Timing the Peaks

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Given the diversity of parameters influencing its potential trajectory, the COVID-19 pandemic is a real challenge for scientists. If there's something everybody agrees upon, it's that everyone disagrees…

In order to estimate the likely epidemic diffusion looking forward, we must eliminate the three most obvious statistical biases:

(1) Lag: The epidemic started in various countries at different moments. We therefore cannot compare the current state of early diffusions with later ones. We must first eliminate the lags.

(2) Population: The USA, for instance, is likely to report many more cases than, say, the United Kingdom. It does not mean that the spreading is worse. The number of cases in a country must be normalized by the size of the population.

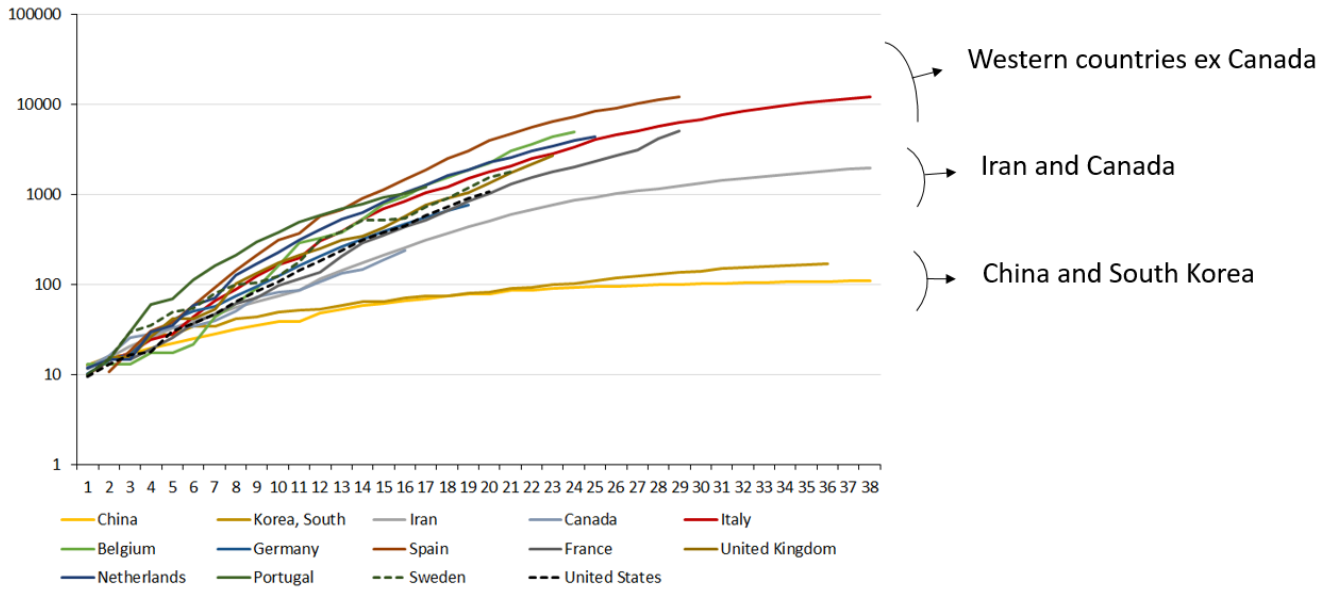
(3) Testing Policy: A few countries decided to implement mass testing, and the isolation of infected cases. Most others decided on lockdowns more or less quickly. The reporting of cases of infection is therefore highly dependent on the testing policy. A way to avoid such a statistical bias is to concentrate on the number of deaths, rather than the pure number of cases, even though these reporting methods are also debated.

A Top-Down View of COVID-19 Reported Deaths across Countries

We first calculated the number of deaths per 50 million inhabitants across countries. We then eliminated the starting lag so that each data series starts when the number of cases per 50 million inhabitants has reached 15.

Figure 1 on the next page displays the trajectories and raises interesting questions.

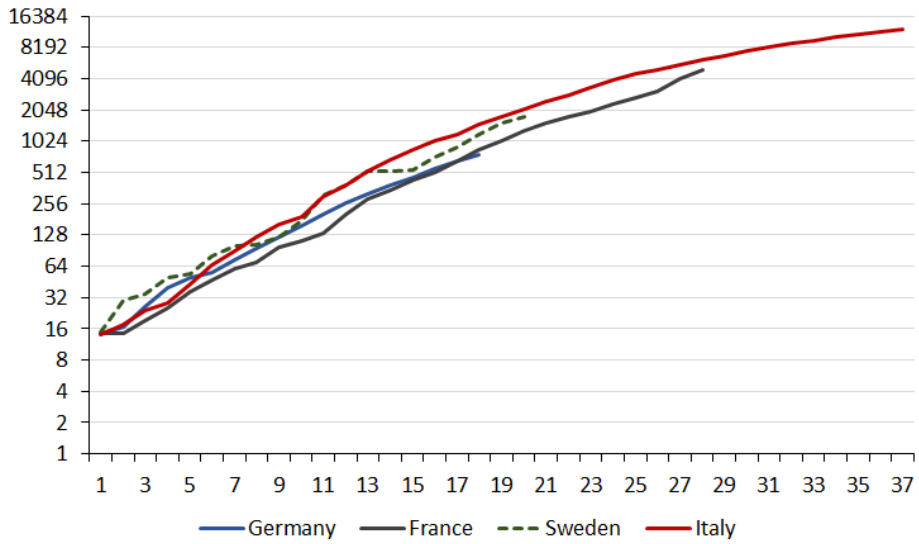
Fig 1. Number of deaths per 50M inhabitants up to April 3rd, 2020 - starting lag eliminated



