Anti-Crisis Fiscal Measures in the European Union during the COVID-19 Pandemic and their Impact on GDP

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ABSTRACT

The aim of this study is to analyze the connection between anti-crisis fiscal measures adopted by EU governments in response to the COVID-19 pandemic and these countries' GDP growth. The study relies on methods of statistical analysis, including cluster analysis, to examine the challenges of forecasting tax revenue collections during the COVID-19 pandemic. It is possible to make preliminary conclusions regarding the relationship between fiscal anti-crisis measures in EU countries and these countries' GDP growth even in the absence of the actual data. The study has revealed variations in forecast GDP growth caused by a higher than usual degree of uncertainty. The best way to minimize such variations is to constantly monitor the situation and adjust the forecast estimates depending on the changes in the relevant factors. The variations in forecast estimates can also stem from adjustments for the changes in tax revenues of EU countries implementing fiscal anti-crisis measures. Most EU countries resorted to such instruments as deferral of certain tax payments, temporary tax breaks, reduction of tax rates, tax loss carryforwards, cancellation or reductions of social contributions. The European leaders in terms of anti-crisis fiscal measures are the Czech Republic and Ireland – these countries used four out of five instruments and were followed by Austria, Hungary and the UK, which used three instruments. We also analyzed the coefficient of tax elasticity for European countries and demonstrated that tax reliefs (tax preferences) influence the level of tax revenue. The hypothesis that there is an indirect connection between the anti-crisis fiscal measures and GDP growth was confirmed. It is shown that clusters of EU countries grouped depending on their anti-crisis fiscal measures do not coincide with the clusters of countries grouped depending on their GDP growth estimates. Thus, a tentative forecast can be made that the fiscal anti-crisis measures taken by EU countries will not have a direct impact on their GDP growth.

KEYWORDS

fiscal anti-crisis measures, tax relief, tax preferences, tax revenue, GDP, coefficient of tax elasticity

JEL H12, H20, H21, H22, H68

Фискальные антикризисные меры в Европейском Союзе в условиях распространения COVID-19: оценки влияния на ВВП

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АННОТАЦИЯ

Цель исследования – провести анализ взаимосвязи принятых в условиях распространения COVID-19 фискальных антикризисных мер и показателя валового

внутреннего продукта в странах Евросоюза. В исследовании применяются методы статистического анализа, в том числе кластерного анализа, и рассматривается вопрос: в чем сложность прогнозирования налоговых поступлений в условиях пандемии COVID-19? Результаты исследования показали, что до получения фактических данных возможно сделать предварительные выводы относительно взаимосвязи принятых в странах ЕС фискальных антикризисных мер в ответ на COVID-19 на показатель ВВП. Были выявлены отклонения в прогнозах показателей ВВП, обусловленные факторами неопределенности, наилучшей мерой нивелирования которых является постоянный мониторинг и пересмотр прогнозных показателей в зависимости от влияния изменяющихся факторов. На отклонения в прогнозах могли повлиять в том числе корректировки, вызванные изменениями показателей налоговых поступлений, обусловленные предпринятыми странами Евросоюза фискальными антикризисными мерами. Среди этих мер чаще всего использовались такие инструменты как отсрочка уплаты налогов, временные налоговые льготы, снижение ставок налогов, перенос убытков, отмена/снижение социальных взносов. Было выявлено, что лидером среди стран по принятию антикризисных фискальных мер являются Чехия и Ирландия, которыми задействованы 4 инструмента антикризисных мер из пяти рассматриваемых. Австрия, Венгрия и Великобритания использовали 3 инструмента. Проведен анализ коэффициента эластичности налогов в разрезе стран Евросоюза. Показано, что на показатель налоговых поступлений оказывают влияние налоговые льготы (преференции). Подтверждена гипотеза о существовании косвенной связи между принятыми антикризисными фискальными мерами и показателем ВВП. В то же время показано, что кластеры стран Евросоюза, сгруппированных по признаку принятых антикризисных фискальных мер не совпадают с кластерами стран ЕС, сгруппированных по изменению прогнозов ВВП. Сделан предварительный прогноз, что фискальные антикризисные меры, предпринятые в странах Евросоюза, не окажут прямого влияния на изменение показателей ВВП.

КЛЮЧЕВЫЕ СЛОВА

фискальные антикризисные меры, налоговые льготы, налоговые преференции, налоговые поступления, валовый внутренний продукт, коэффициент эластичности налогов

1. Introduction

The COVID-19 pandemic has changed the world in many ways and severely disrupted the global economy. The leading experts are unanimous in their predictions that the pandemic will have a negative impact on national economies, the only thing that differs is the scale of this negative impact.

