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# IS THE EUROZONE AN OPTIMUM CURRENCY AREA?

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## Abstract:

The objective of this paper is to examine the past, present, and future of the euro. The first part presents the euro as an edifying currency experiment. The second part analyses the economic performance of the euro area. The third part points out the internal conflicts within the eurozone. The fourth part explains why the eurozone is not an optimum currency area. The fifth part outlines the controversy surrounding the purchase of bonds by the ECB. The sixth part poses the question of whether it is still possible to save the euro. The eurozone is not an optimum currency area. In theory, it could become one, provided that high labour mobility is achieved, wages are flexible downwards, asymmetrical shocks do not occur, and there is a stable system of national finances, supplemented by an effective system of fiscal compensations. Since these conditions are not met, the euro has become a trap for the member states. The euro has not led to convergence in economic development in the eurozone; quite the opposite, it has had a diverging effect.



## Keywords:

Euro , Euro area , Optimum currency area

**JEL Classification:** G10, G23, L25



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## 1 Introduction

The primary objective of this research is to elucidate the consequences of implementing a lockdown policy on public health and economy, with the intent of diminishing the impact of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which is the strain of the novel coronavirus responsible for the Coronavirus disease 2019 (COVID-19) in the world. This paper centers on the data of the first wave of the COVID-19 pandemic (from March to August, 2010) in countries that have implemented longer and shorter lockdown periods with the aim of estimating how effectively incidence of infected cases and fatality rates has been reduced and how their Gross Domestic Product has been impacted.

Faced with COVID-19 and widespread epidemics, governments are forced to cope with the resulting threats on public health, and so it is crucial to scrutinize which containment measures are effective and which are not. Nicoll & Coulombier (2009, p.3ff) suggest that containment measures aim to stop transmission of infections diseases to the greatest extent possible. Particularly, governments implement measures to constrain/hold off chains of transmission and outbreaks, through various means, such as vigorous tracing of contacts, quarantining of contacts, general lockdown of people and economic activities. The main point of this study revolves around the idea of *lockdown* as a policy response by governments to manage the spread of pandemic in the society and providing some brief context can help to understand and clarify it. Merriam-Webster dictionary (2020) lockdown defines lockdown as “a temporary condition imposed by governmental authorities (as during the outbreak of an epidemic disease) in which people are required to stay in their homes and refrain from or limit activities outside the home involving public contact (such as dining out or attending large gatherings)”. Atalan (2020) demonstrates that the CoVID-19 pandemic can be taken under control through social restrictions in the form of containment measures, such as lockdowns. Tobías (2020, p.2) notes that: “Lockdown, including restricted social contact and keeping open only those businesses essential to the country’s supply chains, has had a beneficial effect”. Facing a pandemic or an epidemic, such containment measure has a variable duration and encompasses one or more actions, including but not limited to shutting down schools and workplaces, cancelling public and/or private events, closing museums, introducing restrictions to large gatherings in public and private settings, implementing stay-at-home requirements, regulating internal and international travel, etc. (Nicoll & Coulombier, 2009; Petherick *et al.,* 2020). Atalan (2020) contends that governments can decide to initiate a lockdown when daily number of confirmed cases exceed a critical threshold and to terminate it when Intensive Care Unit (ICU) admissions drop significantly. In general, implementing lockdown as a policy response has significant effects on public health, environment and national economies (Chakraborty & Mait, 2020; Jasova & Kaderabkova, 2022; Bednar, & Kaderabkova, 2022).

