Economics

The effectiveness of fiscal-budgetary measures to counteract the COVID-19 crisis. Evidence from EU countries

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Adina DORNEAN and Dumitru-Cristian OANEA

Abstract
The aim of this paper is to analyze the fiscal-budgetary measures, which have been taken by almost all governments around the world, including EU countries, in an attempt to limit the negative impact of the pandemic blockade. In most cases, these measures concerned the granting of technical unemployment, the postponement of tax payments, the suspension or postponement of loan installments or their maturity. Our study focuses especially on the tax and expenditure measures that EU countries have introduced in response to the COVID-19 crisis in order to support businesses. The analysis of the measures taken by different states is useful and important for establishing which the best practices are. Thus, we use paired sample t-test and multiple linear regression based on balanced panel data for the 27 EU countries for the period 2000Q1 - 2020Q3. Our results show that COVID-19 crisis had a significant negative impact on GDP growth. In the same time, we found a significant increase in Public Debt and Government Deficit due to COVID-19 crisis. However, resuming our findings, the intensity and, implicitly, the effect of these measures depend on the specifics of each economy.

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1 Introduction

The outbreak of the coronavirus was resulting in a health crisis and a drop in economic activity that was without precedent in recent history. In the context of the COVID-19 pandemic crisis, the recovery pace of the world's economies depends on the policies that governments and companies have taken and will continue to take. Thus, the pandemic has elevated the need for fiscal policy action to an unprecedented level.

The health and economic crisis caused by COVID-19 provides a strong rationale for temporary government support for firms. Some sectors have been hit particularly hard (e.g. airlines, restaurants), but the damage is propagating throughout all sectors and economies.

Countries around the world have adopted various forms of support. In the case of measures taken to support businesses, the main types are: revenue measures in order to provide liquidity relief to firms that may face difficulty in paying taxes and other costs; expenditure measures with the objective to help the affected companies to pay for wages and other liquidity needs, such as wage subsidies (to preserve the employer-employee relationship), transfers, or more general liquidity support to firms; government guarantees; subsidized loans provided directly by governments for companies with liquidity pressures; use of extrabudgetary funds (EBFs) managed by the public authorities (e.g. the French Solidarity Fund or Germany's economic stabilization fund, WSF).

According to the European Commission (European Commission, Policy measures taken against the spread and impact, 2020), the policy measures taken against the spread and impact of the coronavirus should be classified into the following categories: expenditure measures; tax measures; sectorial, regional, or measures other than fiscal; any other measures.

In most cases, these measures concerned the granting of technical unemployment, the postponement of tax payments, the suspension or postponement of loan installments or their maturity.

Our study investigates especially the tax and expenditure measures that EU countries have introduced in response to the COVID-19 crisis in order to support businesses. First, we want to highlight the impact of COVID-19 crisis on economic growth (measured by GDP growth) and then to study if the measures taken by all countries, were capable to counteract in a short period of time a part of the negative impact of COVID-19 crisis, by analyzing the evolution of some relevant indicators for economic situation (economic growth, public debt and budgetary deficit) during the time with a focus on the quarters of 2020.

The structure of the paper consists of five sections. Section two provides a review of the adopted measured and their impact. In section three we explain

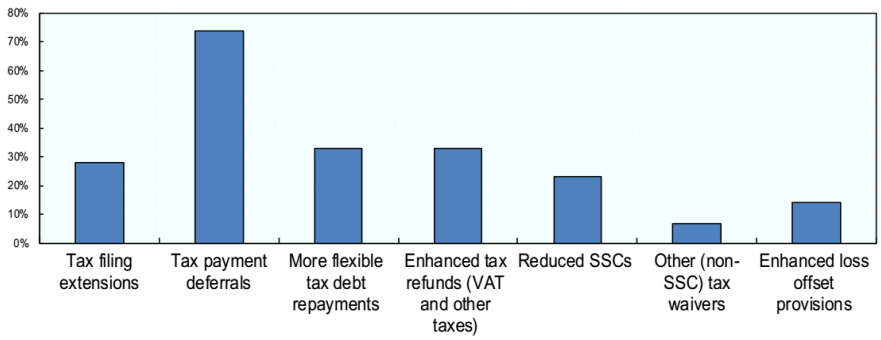
the data source used and we present the main descriptive statistics of the sample and the methodology employed. Section four is dedicated to the presentation of the main results and discussions. Finally, we end by concluding the most relevant results.

2 Literature review regarding the adopted measures and their impact

According to the Report of European Fiscal Monitor (EU Independent Fiscal Institutions, European Fiscal Monitor, 2021), the EU 27 countries introduced over 1,000 budgetary measures to counter the effects of the pandemic in 2020 and/or 2021. The size of the fiscal measures amounted to 5% of GDP in 2020 and 2% of GDP until March 2021, but the fiscal policies for stimulating EU economies will increase in 2021, if new measures will be adopted or current support measures will be extended.

There is an important number of measures (as we can see in the Communication of European Commission - (European Commission, Policy measures taken against the spread and impact, 2021) and it is not our objective to present every measure, but to resume it. Thus, the main priority for countries has been to support business cash flow. Maintaining business cash-flow has been a core goal of the fiscal policy measures (Figure 1) that have been introduced: extending deadlines for tax filing, the deferral of tax payments, the provision of faster tax refunds, more generous loss offset provisions, and some tax exemptions, including from social security contributions, payroll taxes or property taxes (OECD, 2020).

Figure 1. Main tax measures to support business cash flow in OECD and G20 countries (percentage of OECD and G20 countries reporting each type of measure)



Source: OECD. 2020. Tax and Fiscal Policy in Response to the Coronavirus Crisis: Strengthening Confidence and Resilience.