What complicates the situation even more is the lack of reliable information in the key parameters that can be used to estimate the impact of the pandemic on national economies and on the global economy in general. First of all, it is difficult to predict the duration of the pandemic since after a short-term decline in the number of cases, a new resurgence has started again and the governments have to adapt flexibly to these constantly changing conditions. Moreover, we do not have the reliable data on the efficacy of Covid-19 vaccines yet, which means that vaccination is by no means certain to become a panacea for the spread of coronavirus. New COVID-19 flare-ups create difficulties for predicting accurately when the pandemic will have run its course.

Therefore, the pandemic creates a higher-than-usual degree of uncertainty around economic forecasting. In order to minimize the difference between the predicted and actual data, analysts use multiple scenarios, which can differ considerably from each other.

The European Union (EU) took vigorous action to tackle the negative effects of the pandemic in such spheres as health care, economy, research, border mobility, etc. The documents regulating these policies are available on the official EU website[1].

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[1] List of key documents. Available at: https://eur-lex.europa.eu/content/news/index.html.

The European Commission monitors the economic indicators affected by these measures and adjusts the initial forecasts accordingly, which allows us to make some preliminary estimates of the impact that European countries' anti-crisis measures had on their GDP. A key role in this respect is played by fiscal anti-crisis measures, which can have short-term as well as long-term economic effects.

These effects are quite complex and can be found in different spheres, which is why they can be difficult to evaluate. It would be appropriate to use the amount of tax revenues (both short- and long-term) as the key indicator for our analysis. However, the first data on collections for specific types of taxes will be available only after the tax revenue data for 2020 are processed, which will happen later than usual due to delayed tax filing deadlines.

Nevertheless, it is already possible to make the first preliminary estimates by using the available data from interim reports, which leads us to chose GDP growth in EU countries as the main indicator.

The aim of this study is to analyze the connection between the anti-crisis fiscal measures adopted by EU governments in response to the COVID-19 pandemic and these countries' GDP growth.

We have formulated two opposite hypotheses:

Hypothesis 1. The fiscal anti-crisis measures taken by EU countries have a direct or indirect influence on indicators of GDP.

Hypothesis 2. The fiscal anti-crisis measures taken by EU countries have no influence on indicators of GDP.

The paper is structured as follows. The second section reviews the research literature on the effects of fiscal policies on macro-economic indicators. The third section describes our research methodology and hypotheses. The fourth section contains our calculations and analysis of the coefficients of tax elasticity for EU countries. The fifth section analyzes the problems of forecasting the changes in the economic indicators during the pandemic by focusing on the case of GDP. The sixth sec-tion presents a statistical analysis of fiscal measures used by EU countries to tackle the pandemic-induced crisis. The seventh section describes the results of clustering of EU countries according to their anti-crisis measures and the projections of GDP growth. The final section contains our conclusions and outlines the avenues for future research.

2. Literature review

There is a vast body of research on the relationship between fiscal policies and macro-economic indicators. For example, I. Loukianova et al. [1] proposed and confirmed the hypothesis that the fiscal and monetary policies working together can have a synergistic effect on economic growth and that at certain stages one of these policies prevails over the other.

Fundamental studies of various economic, social, political and philosophical problems, including those related to the sphere of taxation, were conducted by F. Knight [2]. J. Mirrlees [3] conducted research in the domain of welfare economics, taxation theory, government spending, contract theory, theories of growth and development economics.

W. Niskanen [4] analyzed the effects of voting rules, progressive taxation and the length of the fiscal horizon of democratic governments.

A. Philippopoulos [5] conducted an empirical study of the role and efficiency of the public sector, public policy regulating labour relations and wages, privatization, fiscal policy and financial stability.

V. Vishnevsky and A. Polovyan [6] considered the difficulties of substantiation of fiscal and monetary measures used to regulate an emergent economy with the help of evolutionary modelling methods. The results of their computational experiments have shown that the success of economic regulation depends on the initial state of the institutional environment. From the perspective of evolutionary economics, a fiscal policy applied in emerging markets retains its regulatory capacity, and therefore requires further reforms in the context of the 'new reality' based on the global value chains.

P. Nijkamp and J. Poot [7] used a sample of 93 published studies, yielding 123 meta-observations, to examine the robustness of the evidence regarding the effect of fiscal policy on economic growth and found that the evidence for a positive effect of conventional fiscal policy on growth is rather weak.