*Existing knowledge on these topics is derived from numerous studies.* Islam *et al.* (2020) assert that implementing lockdown early as a control measure can lead to a decrease in the incidence of COVID-19. The model of Balmford *et al.* (2020) further shows that countries that implemented lockdown promptly experienced reduced number of deaths in comparison to countries that were late for implementing this stringent measure of containment. In their analysis of 50 countries with high number of confirmed COVID-19 cases, Chaudhry *et al.* (2020) report that 40 countries enforced full lockdowns, 5 applied partial lockdowns, and 5 implemented curfews with varying effects. Moreover, this study argues that lockdowns and the extent of testing in society were not correlated with COVID-19 mortality per million people; however, full lockdowns and reduced vulnerability of countries to biological threats were significantly correlated with increased patient recovery rates (Chaudhry *et al.,* 2020). In their March 2020 analysis of their transmission model, Gatto *et al.* (2020) posit that limitation of mobility and human interactions can alleviate COVID-19 transmission dynamics by approximately 45%. Tobías (2020) demonstrates that the trajectories of daily confirmed cases, of deaths and of Intensive Care Unit (ICU) admissions have flattened following the first lockdown in Italy and Spain; however, the intrinsic dynamics of COVID-19 pandemic has not changed the underlying trend that persisted in its upward trajectory. Conversely, the second lockdown, which imposed more extensive restrictions on mobility, appears to have altered such trend, resulting in a decrease in daily diagnosed cases, overall fatalities and ICU admissions. Other studies delve into the effects of COVID-19 lockdown on environment, with a particular focus on the levels of air pollution. Briz-Redón *et al.* (2021) investigate alterations in air pollution in Spanish cities during the COVID-19 lockdown and demonstrates that the lockdown has led to a reduction in the atmospheric levels of $NO_2$, CO, $SO_2$ and $PM_{10}$, with the exception of $O_3$, which remained unaffected. Ghahremanloo *et al.* (2021) study how COVID-19 containment measures impact levels of air pollution in East Asia, confirming that pollutant concentrations in February 2020 are lower in comparison to those in February of 2019. Furthermore, Beijing-Tianjin-Hebei regions, Wuhan, Seoul, and Tokyo had significantly reduced levels of $NO_2$. In this context, Liu *et al.* (2021) study the effects of COVID-19 lockdown in approximately 600 major cities of the world and demonstrate that $NO_2$ air quality index value exhibit more unanticipatedly as compared to the pre-lockdown period, followed by $PM_{10}$, $SO_2$, $PM_{2.5}$, and CO, while $O_3$ levels experience an increase. Additionally, Liu *et al.* (2021) purport that COVID-19 lockdown's environmental impact has yielded health benefits, specifically in terms of expected aversions of premature deaths resulting from reduced air pollution. Generally, there is little dispute now over the evidence that COVID-19 outbreaks have led to a reduction in air pollution levels and the adverse effects that polluted environment has on human health. Nevertheless, *what remains relatively unknown in this field of research* is that if and how the implementation of overall lockdown during the initial wave of the COVID-19 pandemic has been or has not been influential in decreasing the negative impact on economic system and public health. This study constitutes a part of a greater research project conducted on the factors that determine the COVID-19 pandemic's transmission dynamics and socioeconomic impact. The results of this study can elucidate how the lockdown during the initial wave of the COVID-19 pandemic affected the society. It can also serve as a crucial tool in crafting effective strategies and supporting sustainable technologies with the aim of addressing not only future waves of COVID-19, but also new infectious disease epidemics, all while safeguarding the economic system.

## 2 Data and study design

### 2.1 Data and their sources

This study centers on six European countries with similar institutional and socioeconomic framework: three countries implementing a shorter lockdown and other three implementing a longer lockdown. Specifically:

- *Countries with shorter lockdown* periods are (averaging around 15 days of lockdown):

- Austria implemented a lockdown from 3/16/2020 to 4/13/2020, lasting 29 days;
- Portugal implemented a lockdown from 3/19/2020 to 4/2/2020, lasting 15 days;
- Sweden did not apply any lockdown.

- *Countries with longer lockdown periods* are (averaging around 61 days of lockdown):

- France implemented a lockdown from 3/17/2020 to 5/11/2020, lasting 56 days;
- Italy implemented a lockdown from 3/09/2020 to 5/18/2020, lasting 71 days;
- Spain implemented a lockdown from 3/14/2020 to 5/09/2020, lasting 57 days.

- Period studied: from March to August 2020, which corresponds to the first wave of the COVID-19 pandemic.

This study takes into account the data related to confirmed cases, fatality rates and the GDP aggregates in the selected countries after the implementation of the lockdowns; i.e., the timeframe between April 15 and August 30, 2020, which corresponds to the initial wave of the COVID-19 pandemic. These datasets are crucial for the assessment of the effectiveness of lockdown-based policy responses in dealing with the global COVID-19 crisis. The public health data used in the study have been sourced from Johns Hopkins Center for System Science and Engineering (2020), while the economic data have been obtained from Eurostat (2020).

### 2.2 Measurement methodology

- *The numbers of individuals infected with COVID-19* are calculated using confirmed cases of COVID-19 divided by the population % of the countries being studied.

- *The numbers of COVID-19 related deaths* are calculated by fatality rate of COVID-19 given by total infected individuals divided by deaths (%) of countries.

- *Economic activity of countries* is measured using Gross Domestic Product (GDP) and main components (output, expenditure and income). Unit of measure is chain linked volumes, index 2010=100. The accounting period is the calendar quarter (Q), based on 2019-Q2, 2020-Q1 and 2020-Q2 (Q1= January, February, March; Q2=April, May, June). Quarterly national accounts data play a crucial role in economic analysis and policy and in assessing the state of the business cycle (cf., Coccia, 2010).