The degree of policy targeting varied across countries, sectors and businesses, because in some countries, the measures were available to all firms, but in other countries, the measures were granted to specific sectors (e.g. tourism, commercial air travel) or to companies that have experienced a significant drop in revenues (in this case, the taxpayers had to prove the revenue decrease to the tax authority). Also, there are few countries, where the companies receive government support only if they ask for it. On the other hand, there are countries that offered support to small and medium sized enterprises (SMEs) or self-employed businesses considering that these businesses will face higher liquidity constraints than others.

In non-OECD, non-G20 emerging market and developing economies, the most common type of measure has been tax payment deferrals (45% of the total number of measures reported) and also there are mentioned tax filing extensions and more flexible tax debt repayment plans (OECD, 2020).

Regarding the EU countries, the Table 1 provides an overview of the tax policy measures that countries have implemented in response to the Covid-19 pandemic. Thus, the table highlights the types of taxes that have been reformed for each EU country during the immediate crisis phase. In this context, we can notice that personal income tax (PIT), corporate income tax (CIT) and value added tax (VAT) have been the most reformed taxes.

Table 1. Tax policy measures in EU, by tax type

Country	PIT	CIT	SSCs	Property taxes	VAT	Other consumption taxes	Other
Austria	■	■			■	■	■
Belgium	■	■	■	■	■		■
Bulgaria	■	■		■	■		■
Croatia	■	■			■		
Cyprus	■		■		■		
Czech Republic	■	■			■		■
Denmark		■					■
Estonia			■				■
Finland		■			■		
France	■	■	■		■		■
Germany	■	■	■		■		■
Greece	■		■	■	■		■
Hungary		■	■		■	■	■
Ireland	■		■	■	■		■
Italy	■	■	■	■	■	■	■

Latvia							
Lithuania							
Luxembourg							
Malta							
Netherlands							
Poland							
Portugal							
Romania							
Slovak Republic							
Slovenia							
Spain							
Sweden							

Source: author elaboration from OECD. 2020. Overview of Country Tax Policy measures in response to COVID-19 crisis. Retrieved from: http://www.oecd.org/tax/tax-policy/#d.en.194478.

Regarding the expenditure side of fiscal policy, we extract the policy measures from the Report of IMF (IMF Fiscal Affairs, 2020) and we highlight for the case of the EU countries. The most common measures were consisting in providing support through direct lending, loan guarantees, capital injection (in Italy) and deferral of utility and rent payments (France and Spain). In some EU countries is mentioned also the support provided in form of wage subsidies (Austria, France, Denmark, Estonia, Ireland, Italy).

It is considered that expenditure measures are more effective for offering targeted support to firms particularly hard hit by the crisis, having difficulties in accessing the financial system, or not included in the tax system. Also, it is important to mention that these types of expenditure support are typically temporary and on short-term.

Table 2. Expenditure Policy Responses to COVID-19 Outbreak

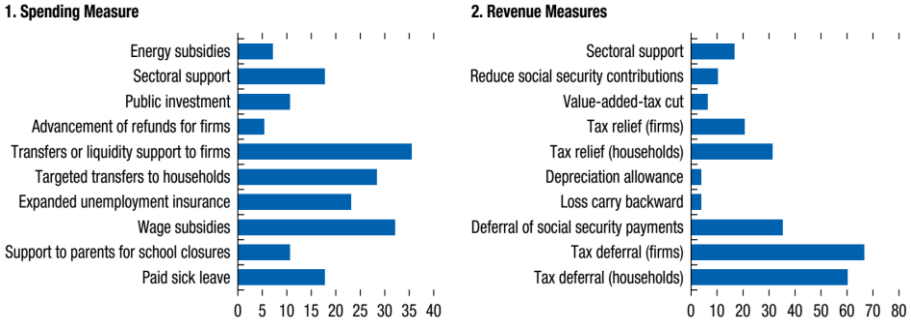
Measures	Targeted population	Targeting method	Countries/regions
Supporting businesses			
		Financial conditions such as drop in sales	New York
		Sector-based targeting	Armenia, Argentina, Indonesia, Russia, United States
Loans, guarantees, and capital injection	Hard hit businesses	Place-based targeting	Italy
		SMEs directly or institutions that works with SMEs	Argentina, Australia, Italy, Spain, United States

		Local governments and community organizations	United States
Deferral of payments such as for utilities, rents or taxes	Hard hit businesses	Sector-based targeting	Indonesia, Venezuela
		SMEs	France, Spain
Preserving employment linkages			
Wage subsidies	Workers facing layoffs or reduction in hours	For workers whose wages are below a certain level	Austria, France, Singapore
	Workers facing layoffs or reduction in hours	Typically targeted at certain firms or workers to keep fiscal cost low	Denmark, Estonia, Ireland, United Kingdom, United States,
		Universal	Italy
Employment and wage restrictions	Workers facing layoffs or reduction in hours	For workers in businesses that receive government support	United States

Source: International Monetary Fund (IMF) Fiscal Affairs. 2020. Expenditure Policies in Support of Firms and Households.

Resuming, governments offered support to address the economic and social challenges of the COVID-19 crisis, and they are using fiscal measures that take various forms: transfers or liquidity support and wage subsidies as most common from the side of expenditure policy and tax deferrals, as the most applied measure from the side of tax policy, as we can observe in Figure 2 (International Monetary Fund (IMF), 2020).

Figure 2. Common fiscal support measures in response to COVID-19 (percent of countries with fiscal support)



Source: International Monetary Fund (IMF). 2020. Fiscal Monitor: Policies to Support People During the COVID-19 Pandemic. Washington, April.

