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The europe second wave of COVID-19 infection and the Italy "strange" situation

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ABSTRACT

At the end of February 2020 COVID-19 infection appeared in Italy, with consequent diffusion, in few weeks, in almost all the Europe. Despite that human-to-human is the recognized main virus transmission way, several authors supposed pollution-to-human mechanisms to justify the appearance of contagious in Italy. However, these works often suffered of a lack of analysis of possible overlapping of different variables, other than only environmental ones.

After a decreasing of detected cases in summer, Europe faced with the appearance of a COVID-19 second wave. In this context the Italy situation appeared to be "strange". Indeed, compared with the other selected Countries (France, Germany, UK, and Spain), the Italian infection cases resulted to be lower, in the same analysed period. This work is devoted to find a possible justification of the unexpected situation found in Italy. A comparison of the imposed restrictions in the considered Countries allows to highlight that some policies result more effective to limit the virus spread. This clearly shows that the imposed constraints and the people capacities to receipt them are fundamental parameters that must be always accounted in the determination of the virus expansion. The lesson provided by Italy should be achieved by other member states where the COVID-19 sanitary crisis results to be worse. It is evident that the re-opening of ordinary activities involving people interactions, in Autumn, may contribute to promote a larger SARS-CoV-2 diffusion also in Italy.

Author strongly highlights that pollution-to-human transmission mechanisms cannot be proposed whiteout considering the complexity of human-to-human interactions, that can be modified by imposed restrictions. It is fundamental to understand that a more precise acknowledge of the variables that should be considered in model predictions, instead of a need of more precise point prediction, will contribute to increase the reliability and the comprehension of the virus diffusion mechanisms, that is fundamental to face this pandemic period.

Author contribution

This paper was conceived and written by only one author.

1. Introduction

The new coronavirus (SARS-CoV-2 or COVID-19) outbreak appeared in Wuhan, China in December 2019 and rapidly was spread in Europe (EU). Italy was the first EU Country to suffer severe effects of this virus diffusion (Remuzzi et al., 2020), with a spiral of infections that placed this Country at the top of the international rankings, overtaking China on March 19, 2020.

It was shown by several authors that airborne transmission represents the dominant route for the spread of this disease (Zhang et al., 2020) (Morawska et al., 2020), the main human-to-human diffusion mechanism (Bontempi, 2020a). In particular, recent studies have also shown that in addition to droplets, generated by infected people, COVID-19 may also be transmitted through submicron aerosols (Prather et al., 2020). Due to their small size, aerosols can penetrate more deeply into the lungs, with the consequence to lead high severity of COVID-19 disease (Buonanno et al., 2020).

However, the lack of a clear definition of the COVID-19 possibilities to be transported by the air (a range of factors must be still analysed, such as viral load emitted as a function of droplet size before, during, and after infection; viability of the virus indoors and outdoors; mechanisms of transmission; airborne concentrations; and spatial patterns) (Prather et al., 2020) has caused some discussions and different opinions, about virus transmission ways (Bontempi, 2020a). For example, despite the limited experimental evidences (Bontempi, 2020b), the unexpected spread of virus localized in Northern Italy alimented the idea

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that air pollution may not only had a role in the increase of disease severity (Conticini et al., 2020), but also as a carrier of the virus diffusion (Frontera et al., 2020), the so called pollution-to-human transmission mechanism. In particular, as it can be found in a freely available database (https://ourworldindata.org), Italy suffers of a higher share of deaths due to ozone and particulate matter (16.9 deaths for 100,000 in 2017) in comparison for example to Spain (14.4 deaths for 100,000 in 2017) and France (11.9 deaths for 100,000 in 2017). In this frame, several possible environmental stressors have been identified, that would be at the origin of the infection of a large number of individuals in a population deprived of immunity (Bakadia et al., 2020), with the possibility that environmental pollution contributes to increasing the likelihood that people will contract viral diseases (Engin et al., 2021).

Then, several researchers hypothesized that the level or air pollution may be correlated with the virus spread. In particular, in addition to the possibility that the viruses can attach to dust and airborne air particulate (Prather et al., 2020), some works propose that ground level of ozone can acts as a COVID-19 virus incubator considering infection cases found in Italy in March and April 2020 (Fattorini et al., 2020) (Zoran et al., 2020). A possible role of sulfur dioxide and biomass smoke in the virus spread (Domingo et al., 2020) is also proposed.

