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Impact of National Gross Public Debt on COVID-19 Fatality Rates: A Study of European Countries

Ulusal Brüt Kamu Borcunun COVID-19 Ölüm Oranları Üzerindeki Etkisi: Avrupa Ülkeleri Üzerine Bir Çalışma

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ABSTRACT

This study investigates the correlation between high national debt, healthcare spending, and COVID-19 mortality rates across European countries. The hypothesis is that excessive public debt undermines healthcare and socioeconomic systems, increasing vulnerability to crises like the pandemic. Findings support this theory. Countries with lower COVID-19 death rates exhibited lower debt levels and higher per capita healthcare spending compared to those with higher mortality rates. Despite increased debt burdens, countries with higher fatality rates struggled to boost healthcare expenditures, potentially due to austerity measures imposed by the European Union. The Methods section indicates that this study analyzed data from 27 EU member states, examining healthcare and economic indicators from 2009 and 2019 to evaluate their influence on COVID-19 mortality rates. Using descriptive statistics, a t-test, and a two-stage least squares (2SLS) regression model, the study compared pre-pandemic trends in healthcare spending and public debt, aiming to assess the impact of high government debt on healthcare systems' crisis response capacity. The research demonstrates a strong association between increased health spending and reduced COVID-19 mortality rates, even when accounting for debt levels. These results highlight the detrimental impact of high public debt on healthcare systems and their ability to respond effectively to public health emergencies. The study underscores the need to address public debt to build more resilient healthcare infrastructures.

KEYWORDS

COVID-19, Government debt, Healthcare spending, Case fatality rate, European Union

ÖZ

Bu çalışma, Avrupa ülkelerinde yüksek ulusal borç, sağlık harcamaları ve COVID-19 ölüm oranları arasındaki ilişkiyi araştırmaktadır. Hipotez, aşırı kamu borcunun sağlık ve sosyoekonomik sistemleri zayıflatarak pandemi gibi krizlere karşı kırılganlığı artırmasıdır. Bulgular bu teoriyi desteklemektedir. Daha düşük COVID-19 ölüm oranlarına sahip ülkeler, daha yüksek ölüm oranlarına sahip olanlara kıyasla daha düşük borç seviyeleri ve daha yüksek kişi başına sağlık harcamaları sergilemiştir. Artan borç yüklerine rağmen, daha yüksek ölüm oranlarına sahip ülkeler, muhtemelen Avrupa Birliği tarafından uygulanan kemer sıkma önlemleri nedeniyle sağlık harcamalarını artırmakta zorlanmıştır. Bu çalışma 27 AB üye ülkesinden verileri analiz ettiğini, 2009 ve 2019'dan itibaren sağlık ve ekonomik göstergeleri inceleyerek COVID-19 ölüm oranları üzerindeki etkilerini değerlendirdiğini göstermektedir. Betimleyici istatistikler, t testi ve iki aşamalı en küçük kareler (2SLS) regresyon modeli kullanılarak, çalışma sağlık harcamaları ve kamu borcundaki pandemi öncesi eğilimleri karşılaştırarak yüksek devlet borcunun sağlık sistemlerinin kriz yanıt kapasitesi üzerindeki etkisini değerlendirmeyi amaçlamaktadır.Araştırma, borç seviyeleri hesaba katıldığında bile artan sağlık harcamaları ile azalan COVID-19 ölüm oranları arasında güçlü bir ilişki olduğunu göstermektedir. Bu sonuçlar, yüksek kamu borcunun sağlık sistemleri ve kamu sağlığı acil durumlarına etkili bir şekilde yanıt verme yetenekleri üzerindeki zararlı etkisini vurgulamaktadır. Çalışma, daha dayanıklı sağlık altyapıları oluşturmak için kamu borcunun ele alınması gerektiğinin altını çizmektedir.