### 2.3 Data analysis procedure

*Firstly*, the data are subjected to descriptive statistics, employing a comparative method between countries with longer and shorter lockdown periods, taking into account arithmetic mean of confirmed cases standardized with population, of fatality rates between April and August 2020 and of the quarterly national accounts of GDP. In addition, the average variation of confirmed cases standardized with population and fatality rate between 15 April 2020 and 30 August 2020, the period that coincides with the initial wave of the COVID-19 pandemic, is calculated in order to evaluate the impact of lockdown on public health.

*Secondly*, for the purpose of ascertaining whether the difference of arithmetic mean and average variation of confirmed cases standardized with population, fatality rate and GDP aggregate between countries with shorter and longer lockdown periods is significant, the Independent Samples *t*-Test is executed. Specifically, the Independent Samples *t*-Test is used to determine whether there exists statistical evidence supporting significant difference between the associated population means by comparing the means of two independent groups. The null hypothesis ($H_0$) and alternative hypothesis ($H_1$) for the Independent Samples *t*-Test are as given below:

$H_0$: $\mu_1 = \mu_2$, indicating that the two-population means are equal in countries with shorter and longer lockdown durations;

$H_1$: $\mu_1 \neq \mu_2$, indicating that the two-population means are not equal in countries with shorter and longer lockdown durations.

Considering that the sample is small, the nonparametric Mann-Whitney *U* Test is also conducted in order to determine whether there is a difference in the dependent variable for these two independent groups. this test assesses through comparison whether the distribution of the dependent variable (i.e., confirmed cases standardized with population and fatality rate) is equivalent for the two groups, which implies that they are from the same population.

*Thirdly*, the study represents the trends of average value of infected individuals and fatality rates of countries that are being analyzed from April till August 2020. These trends are aggregated into two groups as follows:

- Countries with shorter lockdown periods (averaging around 15 days of lockdown)
- Countries with lockdown periods (raging around 61 days of lockdown)

This study examines these trends using a simple regression model that employs the specification of a linear relationship:

$$y_t = \alpha + \beta t + u \qquad (1)$$

$y$ = number of infected individuals or fatalities

$t$ =time from April to August 2020

Ordinary Least Squares (OLS) method is utilized in order to estimate the unknown parameters of linear models [1].

Statistical analyses are conducted using the Statistics Software SPSS® version 26.

## 3 Results

### 3.1 Impact of COVID-19 and lockdown on public health

Descriptive statistics are in Table 1.

**Table 1: Descriptive statistics for the impact of lockdown on public health, period April-August 2020**

| Period April-August 2020 | groups | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Days of lockdown | 1 | 3 | 14.670 | 14.503 | 8.373 |
| | 2 | 3 | 61.330 | 8.386 | 4.842 |
| Average cases/population | 1 | 3 | 0.004 | 0.002 | 0.001 |
| | 2 | 3 | 0.004 | 0.001 | 0.001 |
| Average fatality rate | 1 | 3 | 0.055 | 0.032 | 0.018 |
| | 2 | 3 | 0.127 | 0.020 | 0.012 |
| Variation average cases/population | 1 | 3 | 0.004 | 0.003 | 0.002 |
| | 2 | 3 | 0.003 | 0.002 | 0.001 |
| Variation fatality rate | 1 | 3 | -0.007 | 0.012 | 0.007 |
| | 2 | 3 | -0.019 | 0.020 | 0.011 |

*Note: group 1= countries with a shorter period of lockdown (Austria, Portugal, Sweden); group 2= countries with a longer period of lockdown (France, Italy and Spain)*

*Source: Authors*

**Figure 1: Average values and average variation of confirmed cases/population (%) over April-August 2020 in countries with shorter and longer lockdown periods.**