N. Gemmell et al. [8] suggest that previously estimated 'long-run' growth effects of fiscal policy are typically achieved quickly, consistent with results from short-run models. In principle, these short-run effects 'persist' while in practice, regular fiscal policy changes in OECD countries mean that persistent increases or decreases in growth rates are rare.

Ch. Erceg et al. [9] presented a systematic analysis of the short-run effects of trade policies that are equivalent in a frictionless economy, namely a uniform increase in import tariffs and export subsidies, an increase in value-added taxes accompanied by a payroll tax deduction, and a border adjustment of corporate taxation. The authors concluded that an increase in import tariffs and export subsidies is likely to elicit a much smaller response of the exchange rate than required for "full insulation" to hold, so that expenditure-switching effects show through to higher output. This output stimulus is largely driven by the export subsidy whereas tariffs tend to have a negligible or even contractionary effect on output [9, p. 37].

R. Boadway [10] charts the evolution of optimal tax analysis and discusses the lessons it holds for tax policy. He describes the theoretical challenges posed by recent findings in such fields as behavioral economics and social choice and considers how optimal tax analysis might adapt to these new paradigms.

Sh. Anwar showed that tax decentralization is a pre-requisite for sub-national credit market access. In countries with highly centralized tax bases, unrestrained credit market access by subnational governments poses a risk for macro stabilization policies of the national government as the private sector anticipates a higher level government bailout in the event of default and does not discount the risks of such lending properly [11, p. 40].

C. Romer and D. Romer investigated the causes and consequences of changes in the level of taxation in the postwar United States and concluded that despite the complexity of the legislative process, most significant tax changes have a dominant motivation that fits fairly clearly into one of four categories: counteracting other influences on the economy, paying for increases in government spending (or lowering taxes in response to reductions in spending), addressing an inherited budget deficit, and promoting long-run growth. The last two motivations are essentially unrelated to other factors influencing output, and so policy actions taken because of them can be used to estimate the effects of tax changes on output [12, p. 799].

S. Folster and M. Henrekson conducted an econometric panel study on a sample of rich countries covering the 1970–1995 period and concluded that when the rich country sample is extended to non-OECD countries, both government expenditure and taxation are negatively associated with economic growth [13, p. 15].

S. James et al. [14] analyze a range of manifestations of simplification in taxation, including tax systems, tax law, taxpayer communications and tax administration. A. Laffer et al. [15] have demonstrated that elimination or lowering of excessive tax burden on the level of individual states in the USA boosts economic growth and prosperity.

There is a number of seminal works devoted to tax reforms in a time of crisis: for example, R. De Mooij, G. Nicodème analyze the impact of bank levies or the financial activities tax (FAT) imposed on the financial sector, whose introduction was considered as a possible response to the financial crisis by the European Commission and IMF [16].

J. Alworth and G. Arachi [17] analyze the strengths and weaknesses of various fiscal initiatives, including limitations on the tax advantages to debt financing, special taxes on the financial sector and financial transactions taxes.

E. Engen and J. Skinner [18] found evidence of modest effects, on the order of 0.2 to 0.3 percentage point differences in growth rates in response to a major tax reform. Nevertheless, according to these authors, even such small effects can have a large cumulative impact on living standards.

M. Piqué and J. Martín [19] provide evidence of delayed adverse effects of the fiscal policy in Spain on the rate of growth of public spending and on the growth rate of GDP. The authors demonstrate that the delayed effects of the rate of decline in public investment have a negative impact on economic growth.

Z. Yang [20] analyzed the heterogeneous responses to the changes in the policy of budget decentralization introduced as a part of the 1994 tax reform in China and showed the non-linearity of these responses. The impact of decentralization of revenues and expenditures on economic growth was different across the three key sectors. Interestingly, this measures had the biggest influence on the secondary sector. The author also demonstrated that there is an inverted U-shaped dependency relationship between the degree of decentralization of revenues and expenditures and the growth in the secondary sector.

A. Alesina and F. Giavazzi [21] analyze how fiscal policy after a financial crisis focuses on the effects of fiscal stimuli and increased government spending. They also discuss the merits of alternate means of debt reduction through decreased government spending or increased taxes and investigate how the short-term political forces driving fiscal policy might be balanced with aspects of the long-term planning that governs monetary policy.

C. Cottarelli et al. [22] examine the fiscal vulnerabilities before a financial crisis, the composition of fiscal stimulus packages in countries with developed and developing economies.

