Science and Politics in a Time of Pandemic: Some Epistemological and Political Lessons from the Italian Story

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ABSTRACT

Making public policy choices (especially on health issues) based on available scientific evidence is an ideal condition for any policy making. However, the mechanisms governing these scenarios are complex, non-linear, and, alongside the medical-health and epidemiological issues, involve socio-economic, political, communicative, informational, ethical and epistemological aspects. In this article we analyze the role of scientific evidence when implementing political decisions that strictly depend on it, as in the case of the COVID-19 pandemic. In carrying out this analysis, we will focus above all on the Italian case. This, on the one hand, precisely because Italy led the way (among European countries) regarding the containment policies of the pandemic. Secondly, the government's action was immediately criticized in various respects (specifically, by a publication on the Harvard Business Review, but later on also by various political figures and experts of various research fields). Some were calling into question not only the cumbersome political mechanisms, but also suggesting a scarce ability to take scientific evidence into account. On other fronts, there are those who have criticized Italy for its blind and uncritical faith in science and for the paternalism of its decisions. This debate therefore offers the possibility of dealing with some aspects concerning scientific results and their implementation at the political level from the point of view of a *political philosophy of science*, roughly in the spirit suggested by John Dupré (2016).

1. Introduction

Since the beginning of the pandemic, numerous experts in several disciplines (especially in the field of epidemiology and infectious diseases but also

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physicists and mathematicians) have been called upon to advise governments (all around the world) in the development of strategies that would operate a containment of the virus (e.g. lockdown, hygiene prescriptions, the use of masks) while waiting for measures considered more definitive (such as drugs and vaccines) to be available.

Scientific evidence is certainly a necessary and essential aspect in order to be able to develop policies that adequately respond to the problem of the pandemic. However, since science is only one of the aspects at play in the determination of such policies, it is not enough.

This is also because a phenomenon such as the pandemic is not simply a scientific and medical issue but also affects the economy of a country, its political system and social practices, its development, as well as the different context (geographical, cultural, institutional) in which the spread of the virus takes place. A pandemic is a paradigmatic example of a complex problem, whose several components are impossible to reduce to a single level of analysis and action. Because of that, it is also troublesome to think of a single solution, context independent and stemming out of a single discipline or area of expertise. However, in 2020, an article [1] published by the *Harvard Business Review* criticizes Italian early response to the pandemic by implicitly assuming that even a complex problem such as pandemic has a single, context-independent solution. In this work we take the HBR article as an opportunity to analyze the role of scientific evidence when implementing political decisions that strictly depend on it, as in the case of the COVID-19 pandemic. In doing this we will focus, above all, on the Italian case, both for chronological reasons (Italy was the first European country to apply the lockdown) and because the management of the Italian government was almost immediately the subject of observations and criticisms. We will do this by analyzing in detail the interplay between politics and scientific experts in the Italian strategy of dealing with the pandemic, given that the HBR article was about it.

The structure of our paper is as follows. In Section 2, we provide a brief overview of some concepts of epidemiology and modeling that we will use throughout the paper. In Section 3, we describe HBR criticism of the Italian response in detail, and we identify some of the problematic assumptions of this criticism. In Section 4, we address the first problematic assumption of the HBR

[1] https://hbr.org/2020/03/lessons-from-italys-response-to-coronavirus (accessed April 3rd, 2020)

article, namely that the political structure of a country does not significantly constrain its response to emergencies. Indeed, we show how Italian political structure plays a significant role in the way Italian politics could have possibly responded to the pandemic. In Section 5, we reconstruct in detail the Italian response to the first wave of the pandemic, mentioning as well as the European response to the second and vaccines campaign, in order to show that 'following' the science is very complicated and confusing when science is in the making. In Section 6 we draw some philosophical conclusions from our analysis, by scrutinizing the role of experts and values in policy decision making. In particular by reconsidering scientific experts and scientific knowledge in light of certain notions developed in philosophy of science, we will show how, in the case of COVID-19, the relation between scientific expertise and political action was necessarily shaped by value-laden judgements and, therefore, by non-epistemic considerations.

2. Dealing with a pandemic

On 11 March 2020, the World Health Organization officially declared the COVID-19 pandemic which has so far (November 2021) caused 5,12 million deaths and over 255 million confirmed cases.

Despite being a global threat, and due to its novelty, various nations have differently reacted to it. At least for the first wave, countries like China, Vietnam, New Zealand and Australia have managed to eliminate or have come close to eliminating the epidemic in relatively satisfactory ways. Other nations, such as South Korea, Finland and Norway have failed to eliminate the spread of the virus, but have managed to keep it under control, below certain levels. Unfortunately, many states, including most European countries, the United States, and the United Kingdom have failed (until the arrival of vaccinations) to manage the pandemic satisfactorily, and have faced thousands of deaths and overloaded health services.

In the case of COVID-19 pandemic, the difficulty of developing highly effective strategies is, at least, twofold, both of which depend on the fact that the threat being faced is in fact unknown. On the one hand, containment strategies are based on situations considered similar starting from previous pandemics (which may therefore have similarities but also substantial differences). On the other hand, the novelty of the virus implies that even the knowledge on the mechanisms of diffusion, on the viral structure and sequence and on the

response of the affected subjects are all to be studied, making inductive inferences more uncertain.

In this situation, therefore, the lack of strong scientific evidence, both concerning the success of certain measures and regarding the possible unexpected consequences, such as psychological and economic consequences, combined with the need to respond quickly to the spread of the virus, has also produced a great difficulty in evaluating the measures themselves and the work of the governments that have implemented them.

Nevertheless, concerning COVID-19 pandemic, it is legitimate to ask whether, in the face of an emerging contagious disease and in the absence of specific interventions (such as dedicated drugs or specific vaccines), it is possible to apply effective containment strategies.

These strategies, also called *non-pharmaceutical interventions* (NPI) should ideally provide a first response towards the reduction of the spread of the virus, the rate of infections, hospitalizations and deaths. On the other hand, these interventions need to take into account the psychological, social and economic impact not only of the pandemic itself but also of the countermeasures. In dealing with the pandemic, therefore, pending direct tools, governments around the world have adopted various containment strategies, such as the obligation to physical distancing, the use of masks in all places of interaction, lockdowns and curfews (see, among the others, Chinazzi et al. 2020; Teslya et al. 2020; Tian et al. 2020).

A recent study (Haug et al. 2020) has provided the first general picture of worldwide response, by ranking the effectiveness of different measures. By comparing different statistical models and due to an extensive examination of large databases, Haug and colleagues show that a unique, context independent, approach to deal with pandemics does not exist. Definitely, limitations in people's gathering capacities and movement restrictions (such as lockdowns and curfews) have proved to be effective in many cases, but the study reveals that cannot be simply applied to any situations. As a matter of fact, other elements, such as demographic data, urban geography, the development of the health systems and other social and environmental factors, need to be taken into account in order to build an effective strategy. Moreover, these measures present severe contraindications, considering the impact they have on people's life, from economic difficulties to psychological disorders.

However, an ever-increasing number of studies seem to indicate some characteristics present for a strategy that shows a certain effectiveness. The data

seem to show that the approaches aimed at eliminating the virus, rather than its containment, are the preferable ones under the various aspects involved, from health to the economy to individual freedoms.

According to a recent comparison, published on *Lancet*, countries such as Australia, New Zealand, Vietnam and Japan, adopting an elimination strategy, have had 25 times fewer deaths than countries that have opted for containment (Oliu-Barton et al. 2021). Such approaches such approaches were already in place. Furthermore, countries with better social assistance policies, provided with medicine better organized throughout their territory, with a health system organized not only around centers of excellence (albeit with fewer resources) have reacted to the pandemic more effectively. Last factor not to be overlooked, better results also depended on politicians and experts capable of providing coherent and timely public communication.