Finally, some papers propose a relationship between COVID-19 diffusion and levels of NO_x (Zhu et al., 2020) (Travaglio et al., 2020), due to the demonstrated correlation between chronic exposure to air pollution and both respiratory and cardiovascular toxicity, that may exacerbate the respiratory syndrome due to SARS-CoV-2 (Domingo et al., 2020b).

However, several of these works may produce the result to attribute a lower importance of airborne transmission via respiratory droplets (human-to-human diffusion mechanism), that must not be confused with the possible role of air particulate matter (PM), in establishment of mitigation measures by policymakers.

Nevertheless, during the first COVID-19 wave, in EU Countries the differences in the stage of infections and the late detection of first cases, the diverse applied strategies, such as the implementation of various lockdown restrictions, the socio-demographic and socio-economic local characteristics, the different levels of air pollution and meteorological factors, may had contributed to deduce some contrasting finding (Copat et al., 2020). For example, it is well reported (Silibello et al., 2008) (and the data about ozone concentration in this area, confirm this) (Keller et al., 2020) that in Lombardy ground level of O_3 is higher in summer than in the other seasons; moreover the infection cases detected during summer 2020, in Lombardy, where lower than those found in March and April 2020.

It was recently shown that Italy, one of the largest and most populous Countries in Europe, with the eighth largest economy in the world (Berardi et al., 2020 in press), it is also very active in commercial exchanges, making the Country susceptible to import the virus (Bontempi et al., 2020) in the most active areas. In accord with this finding, it was also recently reported that the spread of virus in Italy can be also correlated to the people mobility (Carteni et al., 2020). Finally, a very recent work (Sannigrahi et al., 2020) has demonstrated the importance of socio-demographic characteristics in determining the spread of COVID-19 first wave in EU.

Starting from the end of July 2020 a potential second wave of infections seemed to appear in EU, with different severity in different areas. Indeed, after a decrease during summer, the number of patients with the disease increased again, suggesting the origin of a second wave of outbreaks of infectious diseases.

This was attributed to the fact that after the lockdown, that was made in several EU Countries, measures have been lifted across EU, during summer. For example, the free movement and tourism was relaunched, with the EU Commission recommendation to lift travel restrictions for Countries agreed by member states.

At the end of September, the second sanitary crisis seems to be less severe in comparison to the first one, considering the death evaluated in comparison to the reported infection cases. However, differences in the virus spread at the starting of second wave are evident in different EU Countries, opening the question if it would be possible to consider policy alternatives, different solutions, or good example developed by some Countries, for a replication, with the target to avoid other lockdown.

For this aim, researchers across different disciplines are working to deal with this pandemic by developing mathematical approach to simulate possible scenario.

Several mathematical models have been proposed to try to understand the COVID-19 dynamics of epidemics (Bjørnstad et al., 2020; Liu et al., 2020a; Cacciapaglia et al., 2020), providing policymakers crucial epidemiological information.

Some approaches have been also proposed to model COVID-19 spread (Cooper et al., 2020), but with attention to restrictions efficacy, taking into account interactions within society or specific relaxations measures (Prem et al., 2020; Giordano et al., 2020). However, even though detailed models are proposed, it was always recognized by the authors the difficulty to estimate the impact of specific restrictions, since many assumptions need to be made. Indeed, several of the proposed models are based on incomplete data, some of the influencing variables may be missing, and the uncertainty about the relationship between cause and effect are too many. For example, a study proposing a comparison between Italy and Guangdong province in China (Liu et al., 2020b), with the aim to model the first outbreak peak, based on the reported infection cases, concluded that the Italy restriction measures were insufficient. However, this comparison didn't account the better Chinese capability to trace also asymptomatic, during the first wave, with a consequent underestimation of the Italian outbreak, making the comparison not affordable. Another example concerns a very recently publish paper reporting a methodology with a forecasting model that suggested the possibility of a spike or second wave of infections originating from Italy (Cooper et al., 2020). Finally, a very recent paper determined a fundamental contribution in EU resurgence only to Germany, France, Italy, and Poland (Ruktanonchai et al., 2020).

Moreover, many EU Countries including France, UK, and Spain are recording at the end of September (when this article has been written) high infection case numbers, comparable to those detected in April and May. On the contrary Italy's infection cases are (at the end of September 2020) lower than those reported in several other Countries. This was unpredictable and seems to be in contrast with several reported papers, that attributed the high severity of the pandemic first wave in this Country to pollution.