J. Shemrod [23] analyzes the fiscal policy during the period of economic downtown of 2008–2009, concluding that public finance economists need to better integrate the economic analysis of taxation

with the concerns and expertise of macro-economists, finance economists, and accountants.

J. Brondolo [24] investigates different aspects of businesses declaring tax losses during an economic crisis to find that tax losses present a growing compliance risk and that tax authorities should give greater attention to verifying doubtful claims.

O. Blanchard and D. Leigh [25] analyzed questions of forecasting tax revenues such as the relationship between growth forecast errors and planned fiscal consolidation during the period of crisis. They found that in advanced economies, stronger planned fiscal consolidation has been associated with lower growth than expected, with the relation being particularly strong, both statistically and economically, early in the crisis. Fiscal multipliers turned out to be substantially higher than implicitly assumed by forecasters.

A. Alesina et al. [26] considered the largest cases of fiscal adjustments in the last 25 years in Western Europe and their political consequences. The authors concluded that it is possible for fiscally responsible governments to engage in large fiscal adjustments and survive politically. Fiscal adjustments based upon spending cuts are more successful, that is, they lead to more stable consolidations of the budget and cause less contraction of the economy than tax increases.

M. Hallerberg and C. Scartascini [27] showed that during banking crises, the need for fiscal reforms is generally higher. During electoral periods, increasing taxes becomes highly unlikely, even if the government is facing financing problems. What is more, Hallerberg and Scartaschini argue, politics seems to trump economics: banking crises do not affect the probability of having a reform during electoral times. The presence of an IMF program affects the tax instruments chosen: countries with a program increase the value-added tax, while those without it raise the personal income tax.

By using the case of the USA, J. Mikesell [28] has shown that the nature of changes of the state tax policy can be economically destabilizing: in certain years,

states are highly likely to raise taxes for a number of reasons unconnected to the national policy of aggregate demand. The budget and fiscal policy should be able to counteract this potentially destabilizing force which has nothing to do with the normal federal control.

R. Chirinko and D. Wilson [29] point out the importance of tax incentives and interstate capital flows, which are an essential element of tax competition. Own-state capital formation is substantially increased by tax-induced reductions in the own-state price of capital and is substantially decreased by tax-induced reductions in the price of capital in competitive-states.

G. Crespi et al. [30] investigated the effects of a tax credit scheme for promoting firm-level innovation investment in Argentina. Their results suggest that the intervention has been effective in increasing firms' innovation efforts. However, effects vary depending on the type of innovation investment being subsidized, industrial sector, and size of the firm.

A. Easson and E. Zolt [31] found that tax incentives can play a positive role in stimulation of domestic and foreign investment. In particular they emphasize that incentive programs should be designed in such a way as to minimize the opportunities for corruption in the granting of incentive and for taxpayer abuse in exploiting the tax benefit.

T. Yefimenko [32] argues that a tax system as a strategic instrument of state regulation should include effective mechanisms of taxes and levies as well as tax incentives and preferences aligned with the key expenditure areas, transfers and subsidies.

M. Bonucchi et al. [33] concluded that the overall effects of reducing the corporate tax burden need to be assessed in a macroeconomic equilibrium context accounting for endogenous spillovers and feedback loops across various sectors of the economy. Over the years, temporary tax incentives have made an important contribution to boosting investment and economic activity during downturns. Reductions in tax rates have had a smaller, but permanent effect imposing a minimal burden on economic activity. Temporary

fiscal incentives generate important positive economic effects, with long-lasting consequences for economic dynamics and welfare.

B. Kalaš and V. Mirovic [34] found a strong and positive relationship between tax revenue growth and corporate income tax, on the one hand, and the growth in gross domestic product, on the other hand. At the same time these authors argue that personal income tax and social security contributions are weakly related to gross domestic product growth.

A. Pogorleckij [35] demonstrates that the majority of tax regulation programs during the COVID-19 pandemic resemble those that were previously used during other pandemics. A new effect of the COVID-19 pandemic found by A. Porogrleckij for indirect taxation is the proposal of a unification of VAT and excise duties that was put on the international agenda and discussed by the corresponding international tax institutions.

Despite such substantial body of research, however, the connection between economic indicators and fiscal anti-crisis measures still remains a largely underexplored question.

3. Methodology

The study relies on qualitative and quantitative methods. Qualitative methods are applied to describe the essential elements of fiscal anti-crisis measures taken by EU countries in response to the pandemic and to highlight the key characteristics of tax relief.