It is crucial here to remember that this result comes more than a year after the start of the pandemic in March 2020. Nevertheless, the WHO and other institutions had long predicted the possibility of a pandemic and hypothesized scenarios and methods of response. However, these warnings have been largely underestimated (also due to health spending cuts following the economic crisis). Richard Horton (physician and editor in chief of Lancet), in an article in the Guardian of 9 April 2020, commented on this scenario saying that "coronavirus is the greatest global science policy failure in a generation"[2]. This might seem surprising. But in fact, despite years of planning, the most developed countries in the world were not able to deal with the COVID-19 pandemic. It follows that this situation is not just a biological or epidemiological problem. What were considered to be the best health systems in the world have proved particularly unsuccessful in managing this emergency.

It is also good to remember that, in spite of these serious shortcomings, something like a pandemic was not a completely new problem. Scientists and experts very often try to understand a new phenomenon starting from its analogy with similar phenomena that have already happened. This is in fact the heart of *inductive reasoning*. Anyone familiar with research knows what the dangers of induction are. In fact, the new phenomenon could also be diverse enough to behave in a different way than what is already known. However, science does not rest on mere inductions. The construction of models that can

[2]https://www.theguardian.com/commentisfree/2020/apr/09/deadly-virus-britain-failed-prepare-mers-sars-ebola-coronavirus (accessed January 18th, 2021)

provide greater precision in inductive predictions allows scientists to try to make a ranking of future possibilities, discarding the less probable ones. Nevertheless, it is clear that the more the phenomenon presents unknown aspects, the more discriminating the assumptions with which the models are constructed. Therefore, in the case of COVID-19 pandemic, uncertainty, which is an always present factor in scientific research, becomes wider and more troublesome in this case. This is because it also alters the ranking of possible forecasts (from the least probable to the safest), which in turn becomes more and more revisable and scalable in its positions. So, faced with a quite unknown threat, with wider margins of uncertainty, where to start?

In this perspective, one of the first steps is trying to understand the phenomenon through one or more models. In the case of a pandemic, the discipline that deals with these models is epidemiology.

2.1 Epidemiology and health policies

One of the scientific disciplines that immediately had a say in the management of the pandemic is epidemiology. "Epidemiology is the study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the control of health problems"[3]. Epidemiology is a medical-scientific discipline that requires skills from different fields of knowledge. Part of an epidemiological study is about understanding the *incidence rate* of a certain disease (i.e. the ratio of a population to the number of new cases over a certain period of time) and its *prevalence rate* (i.e. the overall number of cases observed in a certain time window). The study of these aspects allows one to build models that describe the *frequency* and *distribution*, in a given population, of specific phenomena (such as infectious diseases). Subsequently, on the basis of these results, epidemiology tries to build models that help to identify the *causal relationships* between a given pathology and the several factors (from the specific conditions of the single individual to contextual conditions, such as socio-economic and environmental ones) that favor its development. This type of modelling ideally provides more solid tools to assess

[3] "Principles of Epidemiology in Public Health Practice, Third Edition An Introduction to Applied Epidemiology and Biostatistics". Centers for Disease Control and Prevention. (Retrieved 25 February 2021).

the existence of the determinants of the phenomenon under investigation and increase the capacity to elaborate the appropriate measures to counter it (either through containment or elimination).

One of the most famous groups involved in the construction of mathematical models applied to epidemics is the one led by Neil Ferguson at Imperial College London. For both COVID-19 and other past epidemics, Ferguson′s group models have often been a primary source for the development of specific policies (Adam 2020). On March 16, 2020, Ferguson′s group released a report predicting around half a million deaths in the UK alone, in the absence of specific measures. Similar models have been sent to various European countries (including Italy) to help develop tailored countermeasures towards the pandemic (Chawla 2020, Vollmer et al. 2020). Indeed, Italy was the first European country hit by the pandemic. And one of the decision sources for the decision to declare a national lockdown was precisely the Ferguson group report. Despite these powerful tools, the models developed by the Ferguson group have proved rather inaccurate (Chawla 2020). Ferguson's work was subsequently criticized both from the methodological point of view - some computational scientists even called it "a buggy mess" (Chawla 2020) - and concerning the assumptions. For example, regarding Italy, the model assumed that children transmit the infection like adults (while, during the first wave, apparently, it was not the case). Furthermore, the model did not take into account the significant difference in epidemiological patterns between different regions and areas within the country. Part of Ferguson′s public credibility was then undermined by the fact that the same scientist then violated the restriction rules during the UK lockdown, to visit a person (which eventually led to his resignation as a government consultant). However, it seems clear that this episode does not concern Ferguson′s capability as a scientist, nor does it provide reasons for inaccurate predictions of his work. Nevertheless, his conduct affected his reliability in the public sphere, negatively impacting trust in his epistemic authority.

As already anticipated, science always moves within certain margins of uncertainty. However, there is more. Scientific models can indeed be seen as representations of phenomena but they are partial or distorted representations of them. There is an extensive literature in philosophy of science, on the nature and purposes of scientific models (see for instance Weisberg 2013; Frigg and Hartmann 2020). Roughly speaking, for our purposes it would be sufficient to say that a model can be seen as a representation (of different kinds, from formal

to material ones) of a given phenomenon, which enables the modeler and other researchers to identify certain features of the object of inquiry (otherwise hidden or not immediately detectable) and to elaborate predictions or projections concerning its (putative) behavior. Regarding epidemiology, there are several ways in which we can talk about models and modelling (Fuller 2021). According to Jonathan Fuller, a first distinction should be made between "model forecasts" and "model projections", whereas the former deal with "unconditional predictions" (i.e. something that will take place from a starting scenario) and the latter refers to "conditional predictions" (i.e. something that would take place if something else were not done). In any case, in both cases, the epidemiological models (as indeed any model) necessarily start from certain assumptions. These assumptions are often obtained, in the absence of specific data, from previous information that may relate to similar situations or pathologies with some characteristics that might be comparable to the one in question. Other assumptions may refer to data concerning demography, transmission mechanisms, geographic and climatic variables (relating to the seasonality of certain diseases) etc. As will be seen further (see section 3), all these assumptions involve an *inductive risk* which is inherent in the very practice of doing science. This risk is obviously not a leap of faith but is determined on the basis of various factors, such as the strength of the model, the presence of more or less similarities, the power of external factors to be considered (such as the economic productivity to be preserved or civil liberties to be protected). This aspect should also help to understand the difficulty of accurately establishing *causal links* through such models. If it is true that the different types of epidemiological models used during the pandemic can be more or less considered causal models (in which, for example, by playing with the parameters, predictions can be simulated starting from known causal factors) it is still difficult to establish new/unknown causal links just starting from these models and their manipulation (see also Fuller 2021). With these considerations in mind, the available models and data on the spread of the virus prompted many countries to take measures to address the virus' threat.

3. The analysis of Italy's first reaction by Pisano, Sadun, and Zanini

The Italian case is particularly interesting to analyze. Critically scrutinizing the debate on the Italian response to the pandemic allows us to avoid a simplistic categorization in which decisions are discriminated into "good" or "bad"

choices as such, and to build an interpretative framework that shows how the transition from scientific recommendations to the provision of specific policies is a path that is anything but linear[4].

Italy was harshly criticized for its management of the health emergency, judged to be not timely and not accurately targeted, often ignoring fundamental scientific evidence. On March 27 2020, Gary P. Pisano, Raffaella Sadun, and Michele Zanini, three experienced business administration researchers, wrote an article (Pisano, Sadun, & Zanini, 2020) on the Harvard Business Review (HBR) about the lesson that the world should mature in light of the Italian management of the pandemic known as COVID- 19. The three authors acknowledge that different aspects of the crisis "can undoubtedly be attributed to bad luck". Indeed, the extent of the phenomenon and some of its characteristics have created peculiar dynamics that any government could not have kept under control without difficulty or missteps. On the other hand, on some crucial aspects the study finds errors whose recognition should serve as a lesson for everyone.