Due the novelty of the SARS-CoV-2 virus, it is evident that the proposed models must change, evolve, and be adaptative. This can be obtained by the continuous increasing of the available data, the identification of missing variables and the mitigation scenario, and the raising of the knowledge about the connections between human behavior and the virus transmission.

In this work I examined the measures taken in the main EU Countries facing with the contagious second wave (France, Spain, UK, Italy, and Germany). In particular, it is important to highlight that Italy was the first Country were COVID-19 started to spread in EU (in February), and one of the most severely affected member states, with France, Spain, and UK. On the contrary, Germany was one of less affected member states during the first wave. Moreover, at the end of September 2020 the German and Italian situations, considering the detected infection cases, appear to be comparable, even if Germany is now (at the end of September 2020) recording till to 2500 infections per days (Italy reach as a maximum about 1900 cases). The aim of this work is to show an analysis of the restrictions imposed in the selected Countries and the corresponding trend of COVID-19 diseases. The results can be interpreted on the basis of modified human-to-human interactions, that produce different outcomes in the analysed Countries. This work is original and novel, due to the additional contribution it proposes in the analysis of the human-to-human interactions, that must be accounted considering a second wave, to better understand and probably model the virus spread. Indeed, despite that socio-demographic factors have been recently proposed to be the main factors determining the virus spread in Europe during the first wave (Sannigrahi et al., 2020), a possible modification of the humans interactions due to the difference in the social acceptance of restrictions, that may had promoted a difference in the COVID-19 resurgence in the second wave, was not considered before. On the basis of the proposed results the author strongly highlights that pollution-to-human transmission mechanisms cannot be proposed whiteout considering the complexity of human-to-human interactions, that can be modified (also several times) by imposed restrictions, and the diversity in reception of new constrains by population (urban resilience). It is fundamental to understand that a more precise acknowledge of the variables that should be considered in model predictions, instead of a need of more precise point prediction, will contribute to increase the reliability and the comprehension of the virus diffusion mechanisms, that is fundamental to face this pandemic period.

1.1. Data source

This paper analyses data about reported infection cases, the restriction measures introduced to limit the virus spread, and the survey results about imposed norms application. Data refer to Italy, Germany, France, Spain, and UK.

Data about COVID-19 detected infections cases, occurred Europe were downloaded from the "European Centre for Disease Prevention and Control" (ECDC) webpage (https://www.ecdc.europa.eu/en). ECDC is an EU agency aimed at strengthening Europe's defences against infectious diseases. Data were updated at September 27, 2020.

Data about Countries response measures to COVID-19 were downloaded by ECDC website, https://www.ecdc.europa.eu/. They are based on response measures available from official public sources. Data were updated at September 17, 2020.

Data about COVID-19 responses from governments were provided by the Oxford COVID-19 Government Response Tracker (OxCGRT), that has published a cross-national and -temporal measure index (the Governments response index), to systematically show the government responses and their evolution over the full considered period. Data are available on the "Our World in Data" website, by "Creative Commons" contribution (https://ourworldindata.org). The specific policy and response categories are the following: School closures, Workplace closures, Cancel public events, Restrictions on gatherings, Close public transport, Public information campaigns, Stay at home, Restrictions on internal movement, International travel controls, Testing policy, and Contract tracing. This obtained composite index (Governments response index) is an additive score of the selected indicators, rescaled to vary from 0 to 100. A value of 100 represents the strictest response level. This index was introduced for comparative purposes, then it is suitable to compare the applied policies about COVID-19 in different EU Countries.

Data about the survey of people wearing the facemask in public spaces were downloaded by the "YouGov" website (https://yougov.co.uk/). YouGov is an international research data and analytics group headquartered in London.

Data about the number of deaths attributed to outdoor ozone and particulate matter pollution per 100,000 (the last available data are for 2017) are downloaded by "Our World in Data" website, by "Creative Commons" contribution (https://ourworldindata.org).

2. Results and discussion

Fig. 1 reports the number of positive COVID-19 cases detected in some EU Countries starting from the end of February 2020 (the first wave of outbreak), till to September 27, 2020.

All considered Countries (except Germany) applied strict lockdown policies with good results (obtained at different times) in virus control.

Fig. 1 data, recorded during 7 months, shows a minimum that seems to be comparable for all Countries (from June to July), and a subsequent evidence of a second wave, starting about from mid-July, that is more clear for Spain and France, but that highlights an increase of infections cases in all the investigated Counties. At 25th September the detected infection cases were 1786 for Italy and 2153 for Germany, with a comparable increase curve in the last investigated period. On the contrary, on the same day, Spain and France showed more than 12000 cases, and UK 6634.

