di strumenti digitali, direttamente o indirettamente, al di fuori dell'orario di lavoro"[2], volto a proteggere il lavoratore da una connessione digitale nociva con ripercussioni sulla salute.

Devono essere considerate anche le differenze di genere in quanto le donne più dedite alla cura dei familiari sono più inclini al lavoro agile come modalità esclusiva. Questo modello lavorativo, durante la pandemia, sembra non aver permesso alle donne veri e propri miglioramenti nella possibilità di aumentare i livelli di *work-life balance* e a volte addirittura li ha peggiorati sovrapponendo in un flusso unico il lavoro aziendale e familiare (Rinaldi *et al.*, 2021).

Il lavoro agile, per sua stessa definizione, non può dar luogo a un sovraccarico di lavoro, ma deve favorire la conciliazione dei tempi di vita e di lavoro. Inoltre se nel telelavoro sono regolamentati gli orari e la reperibilità, nel lavoro agile i concetti chiave sono la flessibilità e l'autonomia nell'organizzazione del lavoro, quantunque il dipendente debba essere reperibile.

A questo proposito la Legge n. 81/2017 prevede che sia sottoscritto dal datore di lavoro e dal dipendente, un accordo individuale relativo alla modalità di lavoro agile per disciplinare l'esecuzione della prestazione lavorativa svolta all'esterno dei locali aziendali. Nell'accordo devono essere individuati i tempi di riposo del lavoratore e le misure tecniche e organizzative necessarie per assicurare la disconnessione del lavoratore dalle strumentazioni tecnologiche di lavoro.

Per salvaguardare il diritto alla disconnessione ed evitare abusi, è necessario approntare specifiche "modalità di disconnessione" per permettere al dipendente di interrompere i collegamenti informatici e disattivare i dispositivi elettronici. Inoltre, dovrebbe essere imposto il divieto di eseguire la prestazione lavorativa in orario straordinario, ossia oltre l'orario massimo (giornaliero e/o settimanale) contrattualmente previsto (Beretta *et al.*, 2018).

Con l'emergenza sanitaria le amministrazioni sono state costrette a considerare il lavoro agile come modalità ordinaria di svolgimento della prestazione lavorativa, da attuarsi in forma semplificata derogando all'accordo individuale (Legge n. 27/2020 e la Legge n. 77/2020). La mancanza di accordo scritto tra le parti è espressione della scelta unilaterale del datore di lavoro nell'attivazione dello *smart working* priva del consenso del lavoratore.

Attualmente il Decreto Legge n. 56/2021 consente fino al 31 dicembre 2021 l'accesso al lavoro agile attraverso le modalità semplificate, senza la necessità del previo accordo individuale.

[2] Risoluzione del Parlamento europeo del 21 gennaio 2021 recante raccomandazioni alla Commissione sul diritto alla disconnessione. https://www.europarl.europa.eu/doceo/document/TA-9-2021-0021_IT.html

Infine le modifiche all'articolo 14 Legge n.124/2015 hanno introdotto il Piano Organizzativo del Lavoro Agile – POLA che stabilisce la sottoscrizione dell'accordo individuale per il lavoro agile ordinario in cui devono essere definiti i contenuti minimi ex articolo 19, Legge n. 81/2017. L'accordo, in tal senso, rappresenta lo strumento privilegiato per individuare i rischi lavorativi collegati alle prestazioni esterne anche ai fini di riconoscimento della tutela assicurativa.

2. Diritto alla disconnessione per il nuovo modello di lavoro (new normal)

È passato appena un anno da quando abbiamo cominciato in Italia a decantare i vantaggi dell'uso del digitale nel mondo del lavoro, soprattutto per la possibilità di svolgere da remoto tutta una serie di attività lavorative, che la pandemia avrebbe altrimenti fermato.