ANAHTAR KELİMELER

COVID-19, Devlet borcu, Sağlık harcamaları, Vaka ölüm oranı, Avrupa Birliği

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INTRODUCTION

Early in 2020, the COVID-19 pandemic broke out, severely upsetting economic and health systems around the world. The pandemic caused a series of unfavorable outcomes, driven by a complex interaction of environmental, social, and economic factors (Abel & Gietel-Basten, 2020; Bontempi et al., 2021; Coccia 2020, 2021, 2022, 2023; Goolsbee & Syverson, 2021; Núñez-Delgado et al., 2021; Tisdell, 2020). These include the alarmingly high number of COVID-19 infections and deaths, as well as the long-term social and economic effects both domestically and internationally.

Between 2020 and 2023, the COVID-19 pandemic revealed glaring differences in death rates between countries, especially in the relatively similar European countries with interconnected socioeconomic systems (JHU, 2023). Researchers are now looking into the underlying causes of the variation in COVID-19 mortality rates across different countries and regions in response to this unequal impact (Shakor et al., 2021; Sorci et al., 2020; Khan et al, 2020).

Research indicates that nations with strong healthcare systems and readily available medical resources, like ventilators, are better able to control the spread of airborne illnesses like COVID-19 and, as a result, reduce overall mortality (Coccia, 2021, 2022, 2023, 2023a; Magazzino et al., 2022; Coccia, 2023). But a crucial question still remains: What factors contribute to countries having more developed healthcare infrastrutures and, crucially, higher healthcare spending levels? These resources are essential for combating the COVID-19 pandemic and lowering case fatality rates (CFR), which measure the percentage of deaths compared to confirmed infections.

European countries provide a useful case study to investigate the social impact of COVID-19 due to their stable structural indicators, consistent socioeconomic frameworks, and suitability for comparative analysis. This study aims to clarify the intricate connection between a nation's healthcare system's resilience and its level of public debt, particularly in the face of an unexpected disaster like the COVID-19 pandemic. In particular, the following research questions are posed by this project:

- Do Higher levels of public debt, when combined with other factors, reduce the ability of health systems to withstand systemic vulnerability and the COVID-19 fatality rate?
- Which counties demonstrated great preparedness and resilience at the onset of the pandemic wave to deal with the unanticipated COVID-19 pandemic catastrophe and subsequently reduce the number of fatalities?

The current study seeks to ascertain if statistical evidence supports the hypothesis that a high burden of public debt correlates with reduced health system resilience, potentially resulting in a higher COVID-19 fatality rate among European countries. If supported, quantitative analyses and estimates of the relationship between public debt, health expenditures, and the rate of COVID-19 fatalities will be provided.

The purpose of this study is to investigate the relationship between high levels of public debt, healthcare spending, and COVID-19 mortality rates across European countries. Specifically, the study aims to assess whether countries with higher public debt and constrained healthcare budgets experienced higher mortality rates during the pandemic. By examining the correlation between national debt burdens, the resilience of healthcare systems, and their ability to respond to public health crises, the research seeks to highlight the long-term socioeconomic and fiscal factors that may exacerbate vulnerabilities in health systems.

The scope of the study includes a comparative analysis of European countries, focusing on the period between 2020 and 2023 when the COVID-19 pandemic had its most significant impacts. The research draws on quantitative data related to public debt, healthcare expenditures, and COVID-19 case fatality rates to evaluate the extent to which fiscal policies and austerity measures influenced healthcare outcomes during the pandemic. Furthermore, the study considers historical data on healthcare spending from 2009 to 2019 to establish trends and relationships between financial investments in healthcare infrastructure and pandemic preparedness. This research ultimately aims to contribute to the broader discussion on public debt management, healthcare funding, and pandemic preparedness, offering policy recommendations for building more resilient healthcare systems capable of withstanding future public health emergencies.

This study significantly contributes to the existing literature by bridging the gap between fiscal policies, particularly national debt levels, and public health outcomes in the context of the COVID-19 pandemic. While previous research has explored the impacts of healthcare spending on pandemic preparedness, few studies have examined the compounded effects of high public debt and austerity measures on a country’s ability to manage health crises. By emphasizing the link between constrained healthcare budgets due to debt-related austerity measures and higher COVID-19 morality rates, this research provides a unique perspective on how macroeconomic policies influence health system resilience and public health outcomes.