These data allow to highlight the strange Italian situation: Italy was the first Country in EU that faced the COVID-19 sanitary crisis. In few weeks the virus had rapidly spread in other Countries, such as France, Spain, and UK. Germany better managed the crisis, reaching a limited number of infection cases.

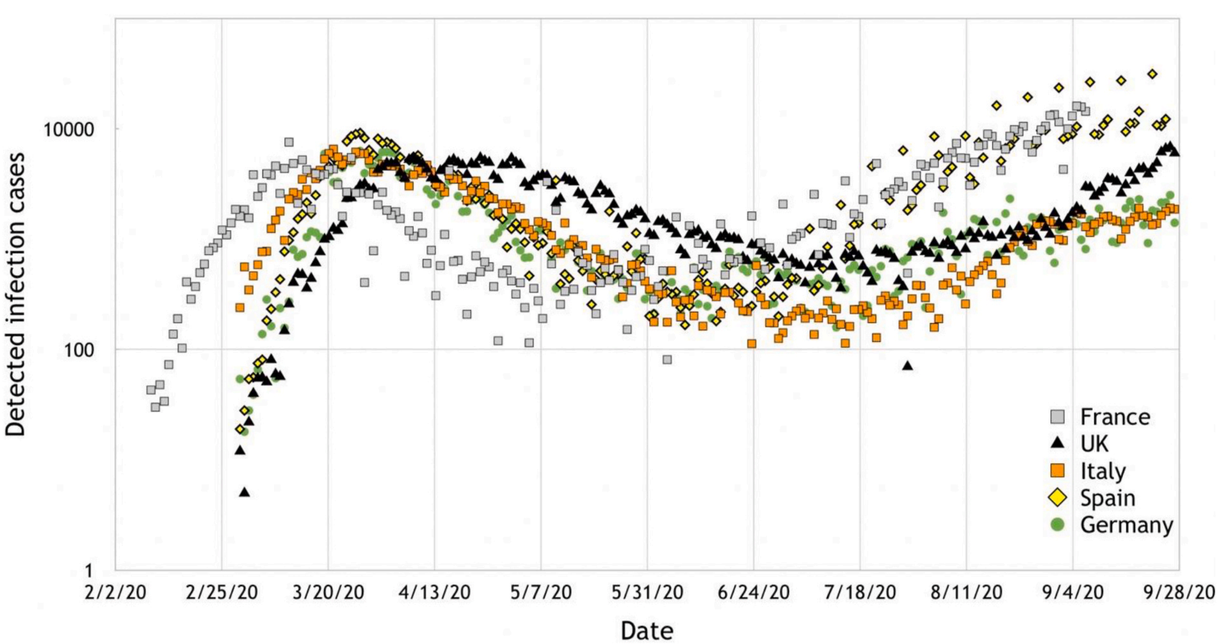

Fig. 1. Detected COVID-19 infection cases in France, UK, Italy, Spain, and Germany, till to September 27, 2020. Data were downloaded from European Centre for Disease Prevention and Control webpage (https://www.ecdc.europa.eu/en). The scale is logarithmic.

Despite these original differences, at the end of September 2020, Italy and Germany seem to be the only Countries that haven't reach a number of infection cases comparable to those obtained in April.

During the first COVID-19 wave, the member states have substantially varied the measures that they have adopted and how quickly they have adopted them. Then, due to the difference in the COVID-19 expansion, when the second wave was approaching, governments were looking to find the most suitable responses to limit the virus spread, with the aim to avoid the complete lockdown, that it expected to pose additional serious economic problems to all EU area.

A key challenge of the works aimed to understand the virus transmission dynamics is that some adopted restrictions are often entangled with each other, and can interfere with other processes, making the individual impact of each measure extremely hard to estimate. A proposed approach to take into account the complexity of these dynamics is to compare multiple Countries, that responded differently (also considering different times), trying to take into account differences in their social and economic characteristics (Metcalf et al., 2020).

The Oxford COVID-19 Government Response Tracker (OxCGRT) has published a cross-national and -temporal measure index, to systematically show the government responses and their evolution over the full considered period. This Government Response index is based on nine response indicators, considering all the proposed restrictions (see the "Data source" section).