Source: The Johns Hopkins University, Politolog.com, Gavekal Intelligence Software

Figure 2 below focuses on four European countries, which have adopted different policy responses to the epidemic: Italy and France, which enforced a lockdown on their population, versus Germany and Sweden, which only recommended social distancing, and instead emphasized the testing and isolating of contaminated people only.

Fig 2. Number of deaths per 50M inhabitant up to April 3rd, 2020 - starting lag eliminated



Source: The Johns Hopkins University, Politolog.com, Gavekal Intelligence Software

Figure 1 and Figure 2 raise a few observations:

1. Western Europe and the USA are following a very similar trajectory, regardless of their local policy response to the epidemic.
2. There might be three types of trajectories, for reasons to be further analysed.
3. Italy may not be an outlier but, quite to the contrary, the benchmark for Western countries.

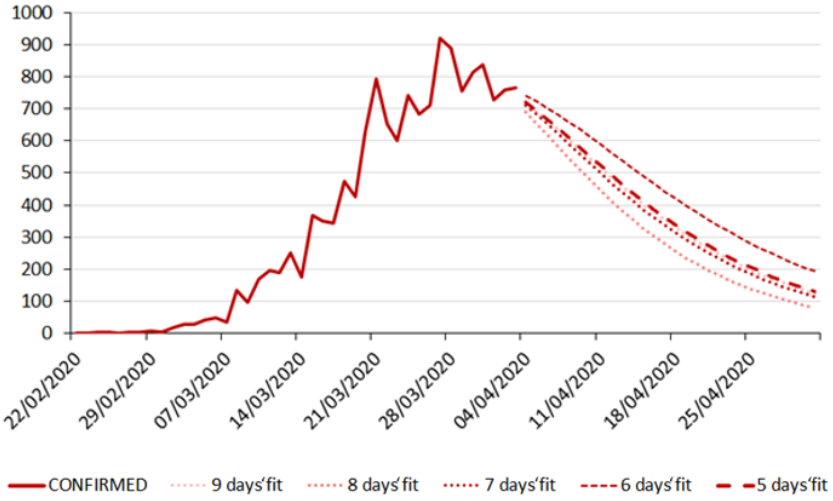
The Italian Case

Italy seems to have crossed its 'deaths per day' peak on the 26th of March. A method to project its future trajectory is the one proposed in our first publication on this subject, published on February 1st, 2020.

Epidemic spreading is like interest rate compounding in finance, from a statistical viewpoint. A constant interest rate leads to exponential increase in price. In the early days of the epidemic, the COVID-19 was compounding at circa 40% per day in any country. Forecasting the trajectory, therefore, requires one to fit the fading of the daily rate, i.e. the 'jolt'. 36 days ago, Italy was compounding at 35% per day. It is now compounding at 5% per day.

Figure 2 below proposes 5 fits, using respectively the previous 5, 6, 7, 8 and 9 days. The daily number of deaths per 50 million inhabitants converges towards a fading path which is expected to last the duration of the initial upward path.

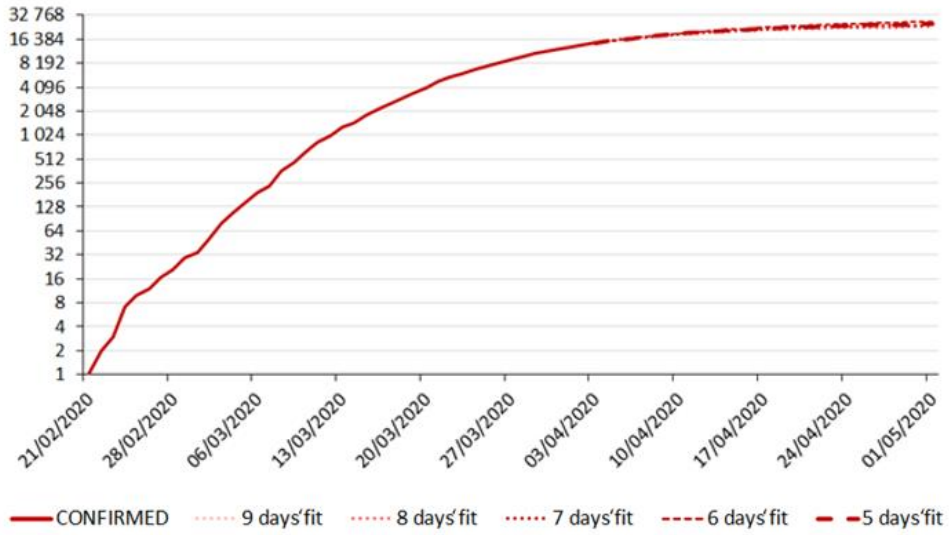
Fig 2. Italy. Projected number of daily deaths per 50 million inhabitants



Source: The Johns Hopkins University, Politolog.com, Gavekal Intelligence Software

The projected trajectories point towards a total number of deaths per 50 million inhabitants of 25,000 by the end of April.