[4] *Nota bene:* Before we describe the main points of HBR analysis, a caveat is necessary. Our analysis does not directly target the analysis published on HBR. Obviously, the three authors deal with business administration and their analysis focuses on what are the problems of a response to the pandemic from this point of view. However, in Italy, the article has been used as a political confrontation tool. Many journalists, politicians and commentators have used this analysis to highlight the incompetence of the Italian government. Surely it is true that there have been errors. However, what leaves us perplexed is that these errors were transformed into political responsibilities as if they were logical consequences. For this reason, in our reply, we try to say that the technical objections to the article should be read as such and not as a general accusation to the Italian case. Furthermore, this accusation appears too abstract if one does not consider that some of those errors perhaps, at least in our view, should also be ascribed to conditions of institutional set-up and to a situation of immaturity in the relationship between science and society. Sadly, this is not just because of a lack of scientific interest and expertise in the Italian political class, but also due to some biases and attitudes within the scientific community (for instance, in Italy many scientists still rely on the so-called "deficit model", often completely ignoring the progress made in the field of social dimension of scientific research). On this point see also: https://www.esquire.com/it/lifestyle/tecnologia/a31327343/coronavirus-scienza/ (accessed August 21st, 2020)

The analysis of HBR identifies several "mistakes" of Italian management of the COVID-19 crisis that can be seen as lessons for any future administration that would have to deal with an emergency of this type.

According to the authors, the Italian government, by not giving the right weight to the phenomenon and by appealing not to stop daily and productive activities, has shown what is known as "confirmation bias", i.e. the tendency to focus on information that allows you to confirm your initial positions and theses, discarding those less in line with our intentions or desires.

Secondly, the Italian government is accused, in the initial phase of the crisis, of taking small, isolated and punctual steps, adopting partial solutions instead of acting systematically and quickly.

Third, the analysis has criticized the excessive fragmentation of the Italian health system, whose competences are in the hands of individual regions. Instead of providing a unified response, the various regions have adopted different protocols and prophylaxis, as can be clearly seen from some comparisons between them, and Lombardy and Veneto (two neighboring regions, among other things) in the first place.

Finally, there is a problem in the way Italy has collected and analyzed data. In the absence of this essential information, the response was consequently less effective and precise.

In the end, while acknowledging to the Italian government the mitigating factors for the novelty of the phenomenon and its scope, the authors conclude that there is "the need for immediate action and for massive mobilization" that will imply "a decision-making approach that is far from business as usual". Accordingly, this means "to adopt one that is systemic, prioritizes learning, and is able to quickly scale successful experiments and identify and shut down the ineffective ones."

In our opinion, the article certainly raises questions that deserve discussion. Thus, stimulated by these interesting reflections we want to point out here some aspects that, it seems to us, have been underestimated or not recognized by the analysis of HBR.

It is not our intention to provide an official defense of the government's work. However, we want to add to the discussion some elements which, in our opinion, more adequately represent Italy's peculiar situation regarding the points raised by the HBR analysis. The points we illustrate articulate a more general perspective on the relation between science,

expertise, and politics that we hope may illuminate also the way other countries have been dealing with the COVID-19 emergency.

In particular, in Section 4 we point out that HBR analysis does not take into account the political structure that inevitably shapes and constrains the politics response to emergencies. Next, in Section 5 we will reconstruct an account of Italy's early response to the pandemic, as well as subsequent European initiatives to tackle the second wave and vaccine campaigns, by showing that partial and limited initiatives were the only possible path because that is what is implied in following a science in the making.

4. The Italian political-constitutional setting

The first limitation of the HBR analysis is that it does not consider that any scientific policy is always implemented in a political structure. Sometimes a political structure can constrain the scope and the power of policies. Italy is no exception.

Italy is a parliamentary republic in which, by constitutional choices (shaped by the desire to avoid the risk of a return to fascism just ended), the power of the executive is severely limited. As a matter of fact, the Italian constitution was discussed and then promulgated with the more or less explicit intent to weaken the action of the government. The memory of the dictatorship and the fear that too many powers could be concentrated in one person or in a group of people, pushed the Constituent Assembly to relegate the government to a role of an *executor*, instead favoring the parliament (with its debates and discussions) as the supreme organ of power.

The pluralism of this genesis is well represented by the fact that the parties involved in the construction of the constitution, previously "united" by anti-fascism feelings, would soon become bitter opponents during the Cold War. This socio-political scenario, and the adoption of a proportional electoral system aimed at avoiding any political hegemony, might explain the choice to favor *representativeness* rather than *governance* (see for instance Cuono 2012).

The "institutionally desired" weakness of the government can therefore explain why there is no clarity about defined reaction plans, automatically taking place in case of need.

In addition, to these general considerations, it is appropriate, when judging the lack of timeliness and strategic nature of the Italian government, to recall some peculiar characteristics of the Italian constitution.

Indeed, some scholars[5] have pointed out how the Italian constitution may seem not fully equipped to regulate and manage the state of emergency. Unlike other constitutional papers, specific emergency clauses that could lead to unpredictable cases were considered a danger to be avoided. The closest thing to the state of emergency is constituted by the adoption of the so-called "decreto legge" (decree law). According to article 77 of the Italian constitution, in extraordinary cases of necessity and urgency and for the limited time of 60 days, the Government could "use" the legislative power otherwise reserved to Parliament and lay down emergency rules with the force of law.

Concerning the government, it is essential to point out how the Constituent Assembly had the precise intention to avoid the figure of a "head of government" and instead created (precisely) a "President of the Council of Ministers" (intended as a coordinator of a collegial and plural body).

However, it is interesting to note that it took 40 years for the Italian Republic to promulgate a precise law establishing the functions of the Presidency of the Council (this is Law 400 of 23 August 1988).

Thus, the Italian "Presidente del Consiglio dei Ministri" (President of the Council of Ministers) disposed the state of emergency in Italy (through a so-called DPCM or Decree of the President of the Council of Ministers) on the basis of a decree-law, the Legislative Decree No. 6 of 26 February 2020. This decree delegates to the Prime Minister (in consultation with the various ministers concerned from time to time), the implementation of a series of restrictive measures aimed at contrasting the spread of the epidemic.

Article 2 generically delegates to the President of the Council "any adequate and proportionate containment and management measure to the evolution of the epidemiological situation". Subsequently, the decree law

[5] See for instance https://www.ilpost.it/carloblengino/2020/03/19/emergenze-e-diritti-fondamentali/ (accessed April 3rd 2020)

was approved and converted by Parliament on February 26, being now an ordinary law.

From this picture, it seems clear that the need for a fast and rational response was also hindered by a regulatory framework which appears to be, at least, incomplete, concerning exceptional circumstances and regarding emergency measures which suspend and limit fundamental rights and freedoms guaranteed by the Constitution such as freedom of movement and meeting (articles 16-17), the right to freely profess one's religious faith in any form (also in group) (article 19), the right to have schools (article 34) or the freedom of enterprise (article 41). Thus, we believe it is, at least, unfair to blame (if one can speak of guilt) the current government for these aspects.

Moreover, the entry into force, in 2001, of the reform of Title V, part 2, of the Constitution (not fully accomplished) has strengthened the multipolarity of power in Italy. At the same time, however, this change did not adequately protect itself from possible conflicts of power between organs/parts of the State (see Marchetti, 2010). Regarding public health policies, the constitutional reform of Title V of the Constitution had important implications. Health protection (a concept that extends the term "hospitalization", which was adopted in the previous system) falls within the scope of concurrent legislation between the State and the Regions. In fact, the State has the prerogative to define the fundamental objectives of prevention, treatment and rehabilitation and the general guidelines of the national health service. The rest, including how to fulfill these objectives, is the responsibility of the Regions.

5. Following the science and getting lost

In our perspective, another limitation of HBR analysis is that it does not see that Italy's initial response constituted by small and partial initiatives was motivated by the uncertainty of scientific recommendations. In order to appreciate this point, it is important to reconstruct at least the initial phases of the Italian crisis.