As expected, it shows significant variations, in different Countries, in the measures that governments adopted to limit the COVID-19 spread. Differential responses were made also across the entire period by the same government. However, it may be interesting to investigate the value of the proposed Government Response index just before the start of second virus wave.

Fig. 2 reports the Government Response index on June 30, 2020 (about 2 weeks before the evident start of the increase of infection cases in Spain, due to the second wave). It can be included among 0 and 100. A value of 100 represents the strictest response level.

From Fig. 2 it results that, on 30th June, Italy showed an index of 55, Germany 63, France 41, Spain 39, and UK 71. Spain resulted to apply the less stringent measures in comparison to the other Countries, that may justify the gradual increase of infection cases, starting from mid of July in this state.

However, the Government Response index, reported in Fig. 2 cannot completely justify the increase of cases detected mainly in UK, that seems to show the more stringent index among all the considered states. The UK Government Response index gradually decreased over the time from 71 (on 30th June) to reach the value of 64 on 21th September, that still was the highest in comparison to all other considered Countries. This strongly suggests that, despite the application of a high number of restrictions, some measures may result to be more effective in comparison to others, and/or that the acceptance of these restriction by population can be different, affecting the Country resilience to pandemic.

Table 1 reports the response measures that were provided by single Country, at national level, with the exact introduction and end dates. The NA code means that end date is extended after 17th September, the data corresponding to the last update (see the "Data source" section).

Among the adopted measures, restrictions concerning schools were not reported, because the global reopening occurred in August–September, when the outbreak curves had already start to growth. In particular, schools were reopened in August in Germany and in September in UK, Spain, France, and Italy.

Table 1 suggests that the main differences concern the facemask and teleworking approaches provided by the selected Countries.

Teleworking was established as a measure to limit the COVID-19 spread about at the same time for the considered states. However, this measure has been relaxed in April by Spain, and in May by UK and France. In France, for example, universities were reopened, but with the evidence that attention was not paid to keep physical distances, in many places (https://www.voanews.com/covid-19-pandemic/virus-clusters-french-universities-give-europe-lesson). This can be obtained by promoting the participation to university lessons of only a limited number of students in class and providing the possibility to other students to follow lessons at home, as currently happens in Italy.

On the contrary, teleworking is still applied in Italy.

A recent published work has shown that travel restrictions, at the early stage of an outbreak, are particularly useful to limit the spread of the outbreak (Kraemer et al., 2020), on the basis of the principle to

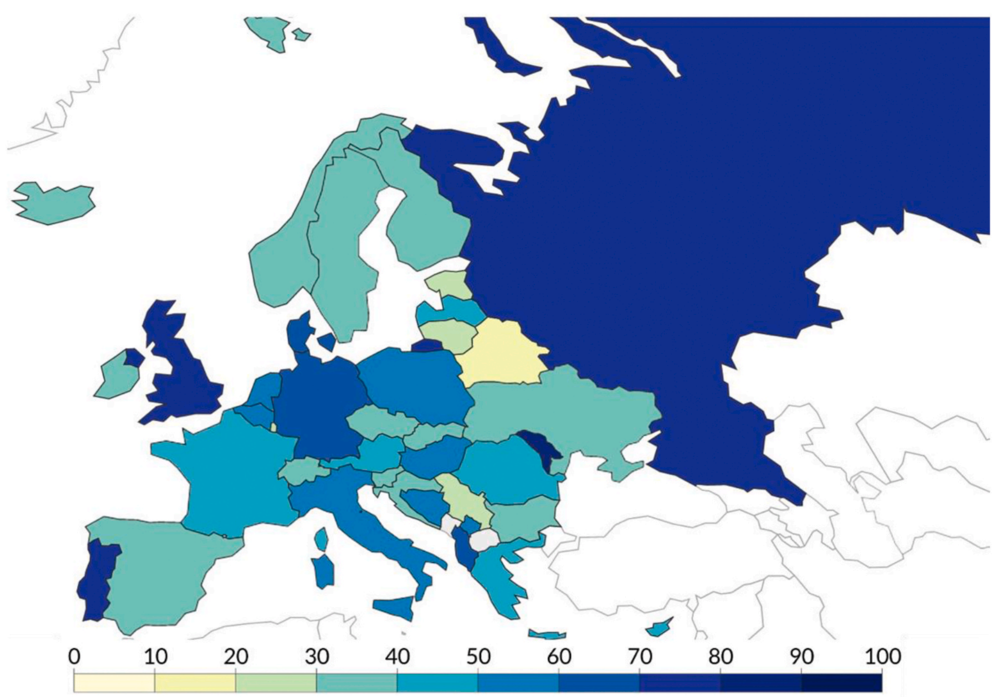

Fig. 2. The Government Response index for EU on June 30, 2020, with the legend. It can be included among 0 and 100. A value of 100 represents the strictest response level. Data are available on the Our World in Data website, by Creative Commons contribution (https://ourworldindata.org).