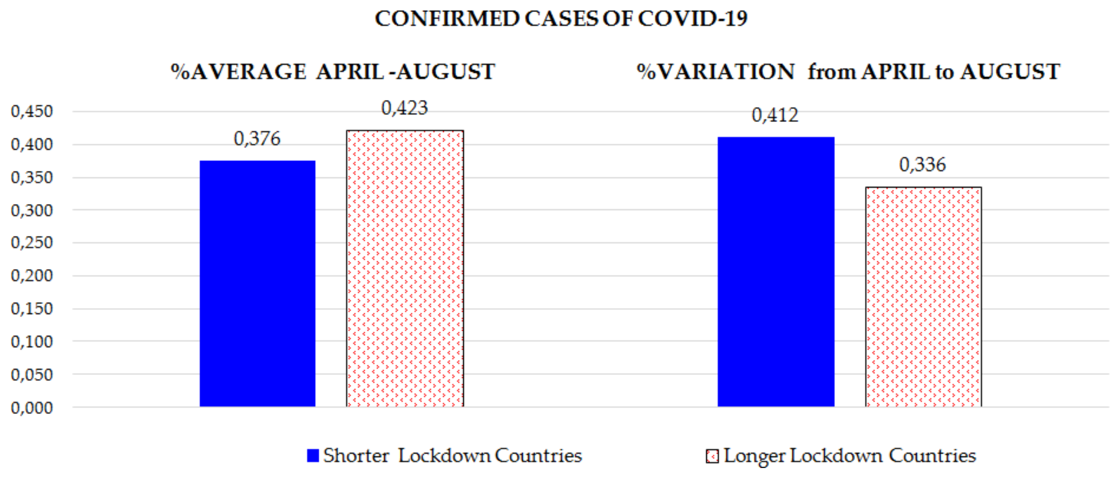



Figure 1 illustrates that, during the initial wave of the COVID-19 pandemic (April till August 2020), countries with shorter lockdown periods have lower average values of confirmed cases/population (%), yet higher variation of confirmed cases/population (%) compared to countries with longer lockdown periods.

**Figure 2: Average values and average variation of fatality rate (%) over April-August 2020 in countries with shorter and longer lockdown periods.**

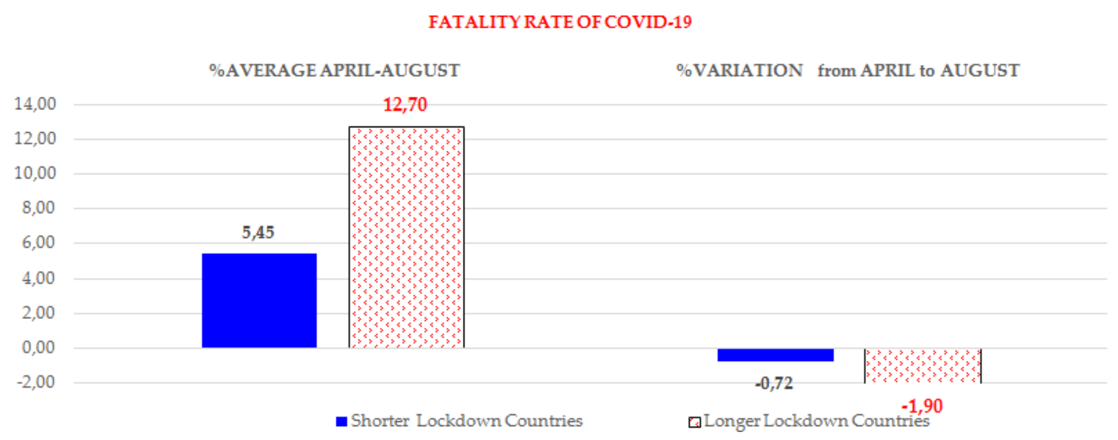



Figure 2 shows that countries with shorter lockdown periods have a lower average fatality rate (%) and a lower reduction of fatality rate in comparison to countries with longer lockdown periods over the span of April - August 2020 (–0.72% vs. –1.90%). In order to determine the significance of the difference of arithmetic mean and average variation of confirmed cases standardized with population and fatality rates between countries with shorter and longer lockdown periods, the Independent Samples *t* Test is executed, taking into account the small size of the sample of the study, and the nonparametric Mann-Whitney *U* Test is conducted as a countercheck measure to reinforce results.

**Table 2: Independent Samples Test for the impact of lockdown on public health**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | |
|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference |
| Days of lockdown | Equal variances assumed | 0.445 | 0.541 | -4.825 | 4 | 0.008 | -46.667 | 9.672 |
| | Equal variances not assumed | | | -4.825 | 3.203 | 0.015 | -46.667 | 9.672 |
| Average cases/population | Equal variances assumed | 0.047 | 0.84 | -0.382 | 4 | 0.722 | 0.000 | 0.001 |
| | Equal variances not assumed | | | -0.382 | 3.83 | 0.723 | 0.000 | 0.001 |
| Average fatality rate | Equal variances assumed | 1.51 | 0.286 | -3.343 | 4 | 0.029 | -0.073 | 0.022 |
| | Equal variances not assumed | | | -3.343 | 3.386 | 0.037 | -0.073 | 0.022 |
| Variation average cases/population from April to August | Equal variances assumed | 0.132 | 0.735 | 0.376 | 4 | 0.726 | 0.001 | 0.002 |
| | Equal variances not assumed | | | 0.376 | 3.704 | 0.727 | 0.001 | 0.002 |
| Variation fatality rate from April to August | Equal variances assumed | 0.393 | 0.565 | 0.878 | 4 | 0.429 | 0.012 | 0.013 |
| | Equal variances not assumed | | | 0.878 | 3.273 | 0.440 | 0.012 | 0.013 |

*Source: Authors*

The *p*-value of Levene's test is not significant, and we must consider the output of "Equal variances assumed". Based on the results, there is a significant difference in mean days of lockdown ($t_4$ = -4.825, $p < .01$) and average fatality rates ($t_4$ = -3.343, $p < .05$) between countries with longer and shorter lockdown durations. In particular, the average fatality rate of countries with shorter lockdown periods was -7.3 percent points lower than countries with longer lockdown periods due to higher initial incidence. Other indicators are not of significance (Table 2).