Fig 3. Italy. Projected cumulated number of deaths per 50 million inhabitants



Source: The Johns Hopkins University, Politolog.com, Gavekal Intelligence Software

25,000 deaths per 50 million people gives a death rate of 0.05% of the population, much lower than what is today predicted by most epidemiologists. A figure to be compared with the 1% natural death rate per annum of the country.

The forecast assumes that a potential loosening of the lockdown in Italy in the coming weeks will not entail secondary epidemic waves. At this stage, there is no evidence of such a risk, since we're not observing after-waves in China, for instance.

The surprising convergence of the cumulated deaths' path across countries could be explained by two factors:

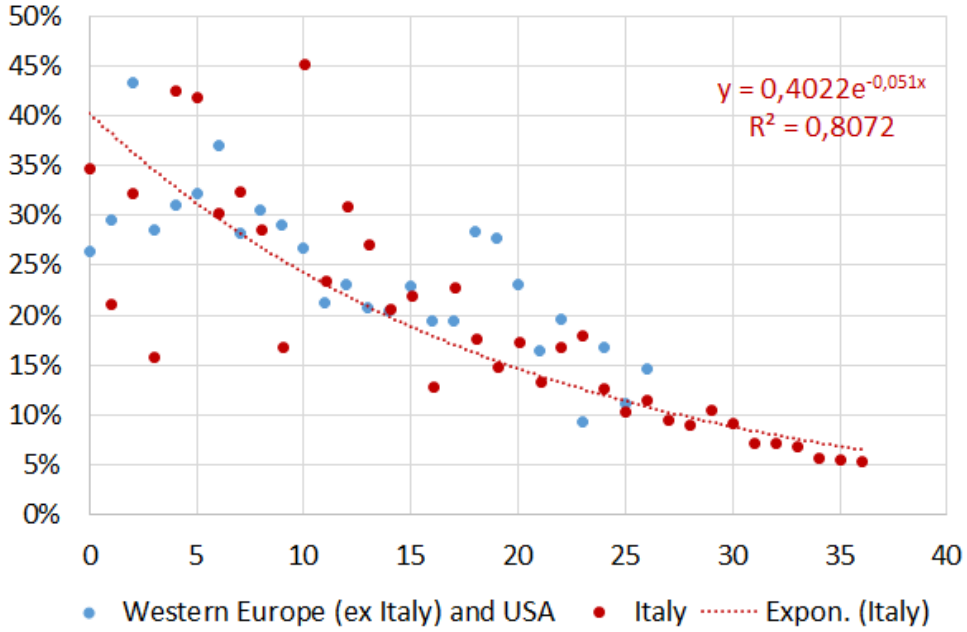
1. The diffusion is controlled by the virus, not by humans.
2. The various health policies, whether hard or soft lockdowns, have few practical consequences, perhaps because populations with similar cultural backgrounds behave the same way at the local interaction level.

If this is true, Italy could be considered as a benchmark for Western countries.

Italy as a Benchmark

Figure 4 below plots the daily rate of incremental deaths in Italy (red) and in Western Europe and the US, on average (blue). The fact that Italy is in advance because of an early epidemic diffusion provides information on the likely path of other countries.

Fig 4. Daily death rate in Western countries and Italy- starting lag eliminated



Source: The Johns Hopkins University, Politolog.com, Gavekal Intelligence Software

According to this projection, Western countries' daily number of deaths are expected to peak after Italy with the following lag.

	Lag in Days	Probable Peak
Italy	0	26/03/2020
Spain	9	04/04/2020
France	10	05/04/2020
Netherlands	14	09/04/2020
United Kingdom	16	11/04/2020
Sweden	17	12/04/2020
United States	18	13/04/2020
Germany	19	14/04/2020
Portugal	21	16/04/2020

Conclusion

This analysis, if correct, brings with it both good and bad news.

The good news is that the pandemic's peak is in view. Italy has likely passed its peak on the 26th of March, after 30 days of growth, starting from 10 deaths per 50 million inhabitants. Other countries will follow in the coming two weeks.

Furthermore, the cumulated death rate due to the COVID-19 could turn out to be much lower than initially feared.

The bad news is that the coming fortnight shall be very painful for many countries. Furthermore, it could take another 30 days to extinguish the propagation.