European Commission estimated the cost of these measures (Table 3) taken by EU member states at 3,8% of GDP in 2020 for the discretionary fiscal measures, which are added to the impact of automatic stabilisers estimated at around 4% of GDP in the same year (European Commission, Communication

from the Commission to the Council: One year since the outbreak of COVID-19: fiscal policy response, 2021). From the side of expenditure measures, the expenditure measures in other areas (compensations to specific sectors for income losses, as well as short-time work schemes) represented 2.7% of GDP, while the tax relief measures accounted 0.4% of GDP. Also, the EU countries offered important liquidity support (around 19% of GDP), mostly in the form of public guarantees.

Table 3. Overview of national fiscal measures in response to the COVID-19 pandemic

	2020		2020-2021		2020-2022	
EU 27	**bln EUR**	**% of GDP**	**bln EUR**	**% of GDP**	**bln EUR**	**% of GDP**
A. Measures with a direct budgetary impact	**497.8**	**3.8**	**364.7**	**2.6**	**83.1**	**0.6**
1. Expenditure	**438.5**	**3.3**	**322.2**	**2.3**	**65.9**	**0.4**
1. a) Health care	80.8	0.6	58.9	0.4	14.9	0.1
1. b) Other	363.0	2.7	264.5	1.9	52.3	0.4
2. Revenue	**59.3**	**0.4**	**42.5**	**0.3**	**14.1**	**0.1**
B. Automatic stabilisers		**±4**				
C. Liquidity measures without a direct budgetary impact	**2505.9**	**18.9**				
1. Tax deferrals	206.5	1.6				
2. Public guarantees (available framework)	1877.0	14.2				
3. Others	422.4	3.2				

Source: European Commission. 2021. Communication from the Commission to the Council. One year since the outbreak of COVID-19: fiscal policy response.

There have been similarities as well as differences between fiscal packages across EU countries. The measures introduced to support businesses have been fairly similar across countries, with a strong focus on tax payment deferrals and transfers to firms. Thus, in the run-up to normality, fiscal policies will continue to play a key role and could undergo major changes globally. The differences between countries come from the amount of discretionary

measures. According to the European Fiscal Monitor (EU Independent Fiscal Institutions, European Fiscal Monitor, 2020), Lithuania has the largest relative amount of discretionary measures (about 21% of GDP), about 20% of which are fiscal expenditures and about 1% of tax relief. Austria (12% of GDP), Cyprus (10%), Germany (11%) and Sweden (12%) are the four other countries that have so far committed more than 10% of GDP in direct expenditures. The smallest packages of discretionary measures were introduced in Bulgaria (2.1%), Romania (1.7%) and Slovakia (1.5%).

COVID-19 has had a major economic and budgetary impact on European countries. Economies shrank rapidly in 2020 and the recovery remains incomplete. Governments have responded with large-scale spending measures, particularly to support employment and household incomes, as well as allowing automatic stabilisers to operate (EU Independent Fiscal Institutions, European Fiscal Monitor, 2021). Of course, the impact of all these measures will vary across countries and across time and will depend on the effectiveness of policy responses taken to limit the economic impact of the crisis and on international transmission channels (OECD, 2020).

Even it passed only one year from the beginning of outbreak in almost all countries of the world, there are an important number of papers who investigated the impact of COVID-19 crisis and the measures taken (Baldwin & Di Mauro, 2020); (Barua, 2020); (Cheng, 2020); (Elgin, Basbug, & Yalaman, 2020); (Siddik, 2020).

One of these papers is that of Cifuentes-Faura (2021), who analysed the virus containment measures carried out by the most affected EU countries by the pandemic. His study comprises 11 EU countries (Austria, Belgium, Czech Republic, France, Germany, Greece, Hungary, Italy, Poland, Portugal, Spain) and United Kingdom The author (Cifuentes-Faura, 2021) investigated if the countries that anticipated taking restrictive measures managed to minimize the impact of the pandemic. His results showed that in the case of these countries the impact was smaller. According to this result, Cifuentes-Faura (2021) propose as solution the adoption of an expansive fiscal policy scenario, in line with a Keynesian vision, accompanied by an investment plan, which can contribute to a fall in unemployment and to economic recovery.

Other authors (Razumovskaia, Yuzvovich, Kniazeva, Klimenko, & Shelyakin, 2020) tried to analyze the effectiveness of the adopted measures in the context of the COVID-19 pandemic only for those measures related to SMEs. Thus, using the Granger test and correlation analysis, they developed a cognitive—econometric model for assessing the effectiveness of the Russian governmental policies to support enterprises in the context of pandemic situation. From the applied measures, state funding resulted more effective and capable of restoring business activities of SMEs, but in order to obtain this result the volume of state funding should increase by 1.89–1.98 times.