Quantitative methods are applied to analyze fiscal anti-crisis measures and GDP growth during the pandemic in EU countries. The calculations were made with the help of Excel and Statistica software. The databases for computations were obtained from the EU[2] and IMF websites[3].

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[2] European Economic Forecast. Summer 2020 (Interim). Available at: https://ec.europa.eu/info/sites/info/files/economy-finance/summer_2020_economic_forecast_-_statistical_annex.pdf.

[3] International Monetary Fund. Policy responses to COVID-19. Policy Tracker. Available at: https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19#A.

At the first stage of our study, we calculated and analyzed coefficients of tax elasticity for different EU countries.

The coefficient of tax elasticity was calculated according to the following formula:

$$K_{TAX} = \frac{\Delta Tax}{Tax} : \frac{\Delta GDP}{GDP}, \qquad (1)$$

where *Tax* is the indicator of total receipts from taxes and social contributions, euro; and *GDP* is gross domestic product, euro.

This indicator reflects the elasticity of tax revenue, showing its response to the changes in the key economic parame-ters such as GDP, per capita income, retail prices, etc. (https://economy-ru.info/info/3945; https://economy-ru.info/info/8070; https://economy-ru.info/info/41018).

Tax revenue can be considered elastic if its percent change causes a comparatively substantial (rapid) percent change in gross domestic product (in absolute terms). In other words, tax revenues are considered elastic provided that $K_{TAX} > 1$.

At the second stage, we analyzed challenges in forecasting economic indicators during the pandemic and focused on the case of gross domestic product.

At the third stage, we conducted a statistical analysis of the efficiency of EU countries' fiscal responses to the COVID-19 pandemic.

At the fourth stage, individual EU countries were clustered in accordance with their fiscal anti-crisis measures and GDP growth forecasts.

4. Analysis of coefficients of tax elasticity for EU countries

To draw preliminary conclusions concerning the relationship between GDP and the indicator "Total Receipts from Taxes and Social Contributions" (and thus to test Hypothesis 1), we calculated the coefficient of tax elasticity (K_{TAX}).

Our analysis of the coefficient of tax elasticity for different EU countries is summarized in Table 1.

Figure 1 provides a graphic illustration of the coefficient of tax elasticity in EU countries.

In almost all European countries, the coefficient of tax elasticity exceeds 1, which signifies the elasticity of tax receipts with respect to GDP growth (Nominal expenditure). However, we believe it is too early to make predictions as to whether this tendency will persist during the pandemic or not.

According to IMF analysts, 'the frequently-used method of forecasting revenue by applying an aggregate tax buoyancy to GDP forecasts is usually reasonably reliable, but often likely to overestimate revenue during the pandemic'. In our view, there is sense in this statement. "The buoyancy is the percent change in total tax revenue resulting from one percent change in GDP. The buoyancy thus reflects both structural features of the economy and tax system and policy measures taken over the cycle. In exceptional times, including in the current pandemic, it is unlikely that the historical relationship remains unchanged. Making projections based on such relationship can thus lead to – often but not always upward – biased projections"'[4].

However, even if we are very cautious in our predictions, the available data still point to the fact that there is a dependency between tax revenue and GDP growth. It could not, therefore, be said that there is no inverse relationship since the level of taxation in a country influences indirectly the consumption of resources. Thus, we can conclude that fiscal policy actions ta-ken in response to the COVID-19 pande-mic and resulting in a decline in tax collections also have an indirect effect on GDP.

5. Forecasts of GDP growth in Europe

As our review of the research literature has shown, the projections of the key economic indicators for the European Union and the world for 2020–2021 have been revised several times.

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[4] Challenges in Forecasting Tax Revenue. Special Series on Fiscal Policies to Respond to COVID-19 Available at: https://www.imf.org/en/Publications/SPROLLs/covid19-special-notes.

