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## Past Pandemics and COVID-19: Do they Impact the Economy in the Same Way?

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**Abstract:**

**Purpose:** The aim of this article is to answer the question, whether COVID-19 pandemic is different from a past pandemic. In the past, pandemics' death rate was a crucial driver to economic impact.

**Methodology:** Panel data for 26 EU countries for industrial production, stringency index, economic support index, and COVID-19 death rate were assessed for significant determinants of economic activity measured by industrial production. At the first panel, estimation was conducted. Following discussion, Granger causality tests indicated links between death rate, stringency, and economic support.

**Findings:** COVID-19 pandemic is different from previous pandemics, as the government action alters the connection between death rate and economic activity. Lockdown policy acts stronger on financial performance and later on the death rate.

**Practical Implications:** Still, death rate is the primary driver for economic performance by influencing government decisions. Only breaking the link between cases and death rate would help to combat COVID-19.

**Originality/Value:** The study is another one indicating vaccine rollout is crucial. But novel approaches suggest non-pharmaceutical intervention would not bring normality in the longer term, as the death rate made the government act.

**Keywords:** COVID-19, Industrial production, panel estimates.

**JEL Classification:** I0, I1.

**Paper Type:** Research Paper.

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## 1. Introduction

Epidemic refers to the rise in several cases in a limited geographical area, whereas pandemics are epidemics that occur in large sizes, mainly at least in several countries (CDC, 2021). In world history, many pandemics were observed, often devastating social and economic life, with a high death toll.

Famous (Jorda, Singh, and Taylor, 2020) paper compares the current COVID-19 pandemic to the past. In 40 years after pandemics, the natural interest rate is substantially lower due to the higher amount of capital per capita left by people who passed away and a shift in preferences to save more and invest less. Additionally, GDP should rise in 20-years horizon due to a rise in labor productivity while population decreases.

The first and deadliest pandemics invaded Europe around 1346, but Black Plague (or Black Death) haunted the continent frequently before and after its biggest outbreak. It is estimated that nearly 30% of the population passed away during the 1346-1400 outbreak. That led to severe economic consequences for the pre-modern economy. A rapid change of relative prices of production factors – costs of natural resources falls and capital goods (Malanima, 2014). In some parts of Europe, mainly in Spain and Italy, drastically inflated prices of unskilled work (ca. 87%), then raw material prices increased either. The Malthusian or Smithian framework could explain this. The first approach relies on land-to-labor and capital-to-labor ratios. In that sense, decreased population leads to rising in per capita wealth. In the Smithian process to the Black Death, transaction cost played a crucial role, division of labor and specialization were no longer effective, so pandemics pressed downward pressure on the economy (Jedwab *et al.*, 2020).

Another issue after the Black Death pandemics stated elevated inflation. Partly due to the rise in commodity prices. Manuro (2004) explained post-pandemics inflation through the Fisher Identity  $MV = PY$ , when national income fall (Y), the amount of money (M) and velocity (V) are left unchanged, the price level has to rise (P). The Great Influenza Pandemic (or “Spanish flu”) outbreaked in 1918 and stayed until 1920. The pandemic was the second severe in European history after Black Death. The dead toll numbered 40 million or 2.1 percent of the population around the World.

The magnitude of the slow rate was significantly and negatively affecting economic growth (Barro *et al.*, 2020). In the United States working population decreased, so it affected labor supply in manufacturing, mainly in the eastern part of the country. As employment backward in a particular firm, marginal productivity curves back too, so a new equilibrium could be achieved with higher real wages. The amount of capital remained unchanged. Therefore, more capital per worker persisted. Some socio-economic problems detected, cohort born during pandemics had more health problems, less human capital, which negatively affected later economic performance (Garrett, 2007). Economic impact also comes from municipal orders to close or reduce

some businesses, but many reduced their operation voluntary or due to lack of staff Bodenhorn (2020). An interesting issue occurred, a rise in building permits and cost in some cities in the U.S., regardless intensity of pandemics (Beach, 2020). In those pandemics inversely to the Black Death, deflation on food prices was observed.

The higher the cumulative excess mortality, the lower inflation or higher deflation (Velde, 2020). On the other hand, after pandemics were over, an inflationary process began (Burdekin, 2020; Grima *et al.*, 2020). Moreover, Dow Jones industrial stock index decreased by 45% between 1919 and 1921 (Velde, 2020). Comparing the two most severe pandemics in history, three robust economic effects one can observe:

1. Decrease of labor force due to high death rate. Change in labor-to-capital ratio, decreased production of vital resources or goods, raise in wages.
2. Inflation due to rise in money stock (inheritance, lower number of people), shortage of goods, sometimes deflation.
3. Economic activity abruptly since some business is closed.