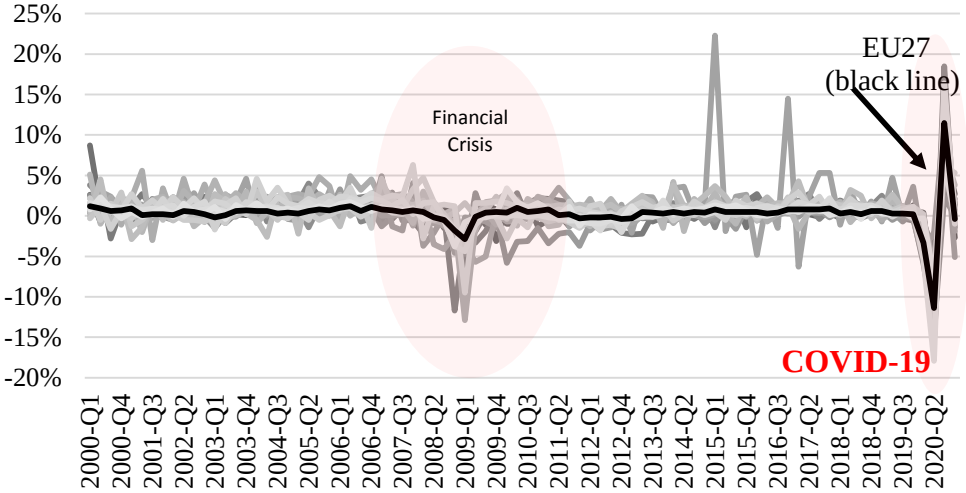
Also, the authors highlight the fact that the government should continue to implement measures, such as tax, administrative, banking and financial support for SMEs to help them to deal with the negative impact of the COVID-19 pandemic.
In another study (Nikolajenko, Viederytė, Šneiderienė, & Aničas, 2021) was examined the efficiency of the Lithuanian government intervention measures intended to support businesses affected by the first lockdown regime, which took place from 16 March, 2020 until 16 June, 2020. They obtained different results depending on who judge them. Thus, from the side of the initiator of the measure, resulted that the government's actions were efficient, but from the point of view of the beneficiary, the efficiency was insufficient.
A more comprehensive study (Vasiljeva, et al., 2020) intended to develop a predictive model for assessing the impact of the COVID-19 pandemic on the economies of Eastern Europe. The countries included in the study were Belarus, Bulgaria, the Czech Republic, Hungary, Moldova, Poland, Romania, Russia, Slovakia, and Ukraine. The reason for who they developed this model is determined, in their opinion, by the leading rating agencies, which estimate that the economies of developing countries are more vulnerable to a deeper recession than those in the developed market. Thus, using this model they determine quantitative estimates of economic development, especially, changes in GDP growth rates over a period of one year, which makes it possible to determine and build strategies of economic management for a long period of time, in contrast to tactical forecasting models.
Our study attempts to fill the literature gap by investigating the effects of the COVID-19 crisis and the economic measures taken by EU countries in order to counteract the pandemic negative effects.

3 Methodology

3.1 Data

Considering the objective of our study, we analyzed the macroeconomic and fiscal key indicators for EU countries for the period of 2000-2020, mainly: GDP growth, Public debt (% from GDP) and Government balance (% from GDP). We extract the data from Eurostat database as quartly values (European Commission, COVID-19: Statistics serving Europe, 2021).
Somehow expected, the COVID-19 pandemic had an immediate and very high effect on economic growth. As we can observe in Figure 3, in 2020 the economic decrease was much higher even when we compare with the value recorded during the global crisis period (2008-2009). Thus, during the 2008 crisis, EU27 recorded a decrease of 2.9% in Q1-2009, but in 2020 - Q2, due to the lockdown measures taken by European countries, GDP recorded a decrease of 11.4%.

Figure 3. GDP evolution by quarter (2000-2020)



Source: Authors' elaboration based on data from Eurostat.

Moreover, taking a look on the main descriptive statistics presented in Table 4, we can see that, with few exceptions, the lowest and the highest increase in GDP for almost all countries was recorded in 2020, during COVID-19 pandemic. The worst affected countries recording the highest decrease of GDP in Q2-2020 were Spain (-17.9%), Croatia (-15.4%), Hungary (-14.5%), Malta (-14.2%), Greece (-14.1%) and Portugal (-13.9%). Despite this, we are able to see that main measures taken by countries quickly counteract the pandemic effects, such that a V-shaped recovery is in place for all countries.

This emphasize the fact that after the economy suffered in Q1-Q2 of 2020 a sharp economic decline, then quickly recovered in Q3 and Q4, evolution confirmed also by the forecast of European Commission (European Commission, European Economic Forecast: Winter 2021 (Interim), 2021).

Trying to come with measures, which would decrease the pandemic effects, most countries applied appropriate fiscal and budgetary actions starting in the second part of Q1-2020 (EU Independent Fiscal Institutions, European Fiscal Monitor, 2021).

Table 4. Descriptive statistics for GDP growth

Country	2000-2019			2020		
	Average	**Min**	**Max**	**Average**	**Min**	**Max**
EU27	0.37%	-2.90%	1.20%	-0.90%	-11.40%	11.50%
Euro area	0.32%	-3.10%	1.20%	-0.90%	-11.70%	12.40%
Austria	0.39%	-2.30%	1.60%	-1.15%	-10.70%	11.80%
Belgium	0.41%	-2.20%	1.50%	-0.93%	-11.80%	11.60%
Bulgaria	0.97%	-3.90%	8.70%	-1.35%	-10.10%	4.30%