5.1 The coronavirus saga: the Italian first reaction towards COVID-19

The 'coronavirus saga[6]' in Italy started on January 29th, when a Chinese couple from Wuhan on vacation in Rome was diagnosed with COVID-19 - and Giuseppe Conte (the Italian PM at that time) decided to block flights to and from China. On January 31st, a cruise ship was blocked near Civitavecchia, and the director of the Spallanzani Hospital (where the Chinese couple was hospitalized) wrote in a report that the pandemic risk for Italy was low. After a few measures made effective by Conte's executive, on February 21st the first individual in Lombardy was diagnosed with coronavirus. On February 23rd, a few cities and towns for a total of 50,000 people were locked down and schools were closed in 6 regions. On February 27, several politicians (from the Lega's secretary Matteo Salvini to Milan's mayor Giuseppe Sala, to the Democratic Party's secretary Nicola Zingaretti) complained that these measures were exaggerated. But with slow and painful coming to an agreement in scientific methodologies and new data pouring in, on March 9 the government decided to put the entire country in lockdown. This reflected the on-going understanding of the impact of the coronavirus on the Italian territory. Experts who were so adamant in underestimating the problem at the beginning, were finally seeing the gravity of the situation. The idea is that the government has implemented recommendations derived from some of the experts' evolving understanding of the phenomenon itself - in other words, the executive indeed followed data, interpretation, and recommendations - but these have changed radically within a short period of time.

This scenario may offer an explanation as to why the government response was not always timely or appeared syncopated. It is a fact that, in the face of the general decisions made by the government, each Italian region has applied/interpreted these provisions in its own way, sometimes even coming into sharp contrast with the central government.[7] For instance, regarding the use of protective masks, each region adopted different obligations (from wearing them everywhere, to the request to

[6] Here is a much more detailed recollection of facts https://www.ilfattoquotidiano.it/in-edicola/articoli/2020/03/16/coronavirus-i-47-giorni-che-hanno-stravolto-litalia/5737766/ (accessed April 15th 2020)

[7] https://www.ilfattoquotidiano.it/2020/03/08/coronavirus-la-diretta-altri-1-326-contagi-in-italia-gallera-in-lombardia-769-casi-in-24-ore-267-vittime-113-piu-di-ieri-la-stretta-di-regioni-e-comuni-quarantena-per-chi-viene-d/5729485/ (accessed April 3rd 2020)

wear them only in certain places)[8]. Furthermore, it is precisely this overlap of powers that could have negatively affected institutional communication. On the evening of March 7, following rumors about the possibility of the lockdown, many citizens, alarmed by the leak of information, adopted behaviors (such as travelling from one region to another) which were detrimental to containing the epidemic. Certainly the circulation of unofficial information, and the communication to the nation late in the evening of March 8, was a mistake.

However, even this case can be explained by the need, as mentioned above, of the central government to consult and cooperate with the regional ones. In this regard, in fact, CNN reported how this draft had come into their possession "by the press office of the Lombardy regional authority"[9].

Furthermore, it should not be forgotten that the decisions of the Italian government were gradual also for the precise will (dictated both by current political balances and by the institutional structure mentioned above) to give birth to the decision in consultation with the other stakeholders in the nation: first of all the regional administrations but obviously also the organizations that preside over the productive activities (*Confindustria*[10] in primis) and the unions.

In the weeks leading up to the most drastic measures, the Italian newspapers and talk shows were pervaded by a heated debate between experts from various fields. Some of these experts, in a constant dialogue with each other and with the political class, favored underestimating the problem. An example is the virologist Roberto Burioni, Professor at San Raffaele University in Milan. Burioni has made a name for himself in the past few years as a scientific popularizer, especially in the battle against the no-vax movement[11]. Burioni supports a rather simple-minded linear model

[8] https://www.ilsole24ore.com/art/coronavirus-ovunque-mai-o-solo-nei-supermaket-regioni-ordine-sparso-mascherine-obbligatorie-ADB9OLI (accessed June 6th 2020).

[9] https://edition.cnn.com/asia/live-news/coronavirus-outbreak-03-08-20-intl-hnk/h_f28ad3a7c6c653b1fe04a628870946d1 (accessed December 1st 2020).

[10] The "Confederazione generale dell'industria italiana" (The General Confederation of Italian Industry), commonly known as "Confindustria", is the most important Italian entrepreneurs' federation and national chamber of commerce.

[11] https://www.sciencemag.org/news/2020/01/italian-scientist-has-become-celebrity fighting-vaccine-skeptics (accessed January 15th, 2021).

of scientific advising (Brown and Havstad 2017), according to which scientists provide the facts, which are beyond interpretation and should strictly inform science policy. On February 2nd in an Italian talk show called *Che Tempo Che Fa*, Burioni was firm in saying that Italy did not run any risk. Similarly, a few days later (February 23rd) Maria Rita Gismondo, who is in charge of the clinical microbiology lab of Sacco Hospital in Milan, argued that we should not think about coronavirus outbreak as a pandemic, because flu has a higher mortality rate[12]. Gismondo's comments were in the form of an outburst on her Facebook page. Later, she decided to express her thoughts in a more systematic way and she added that she was just following data from the Minister of Health and WHO. Ilaria Capua, professor of virology at the University of Florida, in an Italian talk show called *In ½ Ora* said that COVID-19 was a condition similar to influenza, and that in Italy there were more cases only because Italian authorities have been proactive with testing, but she also added that we should follow updates from scientific institutions. However, there were also people who were more concerned and demanded more decisive action. For instance, Ernesto Burgio (president of the Italian Society of Environmental Medicine) explicitly said that the pandemic could have been easily predicted, but the alarm was unfortunately delayed[13]. Burgio says that we already had the knowledge derived from studies of other pandemics in recent decades in China and Southeast Asia. Another aspect that Burgio emphasized is that knowledge of the Chinese case – which was available before in Italy the situation got worse - showed that "it was immediately understood that it was necessary to test and monitor all cases" rather than only the most serious ones, which is what the Italian government ended up doing.

Roughly speaking, politics chose to side with those scientists that undermined the problem. Their recommendations evolved in a short period of time, and strategies have been adjusted on the basis of scientific

[12] https://www.ilsole24ore.com/art/coronavirus-sfogo-direttrice-analisi-sacco-e-follia-uccide-piu-l-influenza-ACq3ISLB (accessed May 19th, 2020)

[13] https://wsimag.com/science-and-technology/61967-covid-19-the-italian-drama (accessed May 19th, 2020)

findings[14]. This is not true just concerning the novelty of the pandemic, but also applies to further phases of the COVID-19.

5.2 Facing the second wave

The attempt to deal with the problem at a European level, starting from the end of the first wave, suffers from the same challenges of following science-in-the-making. Starting from June 2020, the infections within the EU have begun to decline. For instance, in the month of July, in Italy less than 200 cases per day were registered. At the end of July, there were 12,230 positives across the country and there were fewer than 10 deaths per day between late July and early August (Istat report, March 2021).

Thus, during summer of 2020, the EU began to encourage the reopening of borders, also in the face of requests from citizens and the production sector (in particular the tourism sector) who were pushing for a return to normality[15]. However, between August and September the infections started to rise again. This happened despite conditions that seemed better than in March. In fact, the spread of the virus seemed to be concentrated only in small outbreaks, controllable through testing, tracking and isolation of the new positives. Starting from October, the whole EU began to record a rapid and constant increase in infections of the new coronavirus[16]. At the end of October, the President of the European Commission, Ursula von der Leyen, announced a plan to improve the test and tracking system at the European Union level. Meanwhile the President of the European Council, Charles Michel, invited member countries to act immediately to "avoid a tragedy"[17]. In those days, Spain declared a national state of emergency, while Germany announced new countermeasures, including new limitations to people movement and gathering. Something similar has been done in France, that imposed a strict lockdown throughout the national territory. On November 4, 2020, the Italian Prime Minister, Giuseppe Conte, ordered the latest in a series of new measures, to

[14] https://www.businessinsider.com/italy-falling-apart-coronavirus-pandemic-doctors-tough-choices-2020-3 (accessed May 20th, 2020)

[15] https://www.ilsole24ore.com/art/frontiere-ue-cerca-accordo-riapertura-ora-esclusi-usa-AD0MU9a?refresh_ce=1 (accessed May 23rd, 2021)

[16] https://time.com/5902172/europe-coronavirus-second-wave-belgium-czech-republic/ (accessed May 20th 2021)

[17] https://www.ft.com/content/cc928df5-8c4f-4b16-b5e8-78547069c9d5 (accessed May 20th, 2021)

counter the growth of infections and try to reduce the pressure on the hospital network. Those included new travel restrictions and a curfew (from 10pm to 5am) at the national level. Moreover, for the first time, differentiated restrictions were imposed on a territorial basis. Regions and even provinces could be divided by colors ("yellow", "orange" or "red") depending on the risk scenario, a framework which has also prompted again the attrition between national government and local authority [18].