Table 1

Computation of tax elasticity for EU countries in 2017–2018

Country	Total receipts from taxes and social contributions, Million euro			GDP (Nominal expenditure), Million euro			K_{TAX}
	2017	2018	Variation	2017	2018	Variation	
Austria	156303.70	164481.90	0.0523	370296	385712	0.0416	1.26
Belgium	206670.50	213452.30	0.0328	445957	459532	0.0304	1.08
Bulgaria	15315.60	16690.10	0.0897	52310	56087	0.0722	1.24
Croatia	18510.20	19864.40	0.0732	49094	51625	0.0516	1.42
Cyprus	6625.10	7100.50	0.0718	20040	21138	0.0548	1.31
Czechia	67523.30	74832.40	0.1082	191722	207570	0.0827	1.31
Denmark	136743.50	136191.30	–0.0040	292408	301341	0.0305	–0.13
Estonia	7776.50	8549.80	0.0994	23776	26036	0.0951	1.05
Finland	96990.00	99095.00	0.0217	225836	233619	0.0345	0.63
France	1104771.00	1133347.00	0.0259	2295063	2353090	0.0253	1.02
Germany	1322134.00	1380268.00	0.0440	3244990	3344370	0.0306	1.44
Greece	74467.00	76387.00	0.0258	180218	184714	0.0249	1.03
Hungary	48078.00	50070.10	0.0414	125603	133782	0.0651	0.64
Ireland	68313.00	74024.00	0.0836	297131	324038	0.0906	0.92
Italy	726707.00	739360.00	0.0174	1736593	1766168	0.0170	1.02
Latvia	8424.40	9084.30	0.0783	26798	29056	0.0843	0.93
Lithuania	12477.00	13671.60	0.0957	42269	45264	0.0709	1.35
Luxembourg	22100.80	24594.00	0.1128	56814	60053	0.0570	1.98
Malta	3693.40	4008.20	0.0852	11322	12403	0.0955	0.89
Netherlands	286084.00	300351.00	0.0499	738146	774039	0.0486	1.03
Poland	162895.20	178337.40	0.0948	467313	497590	0.0648	1.46
Portugal	71261.60	75472.20	0.0591	195947	204305	0.0427	1.39
Romania	48343.80	54895.10	0.1355	187773	204640	0.0898	1.51
Slovakia	28819.30	30638.30	0.0631	84521	89606	0.0602	1.05
Slovenia	16113.00	17270.60	0.0718	42987	45755	0.0644	1.12
Spain	400152.00	423153.00	0.0575	1161878	1202193	0.0347	1.66
Sweden	213789.00	208653.10	–0.0240	480026	470673	–0.0195	1.23
United Kingdom	823775.20	845278.10	0.0261	2363109	2423737	0.0257	1.02

Source: compiled by the authors based on Eurostat data.
Purchasing power parities (PPPs), price level indices and real expenditures for ESA 2010 aggregates. Available at: https://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do; Main national accounts tax aggregates. Available at: https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=gov_10a_taxag&lang=en
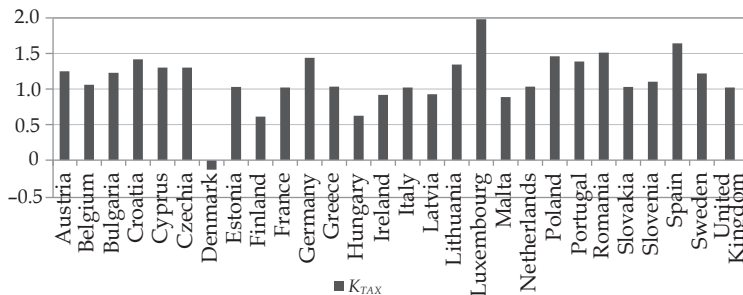

Fig. 1. Tax elasticities in EU countries in 2017–2018

Source: compiled by the authors based on Eurostat data
Purchasing power parities (PPPs), price level indices and real expenditures for ESA 2010 aggregates. Available at: https://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do; Main national accounts tax aggregates. Available at: https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=gov_10a_taxag&lang=en

According to the IMF, global growth is projected at –4.9% in 2020, 1.9% below the April 2020 World Economic Outlook (WEO) forecast. The COVID-19 pandemic has had a more negative impact on activity in the first half of 2020 than anticipated, and the recovery is projected to be more gradual than previously forecast. In 2021 global growth is projected at 5.4%. Overall, this would leave 2021 GDP some 6.5% lower than in the pre-COVID-19 projections of January 2020[5].

Leading analysts are making cautious predictions concerning the impact of the pandemic on the future of individual countries and global economy in general. For instance, in her report, Isabel Schnabel, Member of the Executive Board of the ECB, pointed out that the revisions to inflation expectations for the coming years have been limited and that any mid-point forecast therefore needs to be taken with a grain of salt[6].

IMF analysts have published guidelines for preparing the 2021 budget by taking into account the pandemic situation[7]. In particular, it is emphasized that, with the 2020 budget execution diverging widely from its projected course amid high uncertainty, budgeting during the crisis becomes a continuous reactive process, placing strains on ministries of finance.

In addition to macroeconomic forecasts for the key economic indicators for 2020 and 2021, the European Commission publishes biannual reports. There are also interim reports with estimates adjusted to the changes in the factors that determine the economic situation.