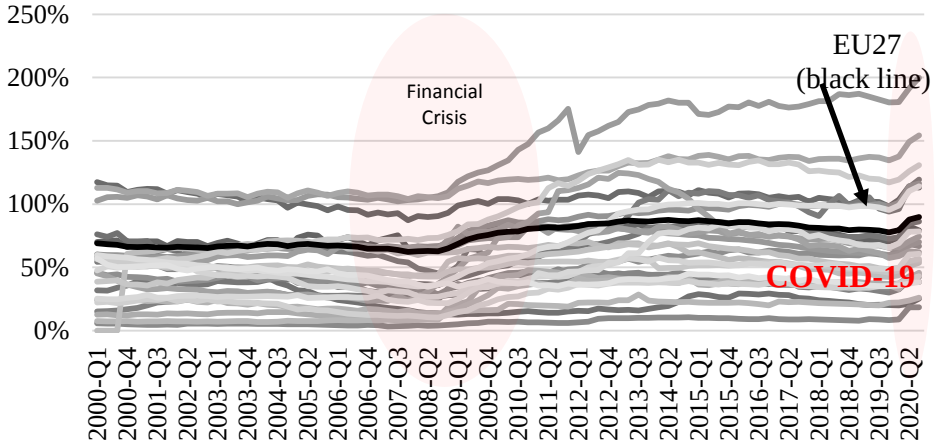
Croatia	0.50%	-4.80%	3.70%	-1.40%	-15.40%	8.20%
Cyprus	0.61%	-2.80%	4.00%	-0.83%	-13.10%	8.90%
Czech Republic	0.71%	-3.40%	2.70%	-1.03%	-8.70%	7.10%
Denmark	0.35%	-2.40%	3.00%	-0.58%	-6.80%	5.20%
Estonia	0.96%	-11.70%	4.00%	-0.43%	-5.20%	2.50%
Finland	0.38%	-6.50%	2.80%	-0.40%	-4.30%	3.20%
France	0.33%	-1.70%	1.00%	-0.58%	-13.50%	18.50%
Germany	0.32%	-4.70%	2.20%	-0.73%	-9.70%	8.50%
Greece	-0.01%	-5.80%	3.30%	-2.93%	-14.10%	2.30%
Hungary	0.65%	-4.30%	2.30%	-0.63%	-14.50%	11.00%
Ireland	1.24%	-6.30%	22.30%	0.18%	-5.10%	11.80%
Italy	0.08%	-2.80%	1.40%	-1.13%	-13.00%	15.90%
Latvia	0.88%	-5.70%	5.60%	-0.33%	-7.00%	6.90%
Lithuania	1.04%	-12.90%	4.40%	-0.15%	-6.20%	6.10%
Luxembourg	0.75%	-3.20%	5.10%	0.50%	-7.30%	9.30%
Malta	0.99%	-3.40%	4.50%	-1.20%	-14.20%	8.00%
Netherlands	0.36%	-3.60%	1.50%	-0.58%	-8.50%	7.80%
Poland	0.92%	-1.50%	4.60%	-0.53%	-9.00%	7.90%
Portugal	0.22%	-2.50%	2.20%	-1.10%	-13.90%	13.30%
Romania	0.99%	-4.10%	4.70%	-0.15%	-12.20%	6.10%
Slovakia	0.95%	-9.50%	6.30%	-0.40%	-8.30%	11.60%
Slovenia	0.61%	-4.40%	2.20%	-0.93%	-10.10%	12.20%
Spain	0.44%	-2.60%	1.60%	-1.60%	-17.90%	16.40%
Sweden	0.55%	-3.80%	3.40%	-0.43%	-7.60%	6.40%

Source: Authors' calculation based on data from Eurostat.

The main direction of most countries was to increase the budgetary expenses, especially for health, which lead to an increase of public debt (Figure 4). This increase of public debt is most visible starting with 2020-Q2. The highest increase of public debt was recorded in Cyprus from 94% in 2019-Q4 to 119.5% in 2020-Q3. Similar increase we noticed in Italy (134.7% in 2019-Q4 to 154.2% in 2020-Q3), Greece (180.5% in 2019.Q4 to 199.9% in 2020-Q3), Spain (95.5% in 2019-Q4 to 114.1% in 2020-Q3).

On the other side, the smallest increases were recorded in Sweden (35.1% in 2019-Q4 to 38.4% in 2020-Q3), Luxembourg (22.0% in 2019-Q4 to 26.1% in 2020-Q3) and Ireland (57.4% in 2019-Q4 to 62.0% in 2020-Q3).

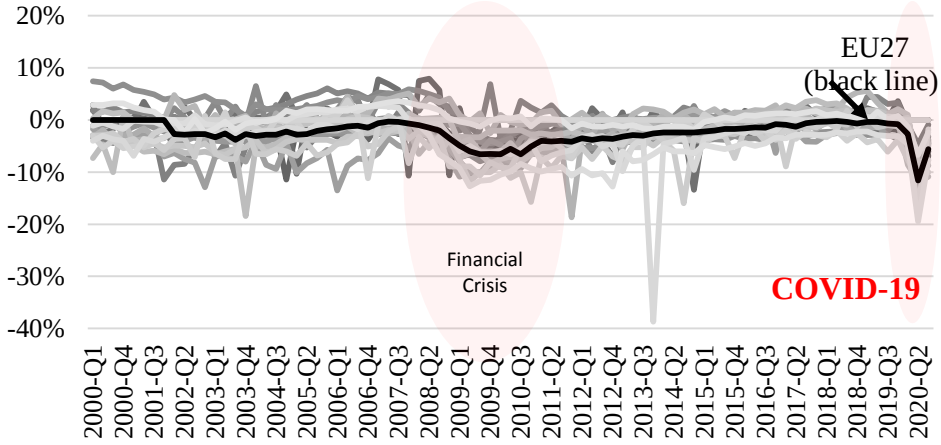
Figure 4. Public debt (% from GDP) evolution by quarter (2000-2020)



Source: Authors' elaboration based on data from Eurostat.

Increasing the public expenditure, but also, in the same time considering the decrease of income revenue (due to the fact that many businesses registered a decrease of their activity or even a shutdown), lead to an increase of the budgetary deficit (Figure 5). There are several countries which in Q2-2020 recorded an increase of budgetary deficit (% from GDP), such is the case of Spain (-19.5%), Poland (-17.1%), Slovenia (-17.0%), Austria (-16,0%) and Belgium (-15.3%).

Figure 5. Budgetary deficit (% from GDP) evolution by quarter (2000-2020)



Source: Authors' elaboration based on data from Eurostat.