**Table 3: Mann-Whitney Test. Rank for the impact of lockdown on public health**

| Period from April to August, 2020 | Groups | N | Mean Rank | Sum of Ranks |
|---|---|---|---|---|
| Days of lockdown | 1 | 3 | 2 | 6 |
| | 2 | 3 | 5 | 15 |
| | Total | 6 | | |
| Average cases/population | 1 | 3 | 3 | 9 |
| | 2 | 3 | 4 | 12 |
| | Total | 6 | | |
| Average fatality rates | 1 | 3 | 2 | 6 |
| | 2 | 3 | 5 | 15 |
| | Total | 6 | | |
| Variation average cases/population | 1 | 3 | 3.67 | 11 |
| | 2 | 3 | 3.33 | 10 |
| | Total | 6 | | |
| Variation fatality rate | 1 | 3 | 3.67 | 11 |
| | 2 | 3 | 3.33 | 10 |
| | Total | 6 | | |

*Note: group 1= countries with a shorter period of lockdown (Austria, Portugal, Sweden) group 2= countries with a longer period of lockdown (France, Italy and Spain)*

*Source: Authors*

**Table 4: Mann-Whitney Test for the impact of lockdown on public health**

| Test Statistics[a] | | | | | |
|---|---|---|---|---|---|
| | Days of lockdown | Average cases/population | Average fatality rates | Variation average cases/population from April to August | Variation fatality rate from April to August |
| Mann-Whitney U | 0 | 3 | 0 | 4 | 4 |
| Wilcoxon W | 6 | 9 | 6 | 10 | 10 |
| Z | -1.964 | -0.655 | -1.964 | -0.218 | -0.218 |
| Asymp. Sig. (2-tailed) | 0.05 | 0.513 | 0.05 | 0.827 | 0.827 |
| Exact Sig. [2*(1-tailed Sig.)] | .100[b] | .700 [b] | .100 [b] | 1.000 [b] | 1.000 [b] |

*Note: a) Grouping Variable: groups; b) Not corrected for ties.*

*Source: Authors*

Tables 3 and 4, according to Mann-Whitney test, show a significantly lower fatality rate in the group of countries with shorter lockdown periods than the group with longer lockdown periods ($U$ = 0, $p$-value = .005). Other indicators here are also not of significance.

Lastly, Table 5 does not provide any significant result regarding the estimated relationships, possibly due to the small sample size. Figure 3 illustrates confirmed cases and fatality rates, which approximatively do not point to a difference

Figure 3 displays trends of confirmed cases and fatality rates that approximatively do not suggest a difference in the temporal progression of the COVID-19 pandemic in countries with longer or shorter lockdown periods. Specifically, the decline in fatality rates observed over time in the groups studied appears to be a result of the favorable climate conditions of the summer season. Studies have suggested that these conditions can reduce the spread of the COVID-19, rather than the strategic differences of longer or shorter lockdown periods (cf., studies by Coccia, 2020, 2021, 2021a, 2022, 2023; Rosario Denes *et al.,* 2020).

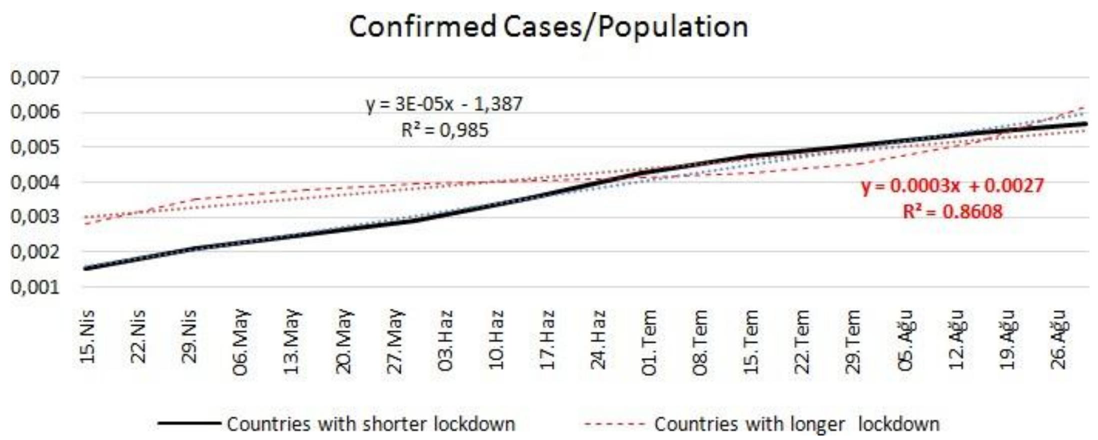
**Table 5: Estimated relationships, based on linear model of regression**