Gli strumenti utilizzati dallo *smart worker* (ad esempio pc portatili e *smartphone*) per prestare la propria attività lavorativa permettono una reperibilità ed una connessione, non solo potenziale ma di fatto, costante e continua. Questo rischia di compromettere il bilanciamento tra vita professionale e vita privata. In questo quadro si inserisce il diritto alla disconnessione per il nuovo modello di lavoro, in virtù del quale il prestatore di lavoro deve essere protetto da una potenziale perenne connessione.

Il diritto alla disconnessione è stato pensato per stabilire dei confini marcati alle comunicazioni dopo l'orario di lavoro e fornire ai dipendenti il diritto di non impegnarsi in alcuna attività lavorativa una volta a casa, riguarda non solo il diritto di scollegarsi, ma anche quello di non essere rimproverati per non essersi connessi (o premiati per essere rimasti collegati quando si sarebbe potuto non farlo).

Il diritto alla disconnessione a livello legale, trova il primo riscontro in Francia nel 2016 all'interno della *"Loi du Travail"* che introduce il principio al diritto alla disconnessione. Questa legge ha introdotto l'obbligo, per le aziende di almeno 50 dipendenti, di assicurare il tempo libero dei dipendenti assieme al divieto di inviare comunicazioni fuori dall'orario di lavoro. Dopo l'iniziativa francese, anche in Italia dal 2017 è stato introdotto il principio al diritto alla disconnessione con la Legge n. 81/2017, così come in Spagna nel 2018 e ora altri Paesi, europei e non, stanno valutando di inserire il diritto alla disconnessione nel proprio ordinamento nazionale.

Il Parlamento Europeo, in tempi non sospetti (relazione di studio del 2019[3]), aveva già avviato uno studio approfondito sul diritto alla disconnessione, allarmato dai rischi che l'incremento del telelavoro senza regole chiare avesse potuto comportare sulla salute e sulla qualità di vita dei lavoratori.

3 https://www.europarl.europa.eu/doceo/document/EMPL-PR-654061_IT.pdf

In un'audizione al Parlamento il 13 maggio 2020[4], il Garante per la protezione dei dati personali ha espresso un interessante punto di vista sulle "ricadute occupazionali dell'epidemia da Covid -19", affermando che sia necessario assicurare in "modo più netto di quanto già previsto" il diritto alla disconnessione per tutelare la distanza tra spazi di vita privata e attività lavorativa ("una delle più antiche conquiste" in fatto di diritti sul lavoro). "Il ricorso alle tecnologie – ha aggiunto – non può rappresentare l'occasione per il monitoraggio sistematico del lavoratore. Deve avvenire nel rispetto delle garanzie sancite dallo Statuto a tutela dell'autodeterminazione del lavoratore che presuppone, anzitutto formazione e informazione del lavoratore sul trattamento a cui i suoi dati saranno soggetti". "Non sarebbe legittimo fornire per lo *smart working* un computer dotato di funzionalità che consentono al datore di lavoro di esercitare un monitoraggio sistematico e pervasivo dell'attività compiuta dal dipendente tramite questo dispositivo".

La ricerca europea, pubblicata su European Neuropsychopharmacology (Wittchen *et al.*, 2011) ha dimostrato che ogni anno il 38,2 % della popolazione dell'Unione Europea soffre di un disturbo mentale. L'Organizzazione Mondiale della Sanità d'altra parte ha segnalato che oltre 300 milioni di persone nel mondo soffrono di depressione e disturbi mentali comuni legati al lavoro e che durante la pandemia si è verificato un incremento dei disturbi legati alla privazione del sonno, all'eccessivo isolamento dei lavoratori, all'esaurimento emotivo e all'ansia, tutti legati al prolungato tempo di connessione digitale (WHO, 2020).

Secondo uno studio condotto da Eurofound (2021), dall'inizio della pandemia il lavoro online è aumentato del 30%, ma lavorare da casa ha raddoppiato il rischio di superare le 48 ore di lavoro settimanale ed è aumentato del 25% l'impiego del tempo libero per esigenze lavorative.