3.2. Model

Based on the descriptive statistic presented in section 3.1, we were able to see the evolution of the main macroeconomic and fiscal key indicators (GDP growth, Public debt and Government balance) for EU countries for period 2000-2020. Our objective is to analyze in detail and to examine if COVID-19 pandemic had a significant impact on GDP growth, and moreover, if the measures taken by EU countries were capable to counteract in a short time a part of the negative impact of COVID-19 crisis. In order to achieve this, we will use paired sample t-test, for all EU countries, in which we will compare for each quarter the AVG during the period 2000-2019 and average for 2020. In this case, the null hypothesis will be as follows (equation 1):

$$(1)\ \begin{matrix} H_0: \mu_{Pre-Covid} = \mu_{Covid} \\ H_1: \mu_{Pre-Covid} \neq \mu_{Covid} \end{matrix}$$

Based on the hypothesis presented by equation (1), we want to see if the average for selected variable are different for these two periods.

We know that the expected mean for the difference series is 0 ($\mu_X = 0$), and the number of our sample is 27 (N=27), the paired sample t-test is computed based on equation (2):

$$(2)\ t = \frac{(\bar{X}-\mu_X)}{S_X} = \frac{(\bar{X}-\mu_X)}{\sqrt{\sum(X-\bar{X})^2}} \cdot \sqrt{\frac{N-1}{N}} = \frac{\sqrt{26}\cdot(\bar{X}-\mu_X)}{\sqrt{27\cdot\sum(X-\bar{X})^2}}$$

Next step is to see if the economic growth was significantly affected during COVID-19 period. In order to achieve this, we will use a multiple linear regression based on balanced panel data for the 27 EU countries for the period 2000Q1-2020Q3. The basic model will be given by equation (3).

$$(3)\ GDP_{i,t} = \alpha_0 + \alpha_1 \cdot GovBalance_{i,t} + \alpha_2 \cdot d(Debt)_{i,t} + \alpha_3 \cdot COVID_{i,t} + \varepsilon_{i,t}$$

Where, $GDP_{i,t}$ – GDP growth for country *i* and quarter *t*; $GovBalance_{i,t}$ - the government balance for country *i* in year *t* (percentage of GDP); $d(Debt)_{i,t}$ – Public Debt (percentage of GDP – first difference); $COVID_{i,t}$ – dummy variable which represents the effects of COVID-19 pandemic period (Q1, Q2, Q3 – 2020) on GDP growth; α_0, α_1, α_2, α_3 - the model's parameters and $\varepsilon_{i,t}$ - error term.

The model will be estimated, using last square method (LS) based on balanced panel data (Cross-section random effects).

Through the regression model, we have to capture all the characteristics of GDP growth, public debt and Government Balance (time series) and we apply the Levin-Lin-Chu panel unit root test (Levin, Lin, & Chu, 2002) to see if the

time series are stationary. According to the results (Table 5), all series are stationary.

Table 5. Stationarity Test Results

Variable	Statistic	Prob.
GDP growth	-26.5609	0.0000***
Government Balance (% of GDP)	-7.7211	0.0000***
Public Debt (% of GDP)	-0.0053	0.4979
1st Diff (Public Debt - % of GDP)	-29.8390	0.0000***

*** - Indicates significant at the 0.01 level.

Source: authors' calculations.

In order to prevent multicollinearity, we calculated the correlation between the independent variable (table 6). The correlation is less than 0.3, so we can say that there cannot be any issue regarding the multicollinearity. Even this, we will try to estimate also a separate model, by including each time just one independent variable from these two.

Table 6. Independent variable correlation

Variable	Government Balance (% of GDP)	1st Diff (Public Debt - % of GDP)
Government Balance (% of GDP)	1.0000	
1st Diff (Public Debt - % of GDP)	-0.2505	1.0000

Source: authors' calculations.

4 Results and discussion

Based on the paired sample t-test, for which the results are presented in table 7, we are able to see that only the GDP growth recorded in Q4 is not significant different for the EU countries. Again, the test is confirming that from statistical point of view, the average GDP growth for EU countries in Q1, Q2 and Q3 of 2020 is significant different compared with each corresponding Q for the period 2000-2019.

Table 7. Paired sample t-test results for EU 27 countries

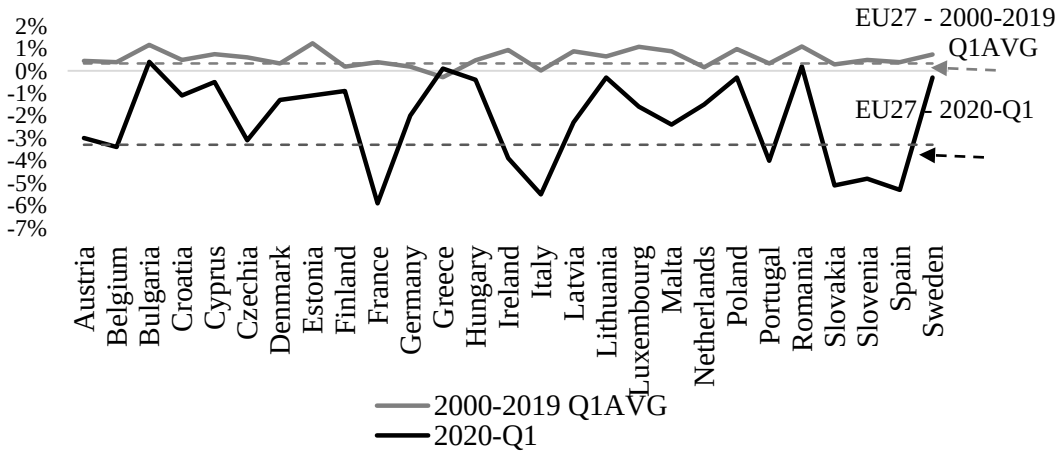
Variable	Average for period 2000-2019	Average for period 2020	t-statistic	p-value
GDP Growth (%)				
Q1	0.56%	-2.20%	7.6883	0.0000***