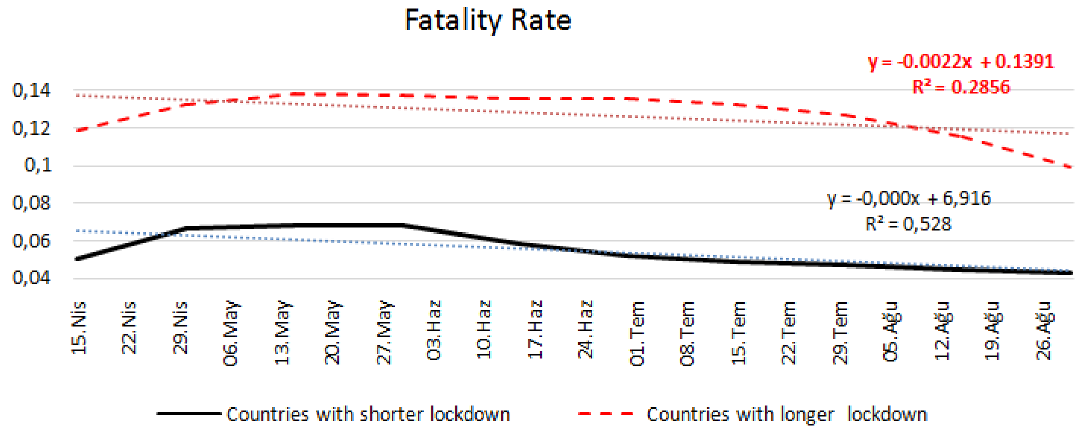
| | Confirmed cases of shorter lockdown countries | Confirmed cases of longer lockdown countries | Fatality rates of shorter lockdown countries | Fatality rates of longer lockdown countries |
|---|---|---|---|---|
| Constant $\alpha$(St. Err.) | −5.34*** (.18) | −2.97***(.18) | 26.00*(8.88) | 21.95(14.06) |
| Coefficient $\beta$(St. Err.) | 3.87E-10[a](.00) | 2.156E-10[a](.00) | −1.88E-9[a](.00) | −1.58E-9[a](.00) |
| Stand. Coefficient Beta | .995 | .896 | −72 | −.48 |
| $R^2$ (St. Err. of Estimate) | .99(.00) | .77(.00) | .52 (.007) | .23 (.012) |
| *F* | 869.52*** | 34.42*** | 8.54* | 2.41 |

*Note: a) not indicated; Dependent variable: time.Significance: *** p-value<0.001; ** p-value<0.01; * p-value<0.05*

*Source: Authors*

**Figure 3: Trend of confirmed cases/population and fatality rates over April-August 2020 in countries with shorter and longer lockdown periods.**






### 3.2 Impact of COVID-19 and lockdown on economic system

**Figure 4: Variation of GDP aggregates (index 2010=100) from 2nd quarter 2020 to 2nd quarter of 2019 and from 1st quarter 2020 to 2nd quarter of 2020 between countries with longer and shorter lockdown periods. Note: Q1= January, February, March; Q2=April, May, June**