Additionally, this study innovatively integrates long-term fiscal trends with pandemic-specific health data, analyzing healthcare expenditures over the decade preceding the pandemic (2009–2019) to contextualize the healthcare system's preparedness. It offers a unique quantitative analysis that links incremental increases in healthcare spending with reductions in COVID-19 mortality, providing deeper insights into how sustained investment in health systems contributes to better outcomes during global health emergencies. This comprehensive approach broadens the current body of knowledge, which often focuses mainly on short-term crisis responses, by underscoring the importance of long-term fiscal stability for public health resilience.

1. LITERATURE REVIEW

The outbreak of the COVID-19 pandemic in early 2020 led to unprecedented global health and economic challenges, particularly in Europe, where public health systems were tested under extreme conditions. The impact of the pandemic varied significantly between European countries, revealing disparities in mortality rates, health system resilience, and economic stability (JHU, 2023; Tisdell, 2020). The literature suggests that these disparities are linked to the interaction between healthcare spending, public debt, and economic policies, particularly austerity measures (Alesina et al., 2019; Bush et al., 2013).

One of the critical determinants of pandemic resilience is healthcare expenditure. Numerous studies have shown that countries with robust healthcare systems, marked by higher per capita spending, experienced lower mortality rates during the pandemic (Coccia, 2021, 2022, 2023; Magazzino et al., 2022). Coccia (2021) emphasized the role of healthcare spending in enhancing a nation's ability to diagnose, treat, and manage crises like COVID-19, reducing the overall case fatality rate (CFR). In line with this, countries with higher healthcare spending, such as Germany, were better able to manage the health crisis, while countries like Italy and Greece, which have faced prolonged periods of economic austerity, struggled to meet the healthcare demands of the pandemic (Sagan et al., 2020).

Empirical research further supports the link between increased healthcare spending and improved pandemic outcomes. A regression analysis conducted by Coccia (2022) found that a 1% increase in per capita healthcare expenditure from 2009 to 2019 correlated with a 2.63% reduction in COVID-19 fatalities. This evidence suggests that long-term investment in healthcare infrastructure, including staffing and hospital capacity, is essential for reducing mortality rates during public health emergencies.

However, healthcare spending is often constrained by broader fiscal policies, particularly in countries with high levels of public debt. The literature reveals that nations with significant debt burdens face limitations in increasing healthcare expenditures, particularly when subjected to austerity measures imposed by international financial institutions or the European Union (Nickel et al., 2010; Bush et al., 2013). These austerity measures, designed to reduce fiscal deficits, often result in cuts to public services, including healthcare, which in turn increases vulnerability during crises like the COVID-19 pandemic (Alesina et al., 2019; McKee et al., 2012).

The relationship between public debt and healthcare resilience is well documented. For instance, Greece, which has one of the highest public debt-to-GDP ratios in Europe, struggled to mobilize healthcare resources during the pandemic, leading to higher mortality rates (Sagan et al., 2021). Similarly, Italy, which also carries a significant public debt burden, experienced some of the highest COVID-19 mortality rates in Europe, partly due to the constraints on healthcare spending that had been imposed following the 2008-2009 financial crisis (Köhler-Töglhofer & Zagler, 2004; Nickel et al., 2010).

In their analysis of the fiscal impact of the pandemic, De Soyres et al. (2022) found that countries with high initial debt levels were less able to implement countercyclical fiscal policies, which exacerbated the health crisis. These findings align with the European Central Bank's (ECB) assertion that high public debt reduces a country's capacity to respond to economic shocks, further compromising healthcare system resilience (ECB, 2016). Moreover, the literature highlights that the pandemic accelerated public debt accumulation globally between 2020 and 2021, placing additional strain on healthcare systems that were already underfunded (Fan et al., 2023).

Austerity measures, which have been implemented in response to high public debt, have had detrimental effects on healthcare systems across Europe. McKee et al. (2012) argue that austerity policies often result in reduced public health expenditures, thereby weakening the healthcare infrastructure that is essential for managing pandemics. This is particularly evident in Southern European countries, where austerity has led to significant cuts in healthcare staffing and hospital capacity, exacerbating the COVID-19 crisis (Sagan et al., 2020).