Q2	0.68%	-10.19%	15.4509	0.0000***
Q3	0.60%	8.99%	-10.2529	0.0000***
Q4	0.61%	0.32%	0.7053	0.4869
Public Debt (% from GDP)				
Q1	59.16%	66.21%	-2.6751	0.0123**
Q2	59.50%	73.93%	-4.9247	0.0000***
Q3	59.36%	75.92%	-5.2700	0.0000***
Government balance (% from GDP)				
Q1	-1.44%	-2.19%	1.8678	0.0723*
Q2	-1.41%	-8.47%	7.7674	0.0000***
Q3	-1.45%	-4.27%	6.0658	0.0000***

***, **, * - *the null hypothesis rejected at 1%, 5% and 10% significance level*
Source: authors' calculations.

Regarding the other two key indicators, for both of them the significance for Q1 is smallest, but for Q2 and Q3 it is clear a significant statistical difference between historical average and the average recorded in 2020.
If the average for period 2000-2019 for public debt was around 59%, in 2020, the average increases to 66% in Q1, and more than 73% in Q2 and Q3.
Going further, we presented in figures 6-9 the GDP evolution for each quarter for all EU 27 countries, in order to see the discrepancies between average recorded in period 2000-2019 and 2020.

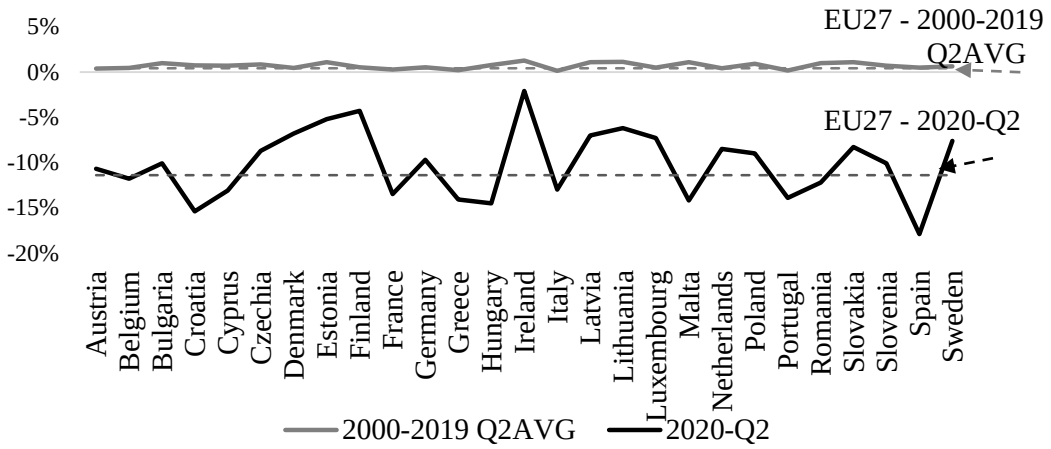
Figure 6. Q1-GDP evolution for EU 27 countries



Source: Authors' elaboration based on data from Eurostat.

Q1-2020 starts with a small decrease of GDP growth for all European countries. This is the time when COVID-19 crisis just started in Europe, so the effect was not so significant for all countries.

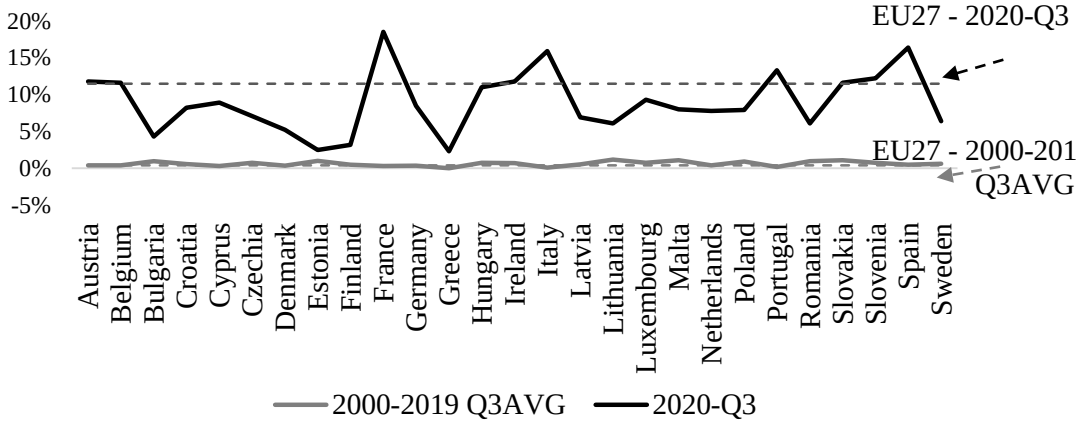
Figure 7. Q2-GDP evolution for EU 27 countries



Source: Authors' elaboration based on data from Eurostat.

In Q2-2020 the decrease of GDP continues and becomes much higher than the average recorded in Q2 for the period 2000-2019. In the second quarter of 2020, almost all European countries had lockdown periods with very strict measures regarding the people movement but also economic activities performed.