Both past pandemics – the Black Death and Spanish flu – presented a strong link between the number of deaths and economic performance, mainly through falling labor force and closing business. In the Spanish flu, pandemics mostly exposed were young people – the core of the labor force. For example, in Madrid in the first wave, standardized mortality risk was 2.28 for the age group 15-24 years old, whereas 1.68 for over 70 years old. In Paris in 1918, flu death accounted for ca. 65% for the age group 15-44 years old (Erkoreka, 2010; Cilek *et al.*, 2018). A similar occurrence occurred in the U.S. and Canada, where peak mortality was 28-30. On the one hand, this could be the case of a large share of the young population, but also the elderly group was more immune to influenza due to previous epidemics, e.g., Russian flu (Gagon *et al.*, 2013).

Pandemics affect people, not capital or money, but people interact as economic agents with wealth and money, so overall macroeconomic effects occur. The first step of analysis is to compare economic development. At first, the structure and level of human capital were far behind current standards. Fewer workers are in the industry, but more in the services, information technologies. So, working online is possible. Another difference comes from the government's administration of crisis. The government's goal consists of reducing hospitalization and death, reducing perturbation of essential goods supply, reducing the rise in unemployment and bankruptcy (Eichenbaum *et al.*, 2021). So, government alters the picture of the economic consequences of pandemics.

The COVID-19 differs from previous pandemics, as new technologies were introduced to get information on cases (Khan *et al.*, 2020). Moreover, the lockdown policy was introduced in detailed aspects to compromise economic impact, and the number of cases increases and hospitalization rate. Additionally, the government helps to closed businesses and easing monetary policy.

## 2. Research Methodology

The gold standard in the magnitude of severe pandemics, such as “Spanish flu,” is the link between death rate and economic activity (as portrayed in Barro *et al.*, 2020). In COVID-19, governments introduced counter pandemics policy immediately. In such circumstances, the death rate should diminish impact on economic performance. To test the hypothesis, we employ like Barro *et al.* (2020) methodology. Actual economic activity measured by the inflation rate and industrial production should be determined by death rate negatively as during “Spanish flu.” Our hypothesis states that the death rate would not determine significantly and negatively economic activity, as government intervention weighs more than the death rate itself. The death rate is the best indicator of pandemics in natural circumstances. However, during COVID-19 pandemics, governments anticipate the death rate and introduce counter polity in advance.

The hypothesis is tested on the dataset obtained from Eurostat (industrial production) and Blavatnik School of Government Oxford (Stringency Index, Economic Support Index, and Death rate). The full dataset is described in Table 1.

**Table 1.** *Summary statistics*

Variable	Description	Mean	Median	S.D.	Obs.
INDU_	Industrial production monthly	0,2136	0,75	7,836	390
Stringency	Stringency Index, monthly sum	133,2	47,15	503,8	390
Support	Economic Support Index, monthly sum	141,1	0,0	504,3	390
Death_rate	Death rate monthly per million	10,50	0,788	97,86	390

**Source:** *Own calculation.*

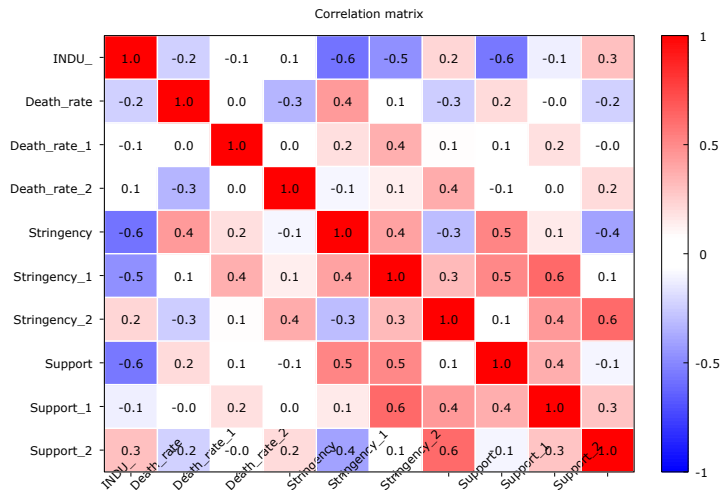
The sample consists of 390 observations – for 26 European Union countries from February 2020 to April 2021. Data are far from a normal distribution. Instead, they represent consecutive waves of COVID-19 outbreaks.

In the next step, we find casual relation between death rate, stringency index, support index, and the dependent variable, the industrial production index. Figure 1, the correlation matrix suggests that industrial production is correlated negatively with the Stringency Index and positively with lagged economic support index, but not with the death rate. At first, pooled regression is estimated, then testing for fixed or random panel effect (Breusch-Pagan test and Hausman test). Since the final model was chosen, our hypothesis is tested.

Industrial production among EU countries was determined by most government stringency policy, as the parameter is significant and damaging up to the second lag.

One lag of economic support raises industrial production then the effect diminishes. The death rate seems to have no impact on industrial production (Table 2).