Nella Risoluzione del 21 gennaio 2021[5], il Parlamento evidenzia i fattori di rischio di una connessione digitale prolungata, per raccomandare agli Stati membri il riconoscimento di questo diritto come fondamentale, con una proposta di direttiva.

Gli strumenti digitali utilizzati a scopi lavorativi, si legge nel documento, possono creare una **pressione e uno stress costanti**, avere un impatto negativo sulla salute fisica e mentale e sul benessere dei lavoratori e condurre a malattie psicosociali o altre malattie professionali, come l'ansia, la depressione, il *burnout*, lo *stress* da tecnologia, disturbi del sonno e muscoloscheletrici. A tutela del lavoratore che svolge l'attività in modalità agile, il DDL di conversione del Decreto Legge n. 30 del 2021 riconosce il diritto alla disconnessione dalle strumentazioni

4 https://www.garanteprivacy.it/web/guest/home/docweb/-/docweb-display/print/9419824
5 https://www.europarl.europa.eu/doceo/document/TA-9-2021-0021_IT.html

tecnologiche e dalle piattaforme informatiche in favore dei lavoratori che svolgono l'attività lavorativa in modalità agile. Tale diritto è riconosciuto nel **rispetto** degli **eventuali accordi sottoscritti** dalle parti e fatti salvi eventuali **periodi di reperibilità concordati**.

L'esercizio del diritto alla disconnessione, necessario per tutelare i tempi di riposo e la salute del lavoratore, non può avere ripercussioni sul rapporto di lavoro o sui trattamenti retributivi. Per il **pubblico impiego**, la disciplina degli istituti del lavoro agile è stabilita dai contratti collettivi nazionali.

Il diritto alla disconnessione è stato regolamentato dal CCNL per i Quadri direttivi e per il personale delle aree professionali dipendenti dalle imprese creditizie, finanziarie e strumentali[6], rinnovato con accordo siglato a dicembre 2019. Nello specifico il CCNL ha disposto che l'utilizzo degli strumenti di lavoro deve avvenire nel rispetto della prestazione lavorativa, garantendo il diritto del lavoratore ai tempi di riposo giornaliero e settimanale, ai periodi di ferie e agli altri legittimi casi di assenza. Per garantire l'effettivo diritto alla disconnessione è stato statuito che il lavoratore possa disattivare i propri dispositivi di connessione per evitare la ricezione di comunicazioni aziendali oltre l'orario di lavoro o nei periodi di assenza legittimati.

3. ISTAT Case study – Analisi dei dati della rilevazione Federazione UIL Scuola Rua Istat

Viene proposto di seguito il caso dell'Istituto Nazionale di Statistica. Nel mese di febbraio 2021 è stata proposta ai lavoratori una rilevazione da parte di un'organizzazione sindacale (Uil Scuola Rua Istat 2021) riguardante il Piano Organizzativo del Lavoro Agile (POLA), quale sezione del piano della performance, previsto dall'art. 263 del Decreto Legge n. 34/2020, convertito con modificazioni dalla Legge n. 77/2020, nel quale si precisa che le amministrazioni pubbliche, sentite le organizzazioni sindacali, lo redigono, entro il 31 gennaio di ciascun anno (a partire dal 2021).

Nel POLA "*sono individuate le linee programmatiche per le modalità attuative del lavoro agile ordinario (…); definisce le misure organizzative, i requisiti tecnologici, i percorsi formativi del personale, anche dirigenziale, e gli strumenti di rilevazione e di verifica periodica dei risultati conseguiti, anche in termini di miglioramento dell'efficacia e dell'efficienza dell'azione amministrativa, della*

[6] https://www.uilca.it/pdf/news/accordo_di_rinnovo_19.12.2019.pdf

digitalizzazione dei processi, nonché della qualità dei servizi erogati, anche coinvolgendo i cittadini, sia individualmente, sia nelle loro forme associative"[7].