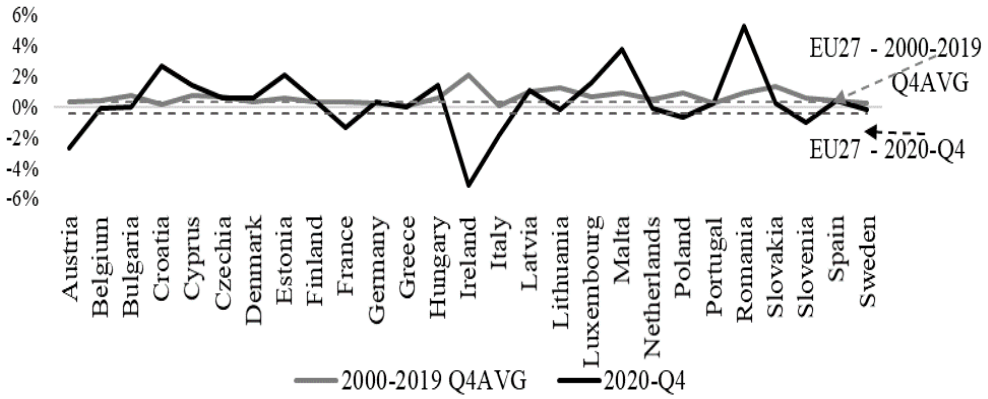
Figure 8. Q3-GDP evolution for EU 27 countries



Source: Authors' elaboration based on data from Eurostat.

Of course, after such drastic period, each country tried to come with specific measures in order to relaunch the economy and to mitigate the negative impact of COVID-19 pandemic. In this context, we are able to see in Q3-2020 a significant increase of GDP, which continues also in Q4, but of course at a lower level.

Figure 9. Q4-GDP evolution for EU 27 countries



Source: Authors' elaboration based on data from Eurostat.

Based on equation (3) presented in model section, we will estimate three regression models. Model 1 will include all independent variables, model 2 will exclude Public Debt variable, while model 3 will exclude Government Balance (% of GDP). Estimation results are presented in table 8.

Table 8. Regression models' estimation

Variable	Model 1	Model 2	Model 3
constant	0.0075*** (0.0006) [a]	0.0079*** (0.0006)	0.0063*** (0.0006)
Government Balance (% of GDP)	0.0845*** (0.0152)	0.1269*** (0.0152)	
1st Diff (Public Debt - % of GDP)	-0.1888*** (0.0164)		-0.2091*** (0.0162)
COVID	-0.0077*** (0.0024)	-0.0131*** (0.0024)	-0.0098*** (0.0023)
R-squared	*0.1037*	*0.0520*	*0.0915*
No. of cases	*2214*	*2214*	*2214*

Source: authors' calculations.

[a] – (standard errors in parentheses).

*** - Indicates significant at 0.01 level.

According to Table 8, we can resume that all models reflect the same conclusion: COVID-19 pandemic period had a significant negative effect on GDP growth. Considering also the t-test results presented previously, we certainly can say that this pandemic period affects and will continue to affect during the next period the economic environment in almost all EU countries.

5 Conclusions

In this paper, we have studied the COVID-19 pandemic crisis on economic growth. More specifically, we tried to highlight the main measures took by EU countries to counteract the negative effects of this crisis, and their effectiveness on sustaining the real economy.

To address the economic and social challenges determined by the COVID-19 pandemic, governments applied fiscal measures that take various forms and have different budgetary and debt-related implications.

Additional spending or tax cuts result in immediately higher budget deficits. On the other hand, the support provided to companies in financial trouble through loans or equity injections does not impact budgets directly, but may increase debt or require additional borrowing.

Our results showed that COVID-19 pandemic had an immediate and significant negative impact on economic growth in Q2-2020, when the highest decrease in GDP growth were recorded in Spain (-17.9%), and the smallest in Ireland (-2.1%). Following this, each country come with different measures mentioned in our paper in order to diminish the negative effects, and to lead to economic recovery, which happened in Q3 and Q4-2020, when we experienced a "V shape" economic recovery. Of course, this achievement was based on other costs, because as we mentioned the public debt and governmental deficit had considerably increase in Q2 and Q3-2020.

Although facing unprecedented difficulties because the current crisis bears no resemblance to what has been experienced in recent decades developed countries have the ability to "flood" economies with money to mitigate the implications of the crisis. Instead, emerging economies, such as Romania's, have much less opportunities to provide liquidity, and dependence on global investors will increase.

Thus, policymakers must adjust the fiscal measures to the economic evolution considering in the same time the level of public debt and budgetary deficit, which are important to maintain their levels to those accepted by Stability and Convergence Programme.

We expect the return to pre-pandemic GDP to occur in early 2022, almost everywhere in the EU, but there will be big differences across economic sectors.

Our contribution consists in exploring and highlighting the immediate impact of COVID-19 crisis. Being an ongoing process, the effects of the pandemic are not fully revealed yet, but through our research, we pointed out the main economic impact and EU countries response in order to rapidly counteract a potential economic crisis.

Our findings are related to the findings of others papers from the literature concentrated on this topic (Cifuentes-Faura (2021), Nikolajenko et al. (2021)**,** Razumovskaia, et al. (2020), Vasiljeva, et al. (2020)) which showed the immediate negative impact on the economy and also the recovery after countries implemented different fiscal and budgetary measures.

Our research presents some limitations regarding data availability because in the regression models we have included only 3 quarters as a proxy for COVID-19 crisis period (Q1, Q2 and Q3-2020). As the COVID-19 crisis is ongoing, having more data can lead to results that are more relevant. Another main shortage of the research, is the fact that we are able to identify and point out just the short-term effect of the fiscal and budgetary measures on economic growth, but at the moment we are not able to identify the effectiveness of these measure on long run time frame. Also, economic policies across the EU are volatile, as governments adopt new measures, so data are accurate up to the selected deadline for data collection (third quarter of 2020).

Future research can compare data at a later period when the pandemic has stabilized, which can offer us the opportunity to test more accurate, the effectiveness of the measures that were finally applied. Also, another idea to develop is to select only specific countries, the most affected by the pandemic rather, and to test the effectiveness of the adopted measures.

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