On November 2, 2020, Kai Kupferschmidt, biologist and Science correspondent wrote:

> With COVID-19 cases mounting and threatening to overwhelm health care capacity, much of Europe has taken similar measures to curb human contacts. Two months ago, as numbers began to creep up after a blissful summer lull, countries still held out hope that more limited, targeted measures could prevent a second wave. Now, that wave is here, with the force of a tsunami. Europe has surpassed the United States in cases per capita; last week, it accounted for half of the more than 3 million cases reported to the World Health Organization (WHO). 'Europe is at the epicenter of this pandemic once again,' WHO's regional director for Europe, Hans Kluge, said on 29 October.[19]

Although months had passed, the European Union was unable to manage the health emergency in a flawless and unified way. Certain evaluations, according to some scholars (Haug et al. 2020), have turned out to be erroneous, such as the line chosen to adopt approaches that balanced the different needs (i.e. more rigid measures due to the health emergency vs more flexible measures due to economic and social needs). However, also on this aspect other studies have shown opposite results (Della Rossa, Salzano, Di Meglio et al. 2020). It is not in our interest to compare the strength and the validity of these studies here. But even in this case, when designing political responses, the scientific dimension cannot simply be subsumed and applied uncritically.

In hindsight, it has been argued that certain stricter restrictions have proved more effective (both in terms of public health and economy) than "stop and go" strategies applied by many European countries, to balance public health

[18] https://www.salute.gov.it/portale/nuovocoronavirus/dettaglioNotizieNuovoCoronavirus.jsp?lingua=italiano&id=5149 (accessed May 20th, 2021)

[19] https://www.sciencemag.org/news/2020/11/europe-locking-down-second-time-what-its-long-term-plan (accessed May 20th, 2021)

interests with other aspects of citizens' lives, such as work and psychosocial well-being (Oliu-Barton et al. 2021).

Analogously to the Italian case during the first wave, even at the end of the second wave there was no scientific consensus, in particular on how to get out of the lockdown and restrictive measures[20]. Again, also during this phase, the sciences and experts have made sure to provide "the best possible evidence", which however clashed with a partially new situation. As already shown, these indications were not always the same, and also reflected different contexts (such as economic situation and political agenda). Of course, this aspect must not be read as a justification for the mistakes made by governments, or as an underestimation of the pressure power of certain groups and sectors (such as the productive one) on public decisions. Rather, this framework allows us to better understand how decisions of this complexity and scope inevitably involve the clash between different perspectives and different interests at stake, that shape the determination of specific responses and policies, often dependent on the context and absolutely non-linear.

5.3 Vaccines on the scene

One of the most astonishing results of scientific research during the progress of the pandemic was the ability to produce vaccines available as early as January 2021, less than a year, in fact, from the WHO's decision to declare a pandemic state.

From the point of view of scientific production, this is an extraordinary result, both for the timing and for the different types of technologies used. So far the European Commission, after the positive evaluation of the European Medicines Agency (EMA) concerning their safety and efficacy, has issued 4 authorizations for vaccines. Two, those developed by BioNTech & Pfizer and Moderna (with "mRNA technology"), while two others, developed by AstraZeneca and Janssen Pharmaceutica NV (through the modification of an adenovirus).

To these must be added other vaccines that have not been approved by the EU but which are used in other areas of the world such as the Cuban vaccines (Soberana02, SoberanaPlus and Abdala, which are proving very effective)[21], the

[20]https://www.sciencemag.org/news/2020/04/ending-coronavirus-lockdowns-will-be-dangerous-process-trial-and-error (accessed May 20th, 2021)

[21] https://www.esquire.com/it/news/attualita/a38382017/covid-19-cuba/ (accessed December 10th, 2021)

four Chinese vaccines (two developed from the state company Sinopharm, plus the CoronaVac, and the CanSino) and the Russian Sputnik V[22].

Moreover, the entire process, despite its scientific relevance, has also prompted a new type of concern in the public sphere. Indeed, COVID-19 vaccines have been approved with unprecedentedly quickness[23]. Many people have begun to suspect that such a speed implies a "relaxation" of the safety and control procedures that normally govern research and especially that of the pharmacological type. There are those in the scientific world who have called for caution (Jiang 2020). In fact, research and politics have therefore found themselves having to balance two needs: on the one hand the urgency to develop vaccines and on the other the obligation to respect the standards of scientific practice both in terms of safety and reproducibility of the results and their methodological correctness.

The traditional vaccine approval process involves three phases. In phase 1, the vaccine is tested on small groups of people to assess its tolerability and safety. Phase 2 involves a few hundred people and the aim is to verify the mechanism of action and the dosage in order to be effective. Phase 3, implies the administration of the vaccine to thousands of people, to determine its overall efficacy and its safety.

Adam Finn, Professor of Pediatrics at Bristol Children's Vaccine Center, explained that several new circumstances have helped to develop safe and reliable drugs without neglecting the methodological constraints of scientific research[24]. Among these it is necessary to include the presence (despite the shortcomings) of action plans in response to possible pandemics, quick identification of the pathogen, huge funding made available in very fast topics, immediate start of clinical trials, recruitment of a large number of volunteers, sharing (in the scientific community) of data and information on a global level. Furthermore, the search has not started out of the blue. For at least two decades, researchers have been studying similar diseases (i.e. SARS and MERS) and certain technologies (such as mRNA-based vaccines). The development of

[22] http://www.newslettereuropean.eu/vaccines-geopolitical-implication-covid-19-crisis/ (accessed May 21st, 2021)

[23] https://www.bbc.com/news/health-55041371 (accessed May 21st, 2021)

[24] https://www.theguardian.com/commentisfree/2020/dec/26/ten-reasons-we-got-covid-19-vaccines-so-quickly-without-cutting-corners (accessed May 21st, 2021)

vaccines in record time was therefore also possible thanks to the knowledge acquired over years of research (Ball 2021).

Despite this astonishing result (mainly but not only in rich Western countries), there have been numerous differences in vaccination policies. The United States began administering the first doses of the covid-19 vaccine in late December 2020, while the European Union was a few weeks behind, also showing internal fragmentation. The vaccination gap between the United States and Europe has widened. In March 2021, Europe found itself hit by a third wave of infections and several countries had to introduce new restrictive measures (such as restrictions on travel, contacts and forms of lockdown). As reported by an NYT investigation, the American government (even before the handover with President Joe Biden's new administration) has decided to deal with the vaccination campaign considering it as an exceptional event, trying to get the first possible doses necessary to immunize one's population (not giving too much importance to the cost). The EU, on the other hand, has opted to purchase the acquisition of vaccines in the traditional way: by evaluating the effects on the budgets, leaving the determination of the price to the market [25]. In other words, while the EU commissioned the production of vaccines as a mere "customer", the United States directly participated in the funding of the research (contributing to the budget of the pharmaceutical companies). To understand the difference between the two situations, while the Trump administration had invested 10 billion in the vaccine development and campaign, the EU opted for an investment of just over 3 billion dollars. By the end of March 2021, the EU had managed to administer only about 10 percent of the doses in Europe. The United States, on the other hand, accounted for 23 percent and the United Kingdom (thanks to the new autonomy due to Brexit) had already vaccinated 39 percent of the population.