Table 1
The response measures that were provided by single Country, at national level, with the exact introduction and end dates. The NA code means that end date is extended after 17th September, the data corresponding to the last update. Data were downloaded by ECDC website, https://www.ecdc.europa.eu/. Legend: * In Italy, this measure was partially relaxed from 15th July to 15th August, 2020, ** For Germany, this measure corresponds for a Stay-at-home recommendation for the general population (which are voluntary or not enforced). Lockdown = Stay-at-home orders for the general population. Lockdown partially relaxed =Stay-at-home orders for the general population - partially relaxed measure. MasksVoluntary = Protective mask use in public spaces/transport on voluntary basis (general recommendation not enforced). MasksMandatory = Protective mask use in public spaces/transport on mandatory basis (enforced by law). Teleworking = Teleworking recommendation or workplace closures. Teleworking Partially relaxed= Teleworking recommendation or workplace closures – partially relaxed measure.

Country	Lockdown		Lockdown partially relaxed		MasksVoluntary		MasksMandatory		Teleworking		Teleworking partially relaxed	
	Start date	End date	Start date	End date	Start date	End date	Start date	End date	Start date	End date	Start date	End date
France	March 17, 2020	May 11, 2020	May 12, 2020	June 02, 2020	May 11, 2020	May 17, 2020	May 18, 2020	NA	March 17, 2020	May 10, 2020	May 11, 2020	NA
United Kingdom (UK)	March 24, 2020	May 09, 2020	May 10, 2020	July 04, 2020	June 09, 2020	July 26, 2020	July 27, 2020	NA	March 16, 2020	May 09, 2020	May 10, 2020	NA
Spain	March 14, 2020	May 03, 2020	May 04, 2020	May 11, 2020	March 13, 2020	May 03, 2020	May 04, 2020	NA	March 09, 2020	April 12, 2020	April 13, 2020	NA
Italy	March 10, 2020	May 04, 2020					April 14, 2020	NA*	March 12, 2020	NA		
Germany	March 17, 2020 **	May 05, 2020 **	May 06, 2020 **	June 29, 2020 **	April 02, 2020	April 26, 2020	April 27, 2020	NA				

reduce human mobility. In this frame, it is evident that teleworking allows to reduce people mobility, in accord with the need of the reduction of social interactions. Then, it is very interesting to conclude that this measure seems to be one of the most effective in reducing COVID-19 spread. The possibility of continuously performing economic activities, even if remotely, provides a specific way to increase urban resilience, also in view of the economic performances. This result is critical for all the governments globally, because it highlights that premature relaxation of some interventions must be avoided.

Concerning Germany, teleworking rules have been established with other Countries only regarding frontiers workers. However, this Country had a limited number of infection cases, during the COVID-19 first wave, then strong measures to limit the virus spread were considered not necessary.

Concerning facemask, it is important to clarify that, despite that mask is now mandatory in all the considered member states, for public transports, some differences exist in the application of this rule for other public area: in Germany, Spain, and Italy, it is obligatory to wear masks inside shops. In the UK and France this measure is not compulsive.

A recent modelling paper has reported that when lockdown periods are implemented in combination with 100% facemask use, the virus spread can be reduced, with the possibility to limit the risk of the occurrence of further waves (Stutt et al., 2020). Then, despite that it is extremely hard to really quantify the advantage that can be obtained by considering the application of this measure, face covering remains a fundamental pillar for virus fight.