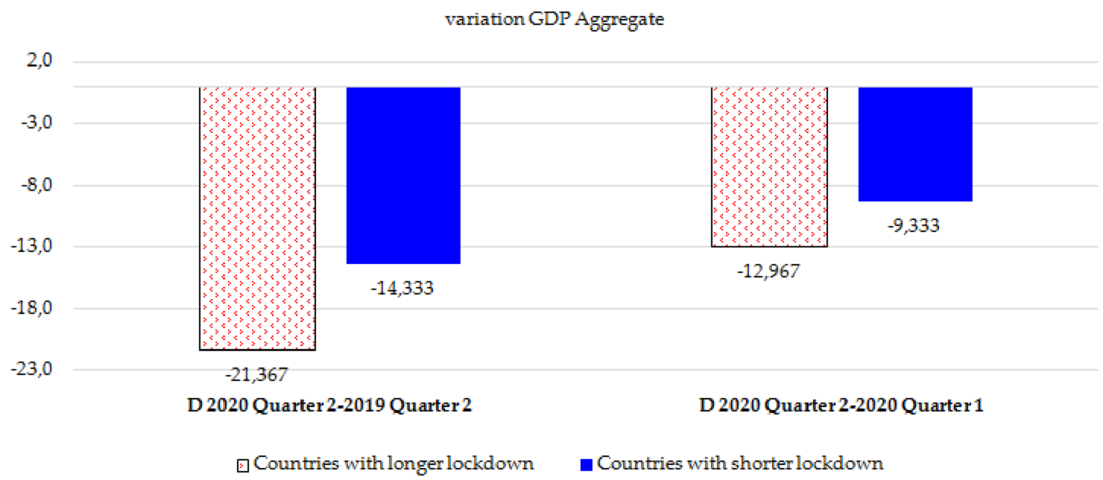


**Table 6: Group statistics for GDP aggregates**

| | Countries | N | Mean | Std. Deviation |
|---|---|---|---|---|
| ∆ GDP(2020Q2-2019Q2) | Shorter period of Lockdown | 3 | -14.33 | 4.59 |
| | Longer period of Lockdown | 3 | -21.37 | 2.76 |
| ∆ GDP(2020Q2-2020Q1) | Shorter period of Lockdown | 3 | -9.33 | 4.37 |
| | Longer period of Lockdown | 3 | -12.97 | 2.83 |

*Note: Q=Quarter of the Gross Domestic Product, GDP; Q1= January, February, March; Q2=April, May, June.*

*Source: Authors*

Figure 4 and Table 6 clearly show that countries that implement longer lockdowns have experienced a more significant decrease in GDP. Such decrease is observed when the index of GDP of the second quarter 2020 is compared to the same indicator in the same period of 2019 and the GDP of the second quarter 2020 is compared to the first quarter(Q) of 2020.

**Table 7: Independent Samples Test for the impact of lockdown on economy of countries**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | |
|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference |
| ∆ GDP (2020Q2-2019Q2) | Equal variances assumed | 1.503 | 0.287 | 2.274 | 4 | 0.085 | 7.033 | 3.093 |
| | Equal variances not assumed | | | 2.274 | 3.276 | 0.1 | 7.033 | 3.093 |

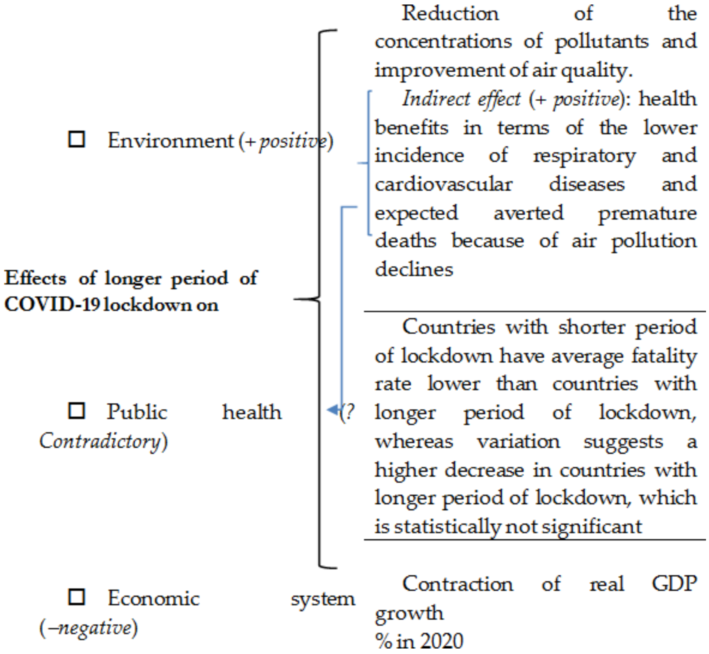
*Source: Authors.*

It is clear from Table 7 that the *p*-value of Levene's test is not significant, suggesting that the output of "Equal variances assumed" must be taken into consideration. Based on the results, there is a notable difference in mean of GDP from Q2 in 2019 to Q2 in 2020 days between countries with longer and shorter lockdown periods ($t_4$ = -2-274, $p$< .085). Specifically, taking into account that the countries studied are located in the same geoeconomic area, those countries with longer lockdown periods have had a GDP aggregate (index 2010=100) that was approximately 7 points lower than those applying shorter lockdowns. This difference can be attributed to the systematic factor of deterioration of the economic system as caused by the negative impact of COVID-19 pandemic, as well as the varying containment measures that have deteriorated this structural indicator of the economic systems mainly in countries with longer lockdown periods.