A seguito dell'elaborazione e della pubblicazione sulla intranet istituzionale da parte dell'amministrazione, il POLA è divenuto oggetto di indagine, soprattutto in riferimento a quegli argomenti che sono risultati più sentiti e dibattuti da parte dei dipendenti.

La Uil Scuola Rua Istat ha predisposto un questionario anonimo per indagare la posizione del personale dell'Ente rispetto a quanto previsto nel documento riguardante il POLA.

La compilazione si è aperta il 9 febbraio 2021 e si è conclusa il 23 febbraio 2021. Il questionario composto da 4 sezioni riguardanti le informazioni generali, i profili di flessibilità, la postazione di lavoro prevedeva una sezione molto corposa sul principio del diritto alla disconnessione, affrontando il tema della reperibilità in lavoro agile con lo scopo di far emergere i problemi derivanti da una mancata disconnessione e legati a una gestione sregolata del tempo di lavoro, lasciando ai lavoratori la possibilità di esprimere apertamente il loro pensiero.

Alla rilevazione hanno partecipato 537 dipendenti su una popolazione di 1.942 con un tasso di risposta complessivo pari al 27,6%. Analizzando il genere si nota che il tasso di risposta delle donne (67,3%) è più elevato di quello degli uomini; sono invece contenute le differenze rispetto al livello professionale. I rispondenti hanno un'età media compresa tra i 41 ed i 60 anni; complessivamente il tasso di risposta di queste due classi di età è pari all'82,4%. Pressoché nulla la partecipazione degli under 30.

Dall'analisi delle informazioni raccolte si evince che le segnalazioni in cui si denuncia una vera e propria non disconnessione dal lavoro sono state numerose e costanti. I lavoratori nel corso dei mesi (marzo 2020 - febbraio 2021) hanno ricevuto mail e chiamate da parte di colleghi e/o superiori gerarchici a qualsiasi ora del giorno, indiscriminatamente, in cui si chiedeva loro di eseguire qualche attività non necessariamente urgente.

Dall'elaborazione dei dati è emerso che quasi un terzo dei lavoratori (33,1%) dichiara di aver ricevuto mail di lavoro nella fascia compresa tra le ore 19.00 e le ore 8.00, in cui gli si chiedeva di eseguire/svolgere subito un compito.

Le percentuali cambiano se invece della mail si fa riferimento ad una telefonata di lavoro, sempre nella fascia compresa tra le ore 19.00 e le 8.00 del mattino la percentuale di coloro che dichiarano di essere stati contattati nella fascia oraria indicata sale a circa il 40% dei rispondenti.

Inoltre, più della metà dei rispondenti (55,2%) ha dichiarato di aver partecipato a riunioni e/o svolto attività oltre l'orario di lavoro giornaliero (7 ore e 12 minuti).

7 http://www.funzionepubblica.gov.it/piano-organizzativo-del-lavoro-agile-pola

Sempre alta rimane la percentuale dei dipendenti che dichiara di esser stato coinvolto in videoconferenze di lavoro nella fascia oraria 13-14 (56,7%).

Di seguito vengono riportate le fasce orarie di maggior interesse utilizzate per riunioni e/o attività istituzionali oltre l'orario di lavoro giornaliero (Tabella 1).

Tabella 1 – *Fasce orarie di maggior interesse utilizzate per riunioni e/o compiti istituzionali oltre l'orario di lavoro giornaliero (valore assoluto).*

Fasce orarie	Numero dipendenti
Prima delle 7.45	6
Fuori dall'orario per coloro che sono in part-time	2
Fascia pomeridiana oltre le 7.12 (17.00 – 19.00)	107
Fascia serale 19.00 – 24.00	115
Feriali e Sabato-Domenica	18
Notturno	5
Prima dell'inizio o dopo la fine del turno	3
Altro	38

Dalla tabella si evince che le fasce pomeridiane e serali sono quelle maggiormente utilizzate per organizzare riunioni e/o svolgere compiti istituzionali.