Research conducted by Alesina et al. (2019) supports this view, demonstrating that austerity measures, while intended to stabilize economies, often lead to underinvestment in critical public sectors like healthcare. These policies not only reduce the capacity of healthcare systems to respond to emergencies but also widen

health inequalities, leaving vulnerable populations at greater risk. The case of Italy is particularly telling, as the country's adherence to fiscal consolidation policies in the years leading up to the pandemic severely limited its ability to expand healthcare services when COVID-19 struck (Kargı et al., 2023).

Governance plays a crucial role in determining how effectively countries can manage public health crises, regardless of their public debt levels. Benati and Coccia (2022) argue that strong governance, characterized by transparent decision-making, efficient resource allocation, and sound public health policies, is essential for enhancing pandemic preparedness and health system resilience. Countries like Germany, which demonstrated effective governance and coordinated responses, were able to mitigate the worst effects of the pandemic, even in the face of significant public health challenges (Kluge et al., 2020).

In contrast, countries with weaker governance structures, compounded by high public debt, struggled to manage the pandemic effectively. Sagan et al. (2020) emphasize that a lack of coordinated governance, combined with austerity measures, led to underfunded healthcare systems, which proved inadequate in responding to the rapid spread of COVID-19. This underscores the need for a coordinated European Union approach to crisis preparedness, as proposed by Legido-Quigley et al. (2020), which would integrate healthcare surveillance systems and funding mechanisms to strengthen resilience across member states.

The literature consistently points to the detrimental impact of high public debt on healthcare system resilience, particularly in countries subjected to austerity measures. Increased healthcare spending is critical for reducing mortality during pandemics, but fiscal constraints often limit governments' ability to invest in public health infrastructure (Coccia, 2021; De Soyres et al., 2022). As Europe faces ongoing challenges related to public debt and health system funding, the need for a balanced approach to fiscal policy that prioritizes long-term health investments is evident (Kargı et al., 2023).

Moreover, strong governance is essential for managing crises effectively. Countries with transparent and efficient health policies were able to mitigate the worst effects of the pandemic, even when facing economic constraints (Benati & Coccia, 2022). Moving forward, a coordinated effort within the European Union, supported by robust governance structures and sustained investments in healthcare, is necessary to improve resilience and preparedness for future public health emergencies (Allen-Douglas, 2022; Penkler et al., 2020).

2. METHODS

2.1. Sample

Based on a homogeneous sample of 27 EU member states with comparable socioeconomic structures, our study employs robust statistical analysis. Specifically, the following European nations are included in the sample: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden.

2.2. Variables

To assess pre-pandemic conditions, this study investigates key health and economic indicators from 2009 and 2019, chosen for their potential influence on a health system's ability to handle sudden crises. By analyzing the relationship between these factors and the 2020 COVID-19 case fatality ratio, we aim to determine if pre-existing weaknesses, such as high debt burdens, may have contributed to higher mortality rates when treatments were limited.

Table 1. Variables and sources

Variable, Acronym, source	Description
Total health care spending per capita in 2009 and 2019 (in US dollars). WHO in 2023	Per capita total expenditure on health, expressed in current US$.
Annual general government gross debt as a percentage of GDP between 2009 and 2019 (Eurostat, 2023)	The statistic is defined under the Treaty on the Functioning of the European Union as the ratio of gross domestic product at current market prices to the amount of outstanding government debt at the end of the year. Government liabilities, as defined in ESA 2010, include currency and deposits, debt securities, and loans. The total consolidated gross debt at nominal value in these categories constitutes government debt for this computation. The general government sector comprises federal government, state government, municipal government, and social security funds. For further guidance on methodology and interpretation, the Eurostat Manual on Debt and Government Deficit is recommended.
As of December 30, 2020, the case fatality rate at JHU (2023)	The COVID-19 case mortality toll divided by the total number of COVID-19 infections

2.3. Working hypothesis and process for analyzing data

The goal of this research is to ascertain whether there is statistical support for the hypothesis that differences in COVID-19 death rates between European nations are correlated with the proportion of their governments' debt to GDP. It is hypothesised that the composition and operation of healthcare systems are strongly impacted by government debt.