As the NYT investigation reads:

> Europe's first deal, with AstraZeneca, came in August, months after the United States. And while Europe negotiated as a powerful buyer, it lacked the wartime procurement powers that the Trump administration had used to secure raw materials for companies. That meant that the bloc was not first in line for the doses. The United States made the negotiations easy – its critics say far too easy – by signing away any right to intellectual property and absolving the drug

[25] https://www.nytimes.com/2021/03/20/world/europe/europe-vaccine-rollout-astrazeneca.html (accessed May 21st, 2021)

> companies of any liability if the vaccines disappointed. Washington paid for the development and the trials; the companies had essentially nothing to lose. Drugmakers expected the same concessions in Europe, but the back and forth over liability was the major stumbling block, Ms. Gallina said. European negotiators had to reconcile disparate liability laws across multiple countries, finding common ground among 27 leaders. '*In a crisis, it always becomes clear that the E.U. is not a country*,' said Jacob Kirkegaard, of the German Marshall Fund[26].

This has therefore created, in the whole EU, a scarcity of doses compared to the need for administration. Next, the different political choices of the individual states of the Union must then be added to the European scenario. In the Italian case, the affair has been complicated by a series of concomitant issues. First of all, the crisis of the Italian government which led, at the end of January 2021, to the resignation of Prime Minister Giuseppe Conte and the alternation with former ECB president Mario Draghi. Furthermore, it emerged that Italy had not elaborated a real national vaccination plan but had limited itself to the elaboration of some guidelines (due to the fact that Regions had to practically organize the campaign). Thus, again, the institutional structure of Italy has impacted policies. As already discussed, public health is something over which the State and the Regions are competing. Under normal conditions, the State is responsible for the general guidelines on which the individual Regions must organize themselves. However, each regional health service is structured differently. This has contributed to creating a different situation on the national territory, with some regions, net of the national supply, which have proved to be more virtuous in vaccinating citizens and others in great delay (without counting the differences in the categories to be vaccinated).

To all this we must then add another issue that has delayed the vaccination campaign. In early March 2021, some countries began to have some suspicions about possible adverse events following the administration of the AstraZeneca vaccine and to suspend its use as a precaution. The first country to stop AstraZeneca's vaccinations was Austria, on 7 March, after two adverse events (with one death). On March 16, the vaccine was suspended in whole or in part in another 15 countries of the European Union, including Italy, despite the fact that just two days earlier the Italian drug agency (AIFA) had officially spoken of

[26] https://www.nytimes.com/2021/03/20/world/europe/europe-vaccine-rollout-astrazeneca.html, emphasis added (accessed May 21st, 2021)

"unjustified alarm" and of "no causal link" among the cases of death that occurred after the administration of the AstraZeneca vaccine. This situation triggered both a political and public debate, which, in some cases, saw the rise of vaccine hesitation towards AstraZeneca (and therefore slowed down the campaign). Eventually, on March 18, EMA, during a press conference, stated that the AstraZeneca vaccine was "safe and effective", and that "the benefits continue to outweigh the risk of side effects"[27]. Right after the declaration of EMA, the European countries that had suspended the administration of AstraZeneca vaccines again responded in a non-uniform manner. While Germany, Spain, the Netherlands, and Italy immediately resumed vaccinations, France opted not to administer this vaccine to people under the age of 55, the age group most affected. Finally, Denmark and Finland preferred not to vaccinate with AstraZeneca.

6. Discussion: Uncertainty, pandemic, science and philosophy there and back again

6.1 COVID 19, data, expertise and public decisions

In light of the above, it seems to us that the issue at stake here is not just of administration and management. Rather, it invests a much more complex debate regarding how intricate political decisions on certain technical matters are taken and what powers a democratic state can exercise and in what ways. This is particularly crucial in those situations in which some fundamental rights appear in conflict with each other.

However, this is just the half of the story. Another crucial element to be considered concerns experts and their role. When there is an appeal to follow experts' recommendations, it is easy to forget that recommendations may vary because data can be incomplete, inaccurate, or simply subjected to different interpretations - *data do not speak for themselves*. In other words, there is a popular idea that scientific knowledge is stable, that scientists push forward facts in the form of data, and these can be unambiguously interpreted in one

[27] https://www.ema.europa.eu/en/news/covid-19-vaccine-astrazeneca-benefits-still-outweigh-risks-despite-possible-link-rare-blood-clots (accessed May 21st, 2021)

direction or another. However, the practice of science shows us otherwise[28] - science, especially cutting-edge science, is not stable at all. When this instability becomes apparent, the public and the politicians are lost. For instance, Francesco Boccia (a former minister in the Italian government) demanded 'clarity' from scientific experts, where 'clarity' means clear-cut, straightforward answers to questions about what to do when policies about COVID-19 are concerned[29]. However, demanding 'clarity' from on-going science denotes a misunderstanding of the practice of science itself.

Far from being a flaw, instability can be a characteristic of good science. Philosophers, historians and sociologists of science have tried to express this progressive feature of scientific practice in various ways. Among the many ways, Helen Longino (1990) conceptualized scientific knowledge not simply as the accumulation of individual contributions, but rather as "a process of critical emendation and modification" (p 68), and that objectivity of science is guaranteed not by the stability of its claims, but by what she calls *transformative criticism* (p 76). This concept is motivated by the idea that objectivity of science or of the scientific method (whatever we mean by this expression) cannot be identified by its empirical features alone. Because hypotheses are connected to evidence only *via* a host of background assumptions, it is important to critically evaluate also those background assumptions, which usually specify correct research strategies, ways of gathering and interpreting data, and other methodological criteria. Coming to an agreement in science means especially agreeing on these issues. Science permits transformative criticism the moment in when the scientific method is "understood as a collection of social, rather than individual, processes, so the issue is the extent to which a scientific community maintains critical dialogue" (p 76). Longino goes further and says that a scientific community is objective (and hence it allows transformative criticism) if there are recognized avenues for the criticism of evidence, methods, and assumptions; if there are shared standards allowing criticism; and if the community is responsive. If we accept Longino's conceptual analysis, then there will be different ways of interpreting data especially when the science about a particular issue is developing - there is no just one straight line from data to

[28] https://www.esquire.com/it/lifestyle/tecnologia/a31327343/coronavirus-scienza/ (accessed May 21st, 2021)

[29] https://www.huffingtonpost.it/entry/dagli-scienziati-pretendiamo-chiarezza_it_5e9547b4c5b6cc788eae43d2 (accessed May 21st, 2021).

scientific knowledge and eventually to policy. Therefore, the route to 'normal science' or to consensus is long, non-linear, and painful.

Instability is what characterizes the science of COVID-19, even at the time of this writing (December 2021) when we are facing uncertainty regarding the latest variant called *Omicron* (Callaway and Ledford 2021). While there are indeed examples of stable theories (such as climate science), Schliesser and Winsberg[30] made a very convincing case for why experts are likely to disagree on COVID-19. The case of climate science, they say, "is a hypothesis that is 100 years old, and it has been carefully studied, criticised, audited, and looked at by a host of different disciplines", in the case of coronavirus none of these conditions apply. At least at the time of the writing of the first draft of this article (May 2020), there were few peer-reviewed studies, and there had not been an attempt to integrate perspectives from different disciplines (e.g. epidemiology, medical genetics, virology, etc). But even now (December 2021), it seems that there are neither agreed standards of data gathering, nor data analysis. For instance, Sabina Leonelli[31] noticed that data is problematic because it has been generated by different countries by using very different criteria even for seemingly straightforward things such as death counts. This in turn makes it very difficult to use data generated from one country to do projections on another country. There are controversies also about the allegedly airborne nature of the virus itself, and how far the virus 'can move' via droplets or aerosols, and even on the nature of the distinction[32] - this has consequences on the on-going debate about the efficacy of wearing masks. Methodological concerns have been raised over the use of antibody tests, especially their reliability[33]. In order to increase both sensitivity (i.e. true positive rate) and specificity (i.e. true negative rate), antibody kits have to be thoroughly tested – which has not been the case so far to our knowledge. A varying rate of false positive or false negative can lead to quite substantial different policy recommendations (Douglas 2000). Finally, the most striking case of disagreement over the science of COVID-19 is