Altro tema indagato nella rilevazione ha riguardato i gruppi di messaggistica istantanea, ormai divenuti un canale di comunicazione diffusissimo nell'ambito lavorativo. I gruppi di lavoro così creati rappresentano un'altra fonte di stress per il lavoratore, che ancor meno può esercitare una sana disconnessione. Infatti l'uso sociale che se ne fa è fuori controllo, i messaggi arrivano a qualsiasi ora del giorno e della notte e hanno - socialmente parlando - una valenza pari ad una telefonata o a una mail di lavoro.

I quesiti posti dal questionario sono volti a conoscere se i lavoratori sono stati inseriti in qualche gruppo di messaggistica istantanea e se la partecipazione è stata autorizzata o meno.

Il 62,5% dei rispondenti dichiara di far parte di una chat di lavoro di messaggistica istantanea e pressoché la metà dei rispondenti (49,2%) si è ritrovata in una chat di lavoro senza aver dato il proprio consenso esplicito.

Questo dato sottolinea l'invasività del modo di lavorare che si sta affermando. Alla luce di questo studio è evidente la necessità di regolamentare le modalità operative dello *smart working* per non confondere la flessibilità lavorativa con la reperibilità perpetua del lavoratore. Questo "modus operand"i è destinato a produrre un calo della produttività del lavoratore, che non staccando mai dal lavoro si troverebbe ad essere perennemente connesso.

4. Verso una reale applicazione del diritto alla disconnessione

Gli strumenti utilizzati dallo *Smart Worker* per prestare la propria attività lavorativa permettono una reperibilità ed una connessione non solo potenziale ma di fatto, costante e continua, rischiando di compromettere il bilanciamento tra vita professionale e vita privata che è tra i presupposti dell'istituto del lavoro agile.

Per questo, sempre più spesso, si parla di *Diritto alla disconnessione*, ossia della possibilità fuori dal normale orario di ufficio di non essere reperibili, di "*staccare la spina*" digitale. Se infatti la tecnologia in questi anni ha rivoluzionato e continua a rivoluzionare in molti modi positivi il mondo del lavoro, questo non avviene senza conseguenze ed effetti collaterali. La presenza pervasiva di *smartphone, tablet* o pc portatili - spesso forniti dalle stesse aziende per cui si opera - ha reso immediate le comunicazioni professionali. Ma questa facilità giustifica una pronta risposta, senza limiti di orario, ad ogni tipo di richiesta e necessità?

Già la Costituzione, con l'articolo 36 comma 2, interviene stabilendo che la durata massima della giornata lavorativa è stabilita dalla legge. Con questa formulazione, il costituente si astiene dall'imporre orari di lavoro prestabiliti a tutte le tipologie di professioni – caratterizzate da tempi e ritmi profondamente diversi – ma allo stesso tempo vuole tutelare i dipendenti, limitando la possibilità dei datori di lavoro di stabilire orari eccessivi e ingiusti che eccedano da quanto predisposto dalla legge.

L'articolo 36 diventa cosi particolarmente importante per lo *Smart Working*. Infatti il problema di tale tipologia di lavoro consiste nella mancanza di orari prestabiliti che spesso può dare adito a pretese pericolose da parte del datore di lavoro, il potere di chiamare o scrivere al dipendente a qualsiasi orario del giorno. Rispondere alle mail o effettuare telefonate per conto del proprio superiore rientra pienamente nelle mansioni lavorative, spesso però non retribuite.

La Legge n. 81/2017 ha introdotto nell'ordinamento italiano il lavoro agile (comunemente definito come *Smart Working*), una specifica modalità di esecuzione del rapporto di lavoro subordinato. Si tratta di un nuovo approccio all'organizzazione aziendale, in cui le esigenze individuali del lavoratore si contemperano, in maniera (potremmo dire) complementare, con quelle dell'impresa.