Initially, we will analyze the data presented in Table 1 using descriptive statistics such as the mean, standard deviation, skewness, and kurtosis to verify whether the data follows a normal distribution. This step is crucial for conducting subsequent statistical tests.

According to the estimate, the average COVID-19 death rate in 2020—the first year of the pandemic—will divide European nations into two groups:

- **Group 1**: Countries with death rates below the average.
- **Group 2**: Countries with death rates above the average.

We will examine the changes in healthcare spending and government debt for both groups from 2009 to 2019 to assess pre-pandemic economic trends. The year 2009 was chosen due to the global financial crisis, which led many countries, including Italy, to reduce their debt. The rate of change for a given variable xxx is calculated using the formula:

$$\Delta change\ of\ variable\ x = \frac{(x\ in\ 2019 - x\ in\ 2009)}{x\ in\ 2009}$$

Subsequently, we will compute the arithmetic mean (Δ) and the standard deviation of these changes within each group. To compare the two groups, we will calculate the average change in healthcare spending and its variability within each group. A t-test will be employed to determine if there are significant differences in the average changes between the two groups. Prior to the t-test, we will use Levene's test to check for homogeneity of variances. The following are the theories behind the independent samples t-test:

H0: $\mu 1=\mu 2$, indicating that the means of the two groups are equal.

H1: $\mu 1\neq\mu 2$, indicating that the means of the two groups are not equal.

To analyze the relationship between government debt, healthcare spending, and COVID-19 death rates, we will utilize a two-stage least squares (2SLS) regression model to address potential data complications. This method uses instrumental variables to estimate problematic variables before incorporating these estimates into the final regression model.

The model will explore the following:

Outcome variable: COVID-19 death rate in 2020.

Predictor variable: Change in per capita healthcare spending from 2009 to 2019.

Instrumental variable: 2009 government debt as a share of GDP.

The 2SLS model consists of two stages, represented by these equations:

Stage 1:

$y=\alpha+\beta_1 \cdot x+u$

where:

y = Change in per capita healthcare spending from 2009 to 2019.

x = Government debt as a percentage of GDP in 2009.

u = Error term.

Stage 2:

$f=k+\beta_2 \cdot fit_y+e$

where:

f = COVID-19 death rate in 2020.

fit_y = Predicted value of yyy from Stage 1.

e = Error term.

In these equations, α and k represent constants, and β_1 and β_2 are coefficients that measure the strength of the relationships between the variables.

3. RESULTS

In the first year of the COVID-19 pandemic, on December 30, 2020, the average (M) case fatality rate (SD) for European countries was 0.86%, while the standard deviation (SD) was 1.98%. Based on this mean, the nations are divided into two categories:

- Group 1: Countries where the average COVID-19 fatality rate is less than the norm, at 1.40%.
- Group 2: Countries where the average COVID-19 fatality rate is higher than 2.83%.

Table 3 presents results of the Independent Samples t-Test and Levene's test, assessing the significance of mean differences between groups 1 and 2 from Table 2. Group 1, with higher per capita health spending (> $3,100) and a growth rate of 0.19 from 2009 to 2019, exhibits a significantly lower COVID-19 fatality rate (1.40% vs. 2.83%) compared to Group 2. In contrast, Group 2, with lower absolute values of health spending per capita (approx. $2,530 in 2009 and $2,600 in 2019) and a slower growth rate of 0.09, demonstrates a higher fatality rate. Additionally, Group 1 maintains consistently lower government debt, with debt-to-GDP ratios of 50.79% and 46.80% in 2009 and 2019, respectively, compared to Group 2's higher ratios (81.49% and 67.22%). Group 1 also experiences slower debt growth (0.12% vs. 0.29%) from 2009 to 2019.