[30] https://www.newstatesman.com/politics/economy/2020/03/climate-coronavirus-science-experts-data-sceptics (accessed May 21st, 2021)

[31] https://www.mpiwg-berlin.mpg.de/video/history-science-call-sabina-leonelli (accessed May 21st, 2021)

[32] https://www.theatlantic.com/health/archive/2020/04/coronavirus-pandemic-airborne-go-outside-masks/609235/ (accessed May 21st, 2021)

[33] https://www.nature.com/articles/d41586-020-01095-0 (accessed May 21st, 2021)

probably the Swedish case. Unlike most European countries, Sweden did not impose any lockdown or social-distancing policies. This strategy has been described and explained by Anders Tegnell in an interview in the journal *Nature*[34]. An interesting thing that he says when asked about the evidence motivating the Swedish approach is that "[i]t is difficult to talk about the scientific basis of a strategy with these types of disease, because we do not know much about it and we are learning as we are doing, day by day". Another interesting point he makes concerns the role of asymptomatic carriers. Most European countries, including Italy, have been concerned that the youngest citizens may be asymptomatic carriers, and could involuntarily infect older people, who will show the harsher symptoms later, and possibly die. But Tegnell suggested that the evidence is not that overwhelming, and that the amount of spread caused by asymptomatic is fairly small if compared to the one caused by those who have symptom – "[i]n the normal distribution of a bell curve asymptomatics sit at the margin, whereas most of the curve is occupied by symptomatics, the ones that we really need to stop". Having this said, are all these disagreements a bad thing? Not necessarily - given that the phenomenon is new, and given different standards, reasonable grounds for disagreement is a sign that science is being careful in addressing the problem: this is really transformative criticism *at its best*.

Moreover, it is also essential to remember, in light of what we have pointed out, that there is no univocal and undisputed "method" not only for selecting the experts that should be considered a "priority", but also for deciding which experts could be suitable in a given context, and above all, no method to certify them, under all circumstances, as competent (on this, see among the others Kitcher 2001, 2011). Indeed, in the public debate, in general but especially in this case in Italy, experts from various disciplines (virologists, biologists, infectious disease specialists, etc.) were invited to publicly express themselves, almost exclusively by virtue of their qualifications, without taking into account other factors (e.g. previous experience on epidemics, ability to communicate to the public, attention to the social and political dimension of science etc.). Furthermore, perhaps even more seriously, none of these experts were asked to either consider or ponder the views of other experts of different areas of knowledge, thus

[34] https://www.nature.com/articles/d41586-020-01098-x (accessed May 21st, 2021)

conveying the idea that the complexity of the problem in question could be solved by a simple 'competition of skills'. This promoted a stereotyped version of cultural Darwinism, in which the optimal solution to pandemics would have been 'selected' from the struggle between 'different types of knowledge'. Finally, the experts, in their public dimension, have often been presented as 'heralds of knowledge', 'announcers of truth' (thus keeping silent on the functioning processes of scientific discovery) often depersonalized, through the representation of their statements by means of the phrase 'Science says x'. Thus, if on the one hand the public image of scientific research has been reduced to the stereotyped representation of an unscratchable and homogeneous stone cube, in contrast, the real scientific debate, with all its intrinsic uncertainties, has not stopped and its disputes have had a direct effect on politics.

But then, given uncertainty, what should politicians do?

6.2 Values and Decisions

It is easy, retrospectively, to blame the Italian government for not imposing a total lockdown since the first case in Codogno, if not even from the case of the Chinese couple in Rome. Now that, within the Italian case, science has come close to an agreement, it is easy to point fingers. However, the Italian government did not have at its disposal such an agreement. The same story can be said concerning other specific evaluations, when novelties came into play throughout the other phases of the pandemic. Indeed, we have shown how a similar situation actually happened regarding vaccination policies. Furthermore, it was also recognized by a subsequent, rather accurate analysis, that Italy's initial reaction was quite effective in responding to the first health emergency but that it was subsequently more deficient in terms of containment and mitigation policies and rather poor in promoting active civic participation (Sanfelici 2020).

When such decisions are at stake, it is also very simplistic to say that governments and policy makers should just "listen to science". First, because, as we showed, science itself was not easy to be listened to. And second because it is not always the case that science and society go in parallel. As Sheila Jasanoff puts it:

> Modern science is a clutch of complex institutions and practices, carrying tendencies that do not always converge with the aims of democracy. Accordingly, simply throwing more money at science, or even listening to

> the best-qualified scientists for policy advice, may not ensure that research and development are conducted for the public good. Care must be taken to avoid the tunnel vision that frequently accompanies expertise"(Jasanoff 2009).

Moreover, politicians, given the initial epistemic uncertainty, acted on the basis of a judgement call, and they could not do otherwise - they ended up being wrong, but it was not possible to correctly predict what was going to happen back in February 2020.

Considering the complex relationship between the political dimension (also in its practical action) and scientific and clinical research, it is therefore legitimate to ask whether there could be metatheoretical categories that can help to understand this scenario. Epistemology has dealt precisely with this question by proposing various models. Famously, Thomas Kuhn's notion of "paradigm shift" related to his account of "normal science" is often cited as a tool to deal with periods of transformation in research (Kuhn 1962). According to Funtowicz and Ravetz (1993), the notion of normal science is mainly applicable as long as the levels of uncertainty are limited and the extra-epistemic relapses are easily traceable and circumscribable. In this situation, the paradigm of normal science acts as a "unifying tool" for the phenomena under study, taking advantage of the presence of consolidated standards about experimentation and encompassing the underlying "truths" of the theoretical context. To this must be added that normal science relies on a substantial agreement on the reproducibility criteria and on the general consensus (theoretical and methodological) relating to them. However, this is definitely not the case of the current pandemic. In a situation such as that constituted by Covid-19, in which the levels of epistemic uncertainty are high[35] and there are enormous direct repercussions on other contexts (such as the economy), the scientific paradigm of the normal phase risks being not only limiting (and limited) but also distorting. In fact, it would find itself reducing any supposed "violation" of the paradigm, such as knowledge or perspectives coming from experts in other sectors or from ordinary citizens, as something inadmissible in principle. This form of reduction could generate not only misunderstandings but also prevent an adequate reconstruction of the state of the art and prevent a virtuous exchange of knowledge.

[35] https://facta.news/storie/2021/12/09/dietrofront-quando-la-scienza-sulla-pandemia-ha-cambiato-idea/ (accessed December 9th, 2021)

To this approach, Funtowicz and Ravetz (1993) contrast what they call "post normal science" (PNS), thought to be more appropriate in those situations where both the uncertainty about the data, the methods and the contrast between values are higher and the general panorama (both on an epistemic and social level) is fragmented. Precisely for this reason, a group of authors (including Funtowicz and Ravetz) has suggested, a few weeks after the outbreak of the pandemic (25 March 2020), the urgency of adopting an approach based on the PNS (pluralist, anti-epistocratic and anti-technocratic) to deal with the pandemic[36].

Even if we just want to remain within the so-called "scientific community" (which, as in the case of a pandemic, still comprises experts with similar but in any case different backgrounds), it is useful to note that in this scenario also the assessments of competent people and experts are not fully reducible to the application of standardized and strictly controlled procedures.

Because of that, we think that the concept of 'inductive risk' introduced by philosophers of science (Hempel 1965; Douglas 2009; Elliot and Richards 2017) can be helpful to explain the difficulties that the Italian government has faced.