In particolare, l'articolo 19 della citata Legge n. 81/2017, seppur senza fornire una definizione giuridica, dispone che "(…) *l'accordo individui tempi di riposo del lavoratore nonché le misure tecniche e organizzative necessarie per assicurare la disconnessione del lavoratore dalle strumentazioni tecnologiche di lavoro*".

In questo contesto va inserito il nascente diritto alla disconnessione, cioè il diritto del lavoratore a essere irreperibile, a non essere soggetto alle richieste presentate in via telematica dal datore di lavoro al di fuori dell'orario di lavoro. Si

tratta del diritto a disconnettersi dall'ambiente lavorativo, senza subire ripercussioni sul salario o sul proseguimento del contratto in caso di mancata risposta.

Proseguendo nella panoramica di percorso di evoluzione di questo nascente fenomeno e delle sue correlazioni, la disconnessione nell'ordinamento francese, a differenza di quanto attualmente avviene in Italia, è qualificata espressamente come un diritto, e questo per il legislatore italiano deve divenire l'obiettivo vero verso cui tendere anche sulla base del quadro europeo che vede il Parlamento Europeo impegnato su questo tema in prima linea.

Tuttavia il legislatore transalpino non riuscì ad inserire alcun tipo di sanzione nei casi in cui questo diritto venga travalicato sull'onda delle pressioni aziendali e probabilmente anche questo aspetto dovrà essere previsto se non dal legislatore italiano ma sicuramente da quello Europeo.

La soluzione francese ha avuto il merito di mostrare una chiara presa di posizione sul tema. In altri Paesi, come la Germania, sono invece state le aziende a muoversi in ordine sparso prevedendo nei loro contratti specifiche possibilità di spegnere ogni *device* e non rispondere a messaggi e comunicazioni nei giorni di festa o nelle ore dedicate alla propria vita privata.

È indubbio quindi, alla luce del percorso francese e delle diverse esperienze soprattutto europee, che in Italia l'applicazione concreta del diritto alla disconnessione dovrà (cosi come concordato tra le parti sociali per quello che riguarda l'applicazione del lavoro agile) essere previsto nella sua applicazione dalla normativa contrattuale nazionale attraverso la fase dei rinnovi dei CCNL di imminente concretizzazione.

In Italia attualmente invece il diritto alla disconnessione rimane un principio enunciato ma non realizzato e le problematiche restano evidenti. Infatti inizialmente, nel DDL, il diritto alla disconnessione veniva qualificato come vero e proprio diritto, mentre nella Legge 81 tale formulazione scompare. In più nella Legge 81, non si specifica esattamente in cosa consista questa disconnessione, né come agire nel caso in cui non venga rispettata la norma e purtroppo molte responsabilità sono lasciate alla contrattazione individuale di per sé un livello che espone la parte più debole il lavoratore rispetto al datore di lavoro rendendo difficoltoso assicurare un'omogeneità di trattamento per tutti i lavoratori. Se il diritto alla disconnessione deve essere regolamentato tramite il contratto tra datore di lavoro e dipendente, in alcuni casi questo può compromettere l'effettività del diritto. Se i tempi di lavoro vengono scelti privatamente, si lascia un margine ampio a potenziali abusi perpetrati dal datore di lavoro, che potrebbe pretendere mansioni e orari ingiusti.

Uno studio di Randstad Workmonitor[8] ha dimostrato che il 71% dei lavoratori italiani risponde alle mail, telefonate e messaggi di lavoro anche al di fuori dell'orario. I tempi di lavoro sembrano essersi dilatati: secondo il report di Eurofound e dell'Ufficio Internazionale del Lavoro (ILO) del 2017, questa assenza di disconnessione può avere delle conseguenze importanti sulla salute e benessere del lavoratore, come ad esempio la sindrome da *burnout*, un esaurimento emotivo caratterizzato da stress cronico causato dal proprio lavoro.