Table 2. Descriptive data grouped by categories

	Countries with LOWER 2020 COVID-19 mortality rates		Countries with HIGHER 2020 COVID-19 death toll	
Variables	Mean	Std. Deviation	Mean	Std. Deviation
COVID-19 Fatality 2020 (%)	1.40	0.44	2.83	0.54
Healthcare Exp Per Capita $ 2009	$3,119.79	$2,192.71	$2,609.13	$1,828.01
Healthcare Exp Per Capita $ 2019	$3,376.29	$2,014.03	$2,530.77	$1,749.05
Δ Healthcare Exp Per Capita $ 2009-2019	0.19	0.30	0.09	0.31
Government gross debt, % of GDP 2009	50.79	27.22	81.49	46.60
Government gross debt, % of GDP 2019	46.80	22.21	67.22	37.35
ΔGovernment gross debt, % of GDP 2009-2019	0.12	0.31	0.29	0.38

Note: Δ= is the rate of change in per capita health spending and the government's gross debt from 2009 to 2019, before the COVID-19 pandemic disaster.

The findings of the Independent Samples t-Test, which are shown in Table 3, compare the mean values between Group 1 and Group 2, with the exception of the COVID-19 fatality rate in 2020. Significant variations are evident in most of the measures. This implies that the observed differences between the groups are unlikely to be the product of random chance.

The results of the Two-Stage Least Squares (2SLS) regression analysis are shown in Table 4. In the subsequent phase, the COVID-19 fatality rate for countries in Europe in 2020 serves as the dependent variable. The findings show that, after taking into consideration the levels of public debt, a 1% increase in per capita health spending between 2009 and 2019 resulted in a 2.63% decrease in the fatality rate. A statistically

significant association between the variables (p-value < 0.01) is demonstrated by this model, which accounts for approximately 25% of the variation in COVID-19 fatality rates.

The susceptibility of different nations to the COVID-19 pandemic is illustrated in Figure 1. Higher death rates are found in nations that are above the average line, including Greece, Italy, Belgium, Hungary, Spain, Poland, Slovenia, and Romania. On the other hand, nations below the line have demonstrated stronger health systems (Sagan et al., 2020, 2021).

Table 3. The Independent Samples Test was conducted using the average mean of the variable change in group 1 and group 2 European nations from 2009 to 2019.

Δ= the rate of change from 2009 to 2019		Levene's Test for Equality of Variances		t-test for Equality of Means		
	Equal variances	*F*	Sig.	t	df	Sig.(2-tailed)
Healthcare Exp Per Capita $ 2009	assumed	1.358	0.255	0.635	25	0.531
	not assumed			0.657	23.947	0.517
Healthcare Exp Per Capita $ 2019	assumed	2.095	0.16	1.129	25	0.270
	not assumed			1.16	23.515	0.258
Δ Healthcare Exp Per Capita $ 2009-2019	assumed	0.214	0.648	0.828	25	0.416
	not assumed			0.826	21.541	0.418
Government gross debt, % of GDP 2009	assumed	4.609	0.042	-1.784	25	0.087
	not assumed			-1.626	14.865	0.125
Government gross debt, % of GDP 2019	assumed	3.460	0.075	-2.163	25	0.040
	not assumed			-1.966	14.702	0.068
ΔGovernment gross debt, % of GDP 2009-2019	assumed	0.64	0.431	-1.275	25	0.214
	not assumed			-1.23	18.852	0.234
COVID-19 Fatality rate in 2020	assumed	0.698	0.411	-7.518	25	0.001
	not assumed			-7.245	18.775	0.001