## 4 Discussion on what this study adds

This study elucidates the impact of varying policy responses to COVID-19 based on longer or shorter lockdowns on public health and economic system. Previous studies indicate that measures of containment can limit the dynamics of human-to-human transmission of infectious diseases in varying ways (Atalan, 2020; Prem *et al.,* 2020; Tobías, 2020). However, as far as we know, no previous study has conducted a comparative analysis of the effects of longer or shorter lockdown periods on public health and economy of countries. *What this study adds to current studies* on the COVID-19 global pandemic crisis is that it provides a meticulous and accurate comparison of varying government responses based on longer/shorter lockdown periods (from April to August 2020) in order to limit the spread of the COVID-19 pandemic. Moreover, the study suggests that longer lockdown periods do not appear to have a link to a statistically significant decrease in the number of confirmed cases among the population or the variation of the fatality rate. Conversely, the countries that implement longer lockdowns have experienced a significant negative impact on their economies (considering a contraction of real GDP growth % in 2020). Overall, the COVID-19 pandemic appears to follow natural dynamics, on which policy responses based on lockdowns at a national level seem to have little effect on significantly decreasing the confirmed cases and mortality rates; however, measures of containment can hinder economic systems, consequently causing social issues. To be more specific, a schematic representation of the results of this study are given in Figure 5 below:

**Figure 5: Impact of national COVID-19 lockdown on environment, public health and economies**




In general, the primary objective of implementing policy response of lockdown as a measure of containment is to minimize the impact that an infectious disease has on public health; however, the results of this study suggest that longer lockdown periods have contradicting and insignificant effects on decreasing the number of confirmed cases and the rates of fatality when compared to shorter lockdown periods. Nevertheless, longer lockdown durations indirectly benefit public health because of reduced concentrations of pollutants, thereby improving air quality. Such improvement in air quality, in turn, can lead to lowered future incidence of respiratory and cardiovascular diseases and expected averted premature deaths (cf., Coccia, 2020, 2021a; Pope, 1989, 1996). In fact, based on their case study conducted in China, Cui *et al.* demonstrate that reductions in air pollution prevent premature deaths and related cases of morbidity, offering fundamental economic benefits through reduced public health expenses and improved social wellbeing.

In summary, countries dealing with the ongoing COVID-19 pandemic have exhibited ambivalent governance practices and an unrealistic optimism regarding their vulnerability to a potential second wave of the pandemic (cf., Weinstein, 1987; Čermáková, *et al.,* 2021). As a matter of fact, despite the significant impact of the initial COVID-19 wave on public health, countries have demonstrated a limited level of national planning to address the second wave of the COVID-19 pandemic crisis. Their policy responses based on lockdown along with other containment measures have been ambiguous and uncertain. In general, it appears that they have not comprehensively extracted lessons from the initial wave of the COVID-19 pandemic to equip themselves with the tools to cope with similar problematic situations and support effective and particularly timely critical decisions (cf., Coccia, 2022; 2023).

## 5 Conclusions

The bright side of this study is that it focuses on countries located in the same geoeconomic area of the European Union, which share similar social and democratic structures. This allows to conduct a comparative analysis of the containment measures adopted to address the COVID-19 pandemic. However, the data of the study are collected from a small sample of countries. So, any future study needs to expand the sample size in order to enhance the generalizability of the key data and maintain a comparable framework for statistical analyses. The statistical evidence presented by this study appears to indicate that the public health effects of a *national lockdown* are contradicting and not straightforward. In other words, longer lockdown durations do not appear to have a significant effect in reducing the number of confirmed cases and fatality rates, but rather can adversely affect the mechanisms of socioeconomic systems that support economic growth.

It is important to note that these conclusions are tentative as numerous factors play a critical role in the face of a second and future COVID-19 waves. Different countries implement different policy responses of lockdown, imposing different social restrictions in the face of increasing numbers of COVID-19 related cases and fatalities. Nevertheless, the use of lockdown as a containment measure on the basis of gradual and intermittent compulsory social restrictions, leads to ambiguous effects on the progression of the pandemic, public health and economic system.

In conclusion, much more comprehensive research is needed to shed light on how countries with varying economic, social and institutional settings can deal with the COVID-19 pandemic crisis with varying measures of containment on the basis of shorter/longer lockdown periods (Coccia, 2022a, 2023; Čermáková, *et al.,* 2021). To sum up, it is of importance to investigate and explain the effects that shorter/longer lockdown periods have on public health and economy, and it is of utmost importance to craft effective containment measures targeting minimization and/or containment of the impact that the second and third waves of the COVID-19 pandemic as well as future similar epidemics may have in societies, all while safeguarding the economic system of nations (Jasova & Kaderabkova, 2022; Bednar, & Kaderabkova, 2022).

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