Between 2019 and August 2020, GDP volume forecasts changed twice (see Table 2).

The indicator "Variation" in the Summer 2020 Forecast in comparison with the Autumn 2019 Forecast shows a considerable degree of variation. It means that in the calculations of GDP growth estimates for 2020 made in the summer of 2020, adjustments were made for a variety of factors, including tax revenues, which are also analyzed by Eurostat[8]. The calculations of tax revenues take into account tax relief offered by EU countries.

Thus, the calculations of forecast GDP growth for 2020 took into account the influence of anti-crisis fiscal measures in EU countries. This aspect can be used for preliminary analysis of the impact of anti-crisis fiscal measures on GDP growth.

Analysis of the variations shows that the most significant changes in the summer forecast in comparison with the autumn forecast were found in the estimates of GDP growth in the following countries: Croatia (–13.4%); Spain (–12.4%); Ireland (–12.0%), France (–11.9%). The smallest variation in predicted GDP values was observed for Sweden (–6.3%), Denmark (–6.7%), Germany (–7.3%), Finland (–7.4%). This fact can be considered as an indirect evidence pointing to the fact that the indicators of the first group of countries were more affected by the pandemic and these countries' response measures (including fiscal measures) than the corresponding indicators of the second group.

If we compare the Summer 2020 Forecast with the Spring 2020 Forecast, we can see that in the former case, the variations are less substantial. The countries that saw the biggest plunge in GDP growth are Portugal (–3.0%), France (–2.4%), and Slovakia (–2.3%).

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[5] World Economic Outlook Update, June 2020. Available at: https://www.imf.org/en/Publications/WEO/Issues/2020/06/24/WEOUpdateJune2020.

[6] The ECB's response to the COVID-19 pandemic. Available at: https://www.ecb.europa.eu/press/key/date/2020/html/ecb.sp200416~4d6bd9b9c0.en.html.

[7] Teresa Curristine. Laura Doherty. Bruno Imbert. Fazeer Sheik Rahim. Vincent Tang and Claude Wendling. Budgeting in a Crisis: Guidance for Preparing the 2021 Budget. Special Series on COVID-19. June 29. 2020. Available at: https://www.imf.org/en/Publications/SPROLLs/covid19-special-notes.

[8] Tax revenue statistics. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php/Tax_revenue_statistics

In 2021, according to Eurostat, the negative impact of the pandemic on GDP will be mitigated and/or overcome and European countries will gradually improve their economic performance (Table 3).

The biggest positive variations in the Summer 2020 Forecast in comparison with the Autumn 2019 Forecast for GDP growth are observed for France (6.4%), Italy (6.4%), Spain (5.7%) and Belgium

(5.5%); the smallest variations, for Finland (1.8%), Poland (1.0%), Romania (0.7%), and Sweden (1.7%).

The variations in the forecasts of GDP growth for the summer of 2020 made in spring can be characterized as insignificant. The biggest variations were found in the forecasts for Greece (–1.9%), Sweden (–1.2%), Slovenia (–0.6%) and Germany (–0.6%).

Table 2

Variation of gross domestic product, volume (percentage change in compared to the preceding year), 2020

Country	Autumn 2019 forecast	Spring 2020 forecast	Summer 2020 forecast	Variation Summer 2020 forecast / Autumn 2019 forecast	Variation Summer 2020 forecast / Spring 2020 forecast
1	2	3	4	5	6
Austria	1.4	–5.5	–7.1	–8.5	–1.6
Belgium	1.0	–7.2	–8.8	–9.8	–1.6
Bulgaria	3.0	–7.2	–7.1	–10.1	0.1
Croatia	2.6	–9.1	–10.8	–13.4	–1.7
Cyprus	2.6	–7.4	–7.7	–10.3	–0.3
Czechia	2.2	–6.2	–7.8	–10.0	–1.6
Denmark	1.5	–5.9	–5.2	–6.7	0.7
Estonia	2.1	–6.9	–7.7	–9.8	–0.8
Finland	1.1	–6.3	–6.3	–7.4	0
France	1.3	–8.2	–10.6	–11.9	–2.4
Germany	1.0	–6.5	–6.3	–7.3	0.2
Greece	2.3	–9.7	–9.0	–11.3	0.7
Hungary	2.8	–7.0	–7.0	–9.8	0
Ireland	3.5	–7.9	–8.5	–12.0	–0.6
Italy	0.4	–9.5	–11.2	–11.6	–1.7
Latvia	2.6	–7.0	–7.0	–9.6	0
Lithuania	2.4	–7.9	–7.1	–9.5	0.8
Luxembourg	2.6	–5.4	–6.2	–8.8	–0.8
Malta	4.2	–5.8	–6.0	–10.2	–0.2
Netherlands	1.3	–6.8	–6.8	–8.1	0
Poland	3.3	–4.3	–4.6	–7.9	–0.3
Portugal	1.7	–6.8	–9.8	–11.5	–3.0
Romania	3.6	–6.0	–6.0	–9.6	0
Slovakia	2.6	–6.7	–9.0	–11.6	–2.3
Slovenia	2.7	–7.0	–7.0	–9.7	0
Spain	1.5	–9.4	–10.9	–12.4	–1.5
Sweden	1.0	–6.1	–5.3	–6.3	0.8
United Kingdom	1.4	–8.3	–9.7	–11.1	–1.4