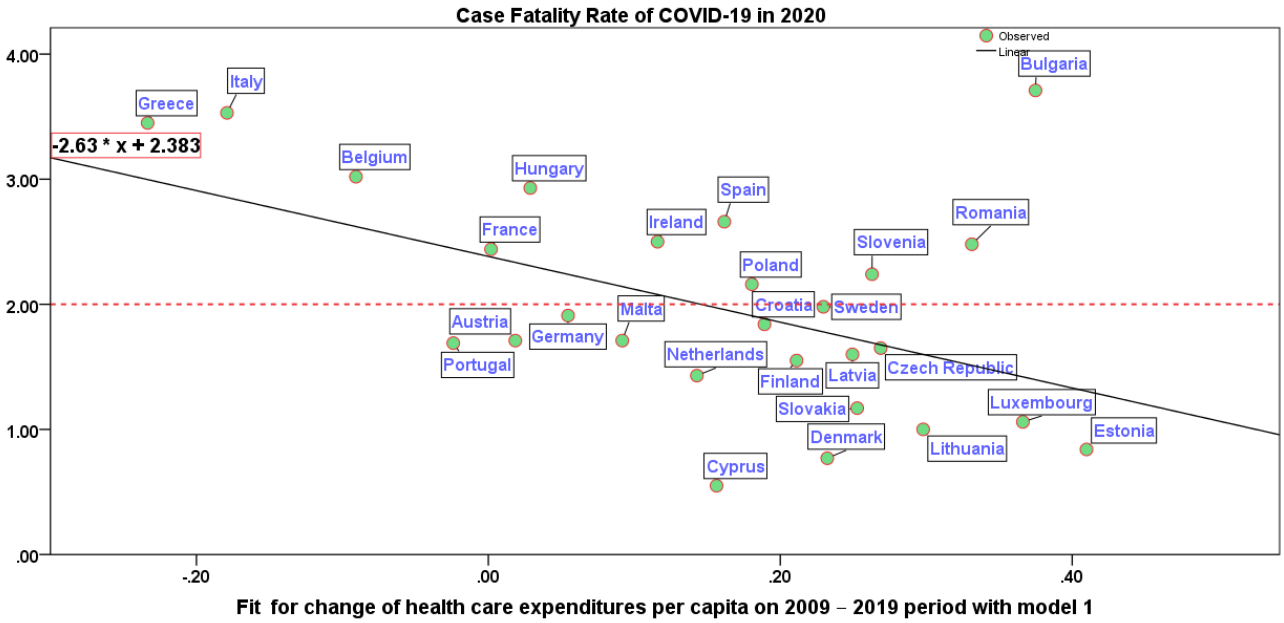
Note: Group 1 consists of nations with LOWER COVID-19 fatalities in 2020; Exp= Expenditure; Group 2 consists of countries with HIGHER COVID-19 deaths in 2020.

Table 4. Estimates of the 2SLS model using parameters

	Constant	Coefficient β	Standardized Coefficient Beta	R^2	*F*
Stage 1					
Change of health care expenditures per capita US$ in 2009 – 2019 (1)	0.449***	−0.005**	−0.540	0.29	10.27**
Stage 2					
COVID-19 Case fatality rate 2020 (2)	2.383***	−2.626**	−0.502	0.25	8.41**

Note: (1) Explanatory variable: the percentage of GDP that the general government owes in 2009; *** p<0.001; ** p<0.01; (2) Explanatory variable: A stage 1 model fitted to the variance in health care spending per capita between 2009 and 2019.

Figure 1. Regression line of the 2020 COVID-19 fatality rate fitted to changes in per capita health care spending between 2009 and 2019 using a stage 1 model



4. DISCUSSION

To safeguard public health and bolster readiness for future pandemics, robust healthcare system funding is essential (Coccia, 2021, 2021b, 2022). Increased per capita healthcare spending correlates with faster diagnoses, improved treatments, and more effective crisis management (Coccia, 2021a). Lower COVID-19 mortality rates align with higher healthcare expenditures on staffing, hospital capacity, and preventive services. Conversely, European nations with higher COVID-19 mortality rates had lower per capita healthcare spending, approximately $2,600 in 2019. Regression analysis links a 1% increase in per capita health spending from 2009 to 2019 to a 2.63% reduction in COVID-19 fatalities, emphasizing public debt's role in economic stability.

High public debt hampers healthcare system resilience, as seen in Greece and Italy (Sagan et al., 2020, 2021). Austerity measures can exacerbate vulnerabilities, impacting public services like healthcare (Bush et al., 2013). The 2008-2009 financial crisis left Europe with substantial public debt, leading to long-term fiscal consolidation, particularly in public salaries and healthcare (Nickel et al., 2010). High public debt limits policy options, negatively impacts financial markets, and necessitates spending cuts for debt reduction (Köhler-Töglhofer & Zagler, 2004). Increased fiscal adjustments, not debt accumulation itself, drive reductions in government spending multipliers (Iwata & Iiboshi, 2023). Public policies often underemphasize their impact on crisis resilience.