Si deve tornare quindi a riconfermare quel patto "costituzionale" che garantisce al lavoratore un momento della giornata in cui ha diritto a non essere connesso a nessun dispositivo, poiché, peraltro, sono sempre più numerose le patologie da stress manifestate dai lavoratori dipendenti moderni, principalmente imputabili al senso del dovere e alla volontà da parte del lavoratore di non "scollegarsi" mai dalle faccende lavorative.

In conclusione l'eccessiva interferenza del lavoro negli spazi personali nonché lo sconfinamento dello stesso in un tempo che dovrebbe essere dedicato ad attività diverse hanno gravi ricadute su alcuni diritti fondamentali, che hanno un ancoraggio costituzionale. Ne discende che, sebbene il legislatore ad oggi non abbia voluto definire la disconnessione quale diritto, essa debba essere necessariamente e urgentemente qualificata come tale, poiché costituisce una sfaccettatura del diritto alla vita privata e familiare e del diritto alla salute; ciò in quanto il suo mancato riconoscimento e/o la sua mancata tutela si traducono in un'indebita lesione dei diritti sopracitati.

Più propriamente, dunque, la disconnessione non costituisce in sé un nuovo diritto, bensì una nuova sfumatura, una nuova prospettiva attraverso la quale guardare ad alcuni diritti fondamentali e proprio questo deve essere il punto di partenza per una lettura che costituzionalmente consenta di attualizzare la tutela della vita privata e familiare nonché della salute del lavoratore alla luce delle modifiche che l'era digitale ha introdotto nella società anche a seguito della attuale fase emergenziale Covid - 19.

Tecnostress, "Zoom Fatigue" (letteralmente, affaticamento da Zoom, dal nome di una delle piattaforme al momento maggiormente impiegate per le videoconferenze)[9], *BurnOut*, o il fenomeno della dipendenza da lavoro sono tutti termini assieme agli altri, non a caso inglesi, che denotano un crescente rischio di nuova ulteriore precarizzazione del lavoro sotto aspetti differenti da quelli a cui

8 https://www.randstad.it/chi-siamo/news-e-comunicati-stampa/news-e-comunicati-stampa/randstad-workmonitor-gli-italiani-si-portano-il-lavoro-a-casa-e-in-ferie/#:~:text=L'indagine%20del%20Randstad%20Workmonitor,farlo%2C%20soprattutto%20fra%20i%20Millennial.&text=E%20il%2053%25%20confessa%20di,durante%20il%20periodo%20di%20ferie.

9 www.engadget.com/online-conferencing-video-chat-fatigue-172357939.html;

siamo fino ad ora abituati che si legano più alla sfera della salute del lavoratore che a quelli classici legati alla retribuzione del lavoro.

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SUMMARY

Principle of the disconnection right: Istat case study

During the previous year, the use of the smart working as a flexible working schemes has changed the balance between private and working life.
The use, by workers, of technological devices (such as laptops and smartphones) allows a continuous availability and connection.
The introduction of these new job models has brought significant professional advantages but at the same time some disadvantages.
Employees are forced to work continuously, in a "Always on mode", jeopardizing out mental health and developing specific stress pathologies.
The "disconnection right" during non-working hours protects employees from an endless connection that could compromise their physical and mental health.
The main purpose of the current paper is to analyze the concept of the disconnection right in all its evolution (even after SARS-CoV-2 pandemic) and to evaluate the ISTAT experience.

Francesca ORECCHINI, ISTAT, forecchini@istat.it
Fabrizio MONTELEONE, ISTAT, famontel@istat.it
Anna CALABRIA, ISTAT, calabria@istat.it
Patrizia GROSSI, ISTAT, grossi@istat.it

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