Figure 1. Correlation matrix



Source: Own creation.

Table 2. Panel estimation, dependent: Industrial production

	coefficient	std. error	z	p-value
const	1.366	0.575	2.375	0.018**
Stringency	-0.004	0.001	-2.631	0.009***
Stringency_1	-0.006	0.001	-5.772	0.000***
Stringency_2	0.003	0.001	2.978	0.003***
Support	-0.005	0.001	-5.677	0.000***
Support_1	0.002	0.001	2.951	0.003***
Support_2	0.000	0.001	0.469	0.639
Death_rate	-0.001	0.004	-0.309	0.757
Death_rate_1	0.008	0.004	1.898	0.058*
Death_rate_2	-0.003	0.005	-0.520	0.603

Source: Own calculation. Random-effect, Beck-Katz standard errors. Durbin-Watson: 2.045, Hausman test - Chi-square(9) = 11.0364, p = 0.273. \*\*\* donotes p<0.01, \*\* - p<0.05, \* - p<0.1.

Finally, we run a casualty test between death rate, stringency, and economic support index to test our hypothesis. The idea behind causation is that firstly death rate rises, then the government steps in with harshness and financial support. The policy alters pass through from death rate to economics. We use the Dumitrescu-Hurlin test for Granger Casualty in panel data that assess whether past values on the first variable are significant predictors on another variable. The null hypothesis states that all the

parameters on the predictors are jointly equal to zero (Table 3). Variable ought to be stationary (Lopez and Weber, 2017).

**Table 3.** Levin-Lin-Chu Panel Unit Root test

Variable	coefficient	t-ratio	z-score	p-value
Death_rate	-1.415	-14.364	-3.51906	0.0002
Stringency	-1.3792	-24.699	-16.4467	0.0000
Support	-0.98617	-29.036	-23.3035	0.0000

**Source:** Own calculation.  $H_0$ : Panel contain unit root, with constant, 2 lags

In the table 3 in all of the investigated variables of unit root presence, we reject null hypothesis, that the series are non-stationary in all three cases.

**Table 4.** Causality tests

Null hypothesis	W-bar	Z-bar	p-value	Lags
Death_rate does not homogeneously Granger-cause Stringency	0.8328	-2.6340	0.0084	2
Stringency does not homogeneously Granger-cause Death_rate	1.2641	-1.9525	0.0509	2
Death_rate does not homogeneously Granger-cause Stringency	1.3109	-2.7989	0.0051	3
Stringency does not homogeneously Granger-cause Death_rate	0.6008	-3.5380	0.0004	3
Death_rate does not homogeneously Granger-cause Support	0.3391	-2.2060	0.0274	1
Support does not homogeneously Granger-cause Death_rate	0.9558	-0.6258	0.5314	1
Death_rate does not homogeneously Granger-cause Support	0.5202	-3.1279	0.0018	2
Support does not homogeneously Granger-cause Death_rate	0.9700	-2.4172	0.0156	2
Stringency does not homogeneously Granger-cause Support	4.2044	7.6984	0.0000	1
Support does not homogeneously Granger-cause Stringency	1.2952	0.2440	0.8072	1

**Source:** Own calculation. Dumitrescu-Hurlin test (Granger causality test for panel data).

As indicated in Table 4, the death rate causing stringency policy within a maximum of three months than the causation is diminished or altered as stringency policy affects death rate (lockdown lowers the number of cases and deaths). Similar findings are on the Support policy. Within a month after the dead rate increase, a support policy is introduced. Then the causation is diminished as the interrelation of death rate, stringency, and support changes. On the other hand, causation from Stringency to Economic Support take place at a lag of 1<sup>2</sup>.

<sup>2</sup> At lag of order 2 the causation is diminished.

### **3. Conclusion**

The question of whether COVID-19 is another pandemic of the century can be resolved negatively. The big difference comes from technological advances when comparing to the times a century ago. Nowadays, the government track evolution of cases, hospitalization, and death rates is different. Having that information, immediately take appropriate action to fulfill the equilibrium, which compromises reducing hospitalization rate and death rate to the consequences of lockdown.

In the past pandemics, the notable example "Spanish flu," death rate determined economic activity, people taking information on the severity of disease retreat from their training, moreover death rate decreased labor supply naturally through lowering the population.

In COVID-19, the pandemics' death rate is not influencing economic activity straight. It still affects it, but only by influencing government policy. At first anticipated death rate sparked the stringency of the lockdown policy. Shortly after (ca. one month later) economy is supported by the monetary and budget policy. Afterward (ca. three months since the death rate is to rise), stringency policy interacts with the death rate by lowering it.

In the light of the above causation, there is a potent vaccine rollout impact on the economy. If the vaccine cuts the link between cases and the death rate, the stringency of the lockdown policy can be significantly reduced.

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