Inductive risk' is the idea that scientific hypotheses are evaluated on the basis of incomplete evidence, and anytime we accept/reject hypotheses we do this by accepting a risk that future evidence may prove our decisions wrong. Richard Rudner eloquently said that, "[i]n accepting a hypothesis the scientist must make the decision that the evidence is sufficiently strong or that the probability is sufficiently high to warrant the acceptance of the hypothesis" (1953, p 2). However, how do we establish if the evidence is 'strong enough'? Deciding this, the argument continues, is "a function of the importance, in the typically ethical sense, of making a mistake in accepting or rejecting a hypothesis" (p 2). Therefore, in determining if evidence is strong enough, we resort to the importance of making a mistake - and whether something is important is sometimes decided by appealing to value-laden considerations. Similarly, Hempel (1965) wrote that in certain cases hypothesis acceptance/rejection requires value judgement (p 92) because of the severity of the consequences of embracing a hypothesis which can turn out to be a false positive, or rejecting a hypothesis that can turn out to be a false negative. Douglas' seminal article and

[36] https://steps-centre.org/blog/postnormal-pandemics-why-covid-19-requires-a-new-approach-to-science/ (accessed November 3rd, 2021)

book (2000; 2009) articulated in great detail this problem. For instance, she considers the case of setting the statistical significance levels for a study aimed at establishing the effects of an air pollutant. Once data has been gathered, one has to establish if the evidence is enough to support the hypothesis 'the air pollutant is toxic'. If we accept the hypothesis, there will be regulatory costs, which would be unnecessary if the result were a false positive. False negatives, on the other hand, could have serious negative effects on the health of individuals. Weighing, which is influenced by ethical and social values, must occur because of "[t]he social and ethical costs of the alarm and regulation on the one hand, and the human health damage and resulting effects on society on the other" (Douglas 2009, p 105). Therefore, the point is that values are not evidence and they should not determine whether a hypothesis has to be accepted or rejected. Recently, on this point, Henschen (2021) argued that the theoretical reconstruction might be even more complicated. Indeed, he first recalled that scientists' main task should be assigning probabilities (to the hypotheses) and not to accept or reject them. Secondly, there could be a mismatch between scientists' decisions concerning their beliefs (and their reasons why) and decisions concerning the approaches in the practice. Moreover, sometimes decisions can be somehow "forced" by contingency (e.g. a state of emergency), which implies that values, despite being present, are not necessarily fully explicit to the scientists.

However, we believe it is fair to say that social and political values can indirectly adjust the amount of evidence one requires in order to accept or reject the hypothesis itself. Biddle and Kukla (2017) elaborate a more general version of inductive risk which they call 'phronetic risk', defined as a subset of epistemic risk "insofar as there are risks that need to be managed and balanced in light of values and interests" (p 220). Inductive/phronetic risk squarely characterizes the practice of science. Yet, considerations dictated by inductive/phronetic risk rarely emerge at the policy level in the clear and transparent way that they should, and politicians had to deal with conflicting suggestions about what to do, under the typical simplistic linear view that science is authoritative for policy. Seen from this point of view, politicians inherited the grave magnitude of inductive/phronetic risks of the practice of science still in the context of discovery rather than its mature phase, while at the same time being distressed by their own phronetic risks.

Nevertheless, while the inductive/phronetic risk of science is somehow clear, what was exactly the inductive/phronetic risk of Giuseppe Conte and the Italian

government? In order to show this more effectively, it is better to recall what uncertainties they were facing. First, there was the uncertainty whether to accept or reject alarmist hypotheses about COVID-19 in Italy. The uncertainty derived from the problems outlined above about the heterogeneity of data sets, methodological norms dictating the way they were accumulated and interpreted, etc. This has created a sharp divide between experts initially undermining the problem such as Burioni, and much more alarmists such as Burgio. In addition to the initial mixed recommendations, uncertainty derived from the evolution of those recommendations, which had changed substantially in a short period of time. But the most important uncertainties were about the social and economic dimension of what was proposed to do.There were the social consequences of accepting one scenario or another (e.g. pandemics) and acting accordingly (e.g. immediate lockdown). An immediate lockdown meant putting at great risk the Italian economy, given the importance of Lombardy from this point of view. Sacrificing the economy does not mean merely sacrificing businesses and jobs, but it does mean also *putting at great risk also the health of citizens in the long-term future* - the disaster happened in Greece is a case in point (Vos et al. 2016, Tyrovolas et al. 2018). And if coronavirus turned out to be only a 'flu', then this would have been for nothing. Therefore, when one considers 'economic cost' it is not necessarily being 'greedy'. In addition to the economic costs, the long-term future health costs, there would have been also political costs for the two main parties in charge, the MS5 (Five Stars Movement) and the PD (Democratic Party). Moreover, deciding to do the opposite comes with the great immediate risk to the health of citizens - if then coronavirus turned out to be a pandemic as it was in China, then the immediate harm caused to the health of Italian citizens would have been incommensurable.

How unsettling such lines of reasoning are to the Italian government can be hardly overestimated. However, the important thing to point out is that there was simply no objective fact of the matter about how to choose, at the beginning, between the two scenarios of immediate and gradual lockdown - value-laden considerations were unavoidable, and Giuseppe Conte's government made a judgement call.

7. Conclusions

In this essay we have tried to provide what seems to us to be a more appropriate context in which to read the criticisms made of some political decisions, with a

special focus on the Italian case, concerning COVID-19 policies. In doing this, we do not want to produce an uncritical defense of certain decisions or ignore the mistakes that have been made. Furthermore, our goal is not to propose a particular philosophical framework nor to provide an explanatory and exhaustive model for what happened. Our goal was concentrated on a description (almost in a phenomenological sense) of the events that saw the world face the threat of the pandemic. Subsequently, through a revision of some important themes of the philosophy of science and epistemology, we tried to "read" those same events in a critical way, in order to offer the reader a less naive perspective on these events. In this sense, we think that what has happened, especially in relation to the Italian case, can really offer lessons for the future.

Thus, our intent is to make clear that these problems, in their complexity, must certainly include business administration (as suggested by the article appeared on the HBR) but cannot be reduced to it or any other disciplines. Indeed, the simple appeal to sciences (both hard and social ones) *per se* cannot be a panacea. Otherwise those disciplines, such as social sciences or medicine, which in their constitution were born as "anti-reductionists" become reductionist.

In other words, we would like to point out that technical aspects are a necessary but not sufficient condition of a problem which is complex and political. Net of the health and scientific situation, this situation we are all facing is definitely and crucially a political one - in other words, non-epistemic considerations play an important role.

Therefore, if it is absolutely important that any shortcomings in making decisions (and what they are) should be noted and made explicit, we believe, however, that a political and complex problem cannot be solved only resting on "technical solutions". In doing this, we wanted to provide a picture of the complexity of the issue here by placing the emphasis on at least 3 factors that should make it necessary to give up political solutions as a simple implementation of technical considerations.

First of all, we have shown how the constitutional setting of a country is an essential aspect for understanding the modalities of action of the government of that country. These specificities are also crucial because they reflect a type of political culture and an idea of democracy that cannot and must not be leveled on too general and abstract ideals concerning the nature of democracy. This, in turn, shows that scientific policies cannot be transposed from one context to another without taking into account a pre-existing political structure.

Second, we have stressed that making decisions, especially when science is at stake (with its practical and social consequences) is not a linear operation but involves different levels of complexity and interaction. In particular, we have shown how transforming experts' recommendations into political actions is not a simple "translation" job but involves many steps that are also based on evaluations (often requiring other forms of expertise) and intermediate decisions.

Finally, we tried to show how decisions, which also concern purely technical issues, are always "value laden". In other words, it is not easy (if not impossible) to discriminate between the factual aspects from the value aspects. To put it differently, even the choice of "being purely technical" is also a value laden choice and not a technical one. With all the consequences that this entails.

In making decisions, this dimension appears crucial and cannot be reduced simply to the presence of common cognitive bias or to errors of assessment that can be explained by the lack of competence.

Finally, as reported in our analysis, Italy has unfortunately been a "privileged" political and epistemic laboratory allowing us to observe these phenomena in a more articulated way. Let us hope these lessons were not in vain.

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