Another clear difference in the COVID-19 managing measures can be noted in the dates when the facemask wearing was established as compulsory (see Table 1). Spain and France imposed the mask use in May 2020, after the COVID-19 explosion in EU. UK established this rule

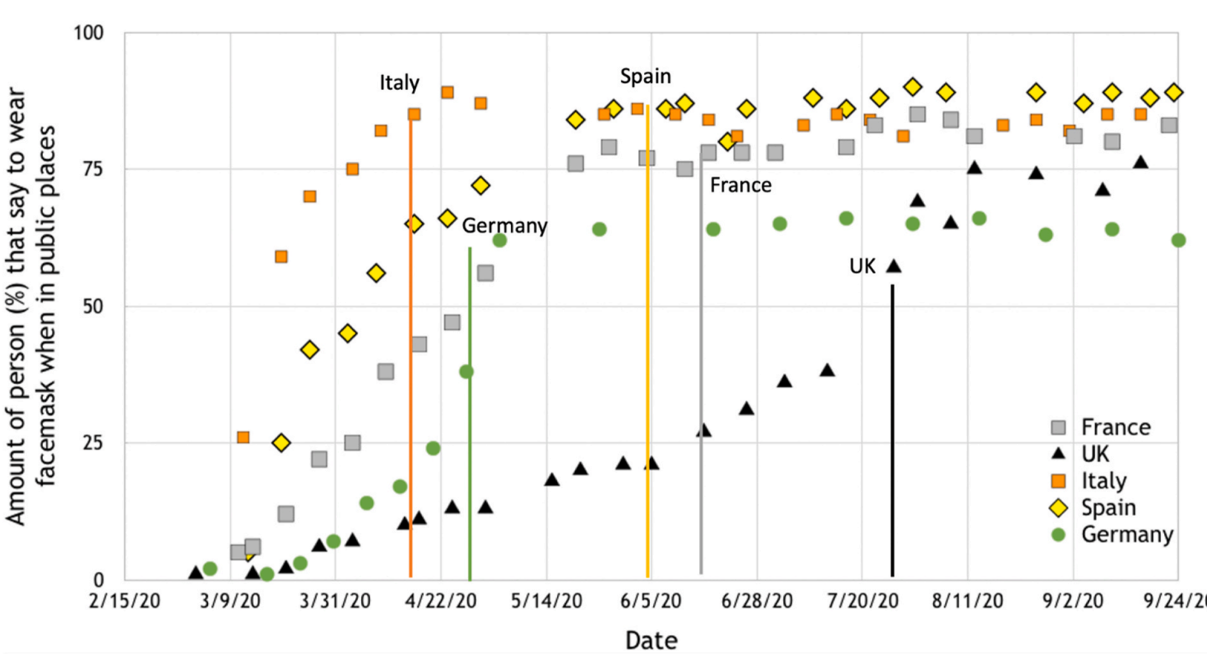

Fig. 3. Data about the survey of people wearing the facemask in public spaces (%). These data were downloaded by the YouGov website (https://yougov.co.uk/). The date when the facemask measure was mandatory, for the considered EU Countries, is also reported (in accord with data reported in Table 1) and displayed as a vertical line.

only in July. On the contrary Italy and Germany adopted this measure in April. This rule was partially relaxed in Italy, but only from 15th July to 15th August , 2020.

It is evident that, analysing these data, the role of facemask appears another fundamental measure in the limitation of COVID-19 spread.

Fig. 3 shows the amount of people that declared to wear a facemask in public spaces (data were available at YouGov website). In the same figure the date when the facemask measure was established as compulsory, for the considered EU Countries, is also reported. This figure highlights that the effective reception of this measure by population, was accomplished at different dates.

It is very interesting to notice that when facemask began to be compulsory, an increase of the population that follow this norm, till to reach to the maximum amount for single Country, can be found.

Fig. 2 shows that at the end of September 2020 a maximum very close to 90% of people declaring to wear facemask can be reach for Italy, Spain, and France. This value is about 65% for Germany and 75% for UK. Then, British and German people appear to be not inclined to facemask wearing. The resistance of UK is quite surprisingly for a Country with the highest death toll in Europe.

The absence of a recognized international consensus with respect to face covering was already recognized (Worby et al., 2020): it was substantially attributed to a combination of cultural norms, although not helped by scientific inertia in some Countries and in WHO. Indeed, a comparative study highlights clear differences among uptakes of recommended measures, such as hand washing and wearing face masks (Jones, 2020), in different geographical area.

It is evident that data shown in Fig. 3 strongly support the conclusion that Italian politics authorities imposed strict measures, that seem to be winning and the Italian people had the merit to generally accept the rules, demonstrating that the capacity to increase urban resilience, can be effectively reached by suitable behaviours.