High public debt economies struggle with countercyclical fiscal policies, making them more vulnerable to severe economic downturns (Burriel et al., 2020). The ECB highlights how high public debt reduces economic shock resistance, potentially leading to fiscal consequences (ECB, 2016). Unexpected public debt increases typically harm real GDP, especially in countries with high initial debt levels (De Soyres et al., 2022).

The COVID-19 pandemic accelerated global public debt accumulation between 2020 and 2021 (Fan et al., 2023). Different crises lead to varying debt and growth patterns (Georgantas et al., 2023). Austerity measures in response to high public debt have reduced healthcare expenditures and access to care, exacerbating COVID-19-related infections and fatalities (McKee et al., 2012). Public ambiguity has heightened vulnerability and reduced resilience in European healthcare systems.

Increased health spending is crucial for pandemic readiness. However, effective disease surveillance systems, public health infrastructure, and health policy responses require sound governance (Benati & Coccia, 2022, 2022a; Kluge et al., 2020; Sagan et al., 2020). High public debt burdens challenge this strategy. The COVID-19 crisis demonstrated how European austerity policies can harm health expenditures (Alesina et al., 2019). Investing in public health infrastructure and healthcare systems, supported by strong governance, is essential for mitigating vulnerabilities and protecting populations from future outbreaks (Benati & Coccia,

2022a; Coccia, 2021a). Targeted healthcare infrastructure investments can improve health outcomes and bolster resilience.

Despite public health systems' leadership during the pandemic, many governments underinvest in these sectors (Jacques et al., 2023). Austerity budgets often reduce public health and medical care spending. Prioritizing research capacity building and addressing health inequalities is crucial for future crisis preparedness. Sustaining vital health funding, including pandemic preparedness investments, is essential.

True systemic resilience requires increased health expenditure and effective governance (Sagan et al., 2020). Resilient nations minimize shock exposure and swiftly implement mitigation measures (Bouchet et al., 2003). Even with high public debt, sound governance must prioritize health spending for resilience-building, ensuring response capacity and appropriate governance structures.

A coordinated European Union effort is vital, including collaborative funding projects, common surveillance systems, and an integrated crisis preparedness framework (Legido-Quigley et al., 2020). A multi-sectoral strategy is necessary to improve preparedness, resilience, and reduce pandemic mortality rates in European countries (Coccia, 2019; Penkler et al., 2020). Increased health spending must be part of larger, systemic policies to improve resilience throughout Europe; isolated policy initiatives are insufficient (Allen-Douglas, 2022; Barro, 2020; McKee, 2020; Sagan et al., 2020; Kargı et al., 2023, 2023a, 2023b; Uçkaç et al., 2023, 2023a).

CONCLUSION

The COVID-19 pandemic exposed significant disparities in illness prevention and treatment across European nations, likely influenced by national health system funding and constrained by high public debt and austerity measures (Alesina et al., 2019). Balancing macroeconomic stability with efforts to reduce mortality during pandemics is crucial (Coccia, 2021).

Our hypothesis linking public debt to health expenditure and COVID-19 case fatality rates is supported by statistical evidence (Alesina et al., 2019). Debt-management austerity often reduces healthcare budgets, which increases vulnerability during pandemics (Coccia, 2023). Higher per capita healthcare spending from 2009 to 2019 correlates with lower COVID-19 mortality rates, indicating improved pandemic preparedness (Coccia, 2022, 2022a, 2022b; Kluge et al., 2020; Kapitsinis, 2020). Prioritizing investments in healthcare infrastructure enhances resilience against infectious diseases. Strengthening health systems under sound governance is essential for future preparedness against pandemics, especially those involving severe respiratory disorders (Coccia, 2022, 2022a, 2022b; Kluge et al., 2020; Kapitsinis, 2020).

An effective pandemic response requires both long-term planning and consistent health sector investment, including advancements in IT infrastructure and workforce development (Coccia, 2021). Countries with higher per capita healthcare spending and lower public debt experienced reduced COVID-19 mortality rates. However, further research is needed to explore other factors influencing the correlation between public debt, health spending, and COVID-19 fatality rates (Coccia, 2021). Gaining a deeper understanding of these dynamics can inform policies to mitigate future pandemics and crises while preserving public health and socioeconomic equilibrium.

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