Comparing data reported in Figs. 2 and 3 some other considerations must be also recognized: despite that Government Response index is higher for UK in comparison to that of Italy, data about infections cases show a different trend. It can be concluded that the proposed mitigation measures, such as social distancing, quarantine, and isolation, that were generally applied, are insufficient by themselves in protecting the population. The results presented here, considering the Italian case clearly highlight that the number and strictness of government policies cannot be interpreted as a measure of the appropriateness or effectiveness of a Country's response. Some restrictions are more effective and must be applied as soon as possible to limit the virus spread. Face covering (coupled with smart working policies), for example, seems to represent the main measure in shaping the trends of the pandemic.

Author cannot found a paper in literature proposing the air pollution as a vector of SARS-CoV-2 spread, that was also able to account a comparison between different Countries, considering differences in the restriction measures and the corresponding people response, able to eventually separate the human-to-human transmission mechanisms from the proposed pollution-to-human transmission ways. Indeed, as shown in Fig. 3, a substantial heterogeneity can be found in the implementation of restriction measures between Countries: the level of enforcement of measures may vary between Countries and the people response can be very different. In addition, specific more stringent rules and/or exceptions to the measures may also happen, making interpretation of the contagious cases reported data extremely complicated.

In this frame it is important to highlight that some authors suggested that COVID-19 outbreak was contained more easily and effectively in South Asian Countries (as Hong Kong, Taiwan, and South Korea), in comparison for example to EU member states, due to their population prevalence culture of wearing masks routinely (Leung et al., 2020).

Finally, it is important to highlight the fundamental role of political authorities in promoting suitable measures, using their credibility to increase the social acceptance of the imposed constrains.

In federal Countries (such as UK), individual states have been given the possibility to implement their own measures to limit the virus spread. On the contrary, in Italy these rules have been basically established by central government, with the possibility to implement locally basically more strict measures.

In Italy, for example, the facemask wearing is now mandatory (from 16th August) between 6pm and 6am, also outdoor, where social distancing is not possible. From 24th September some Italian regions introduced more strict measures, i.e. the obligatory use of facemask always, also outdoor.

This is a fundamental message for the population: when a range of possible measures are proposed in distinct regions of the same Country, the efficacy of the measures and the credibility of the public administrators about sanitary crisis management may be damaged.

As an example, the conflicting measures about facemask can be exemplified by UK, that proposed guidelines that include facemasks, after the antecedent dismiss of their use.

On these bases, it is possible to conclude that country-specific approaches, taking into account also the population acceptance of the measures, modeling the effects restrictions, as well as the possible alternative strategies after the interventions relaxation, are now mandatory.

At the end of September 2020, with the re-opening of ordinary activities, the virus reproduction rate may be exacerbated, with an expected increase of contagious diffusion in all the Europe.

3. Conclusions

This paper reports and discuss the possible origins of a difference of COVID-19 second wave spread in Europe, with particular attention to the "strange" case of Italy.

The aim of the proposed analysis is to find the possible reasons able to explain the unexpected better situation, concerning the amount of new detected cases, occurred in Italy, if compared to other EU Countries, during the starting of second wave of infections (July–September 2020).

This work supports the evidence that the failure in containing the propagation of COVID-19 pandemic worldwide can be largely attributed to the unrecognized importance of airborne virus transmission via aerosols, with the consequent few attentions to safety conditions importance. Example of inappropriate political management strategies, often occurred at the beginning of virus spread, are several.

By the analysis of data about detected contagious cases and the measures to limit the virus spread, in five EU member states (Italy, Germany, France, Spain, and UK) some conclusions can be proposed. Wearing a face mask as well as practicing social distancing and suitable hand hygiene, closing some public places, cancel public events, and limit transports capacity should be recommended to reduce the chances of contracting the virus. However, based on the results obtained for the Italian case, it is possible to conclude that wearing a facemask in public, coupled with social distancing that can be obtained by teleworking practice, corresponds to the most effective mean to prevent human-to-human transmission of COVID-19. It is fundamental that this result is accepted by policy makers of all the world, mainly where the virus diffusion is very rapid, to be considered in developing decision-making strategies. A global and effective response to pandemic needs a synergy between science and policy.

Author also strongly highlights that pollution-to-human transmission mechanisms must be proposed always considering the complexity of human-to-human interactions, that can be modified by imposed restrictions. It is fundamental to understand that a more precise acknowledge of the variables that should be considered in model predictions, instead of a need of more precise point prediction, will contribute to increase the reliability and the comprehension of the virus diffusion mechanisms, that is fundamental to face this pandemic period.

Declaration of competing interest

The author declares that she has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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