Source: compiled by the authors based on Eurostat data.
European Economic Forecast. Spring 2020. Institutional paper 125 | May 2020. Available at: https://www.politico.eu/wp-content/uploads/2020/05/Spring-2020-Economic-Forecast.pdf; European Economic Forecast. Summer 2020 (Interim). Available at: https://ec.europa.eu/info/sites/info/files/economy-finance/summer_2020_economic_forecast_-_statistical_annex.pdf

6. Analysis of fiscal responses of EU countries to the COVID-19 pandemic

In the majority of countries, tax revenues are crucial for the state budget. We cannot but agree with IMF specialists' opinion that the fiscal policy is at the forefront of the struggle against the pandemic[9]. Fiscal measures can help save lives, protect the most vulnerable social groups

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[9] Fiscal monitor reports. Fiscal monitor – April 2020. Reports International Monetary Fund. Available at: https://www.imf.org/en/publications/fm/issues/2020/04/06/fiscal-monitor-april-2020.

and companies from the economic consequences of the pandemic and prevent the countries experiencing health-care crisis from plunging into a deep and prolonged recession. Fiscal policy is going to be one of the primary means of stimulating economic recovery after the end of the lockdown and pandemic.

In this study, we are going to focus on the impact of fiscal anti-crisis measures in EU countries on their gross domestic product. The results of this analysis may prove useful to fiscal policy-makers in the future.

Table 3

**Variation of gross domestic product, volume
(percentage change compared to the preceding year), 2021**

Country	Autumn 2019 forecast	Spring 2020 forecast	Summer 2020 forecast	Variation Summer 2020 forecast / Autumn 2019 forecast	Variation Summer 2020 forecast / Spring 2020 forecast
1	**2**	**3**	**4**	**5**	**6**
Austria	1.4	5.0	5.6	4.2	0.6
Belgium	1.0	6.7	6.5	5.5	–0.2
Bulgaria	2.9	6.0	5.3	2.4	–0.7
Croatia	2.4	7.5	7.5	5.1	0
Cyprus	0.7	6.1	5.3	4.6	–0.8
Czechia	2.1	5.0	4.5	2.4	–0.5
Denmark	1.6	5.1	4.3	2.7	–0.8
Estonia	2.4	5.9	6.2	3.8	0.3
Finland	1.0	3.7	2.8	1.8	–0.9
France	1.2	7.4	7.6	6.4	0.2
Germany	1.0	5.9	5.3	4.3	–0.6
Greece	2.0	7.9	6.0	4.0	–1.9
Hungary	2.8	6.0	6.0	3.2	0
Ireland	3.2	6.1	6.3	3.1	0.2
Italy	0.1	6.5	6.1	6.4	–0.4
Latvia	2.7	6.4	6.4	3.7	0
Lithuania	2.4	7.4	6.7	4.3	–0.7
Luxembourg	2.6	5.7	5.4	2.8	–0.3
Malta	3.8	6.0	6.3	2.5	0.3
Netherlands	1.3	5.0	4.6	3.3	–0.4
Poland	3.3	4.1	4.3	1.0	0.2
Portugal	1.7	5.8	6.0	4.3	0.2
Romania	3.3	4.2	4.0	0.7	–0.2
Slovakia	2.7	6.6	7.4	4.7	0.8
Slovenia	2.7	6.7	6.1	3.4	–0.6
Spain	1.4	7.0	7.1	5.7	0.1
Sweden	1.4	4.3	3.1	1.7	–1.2
United Kingdom	1.4	6.0	6.0	4.6	0

Source: compiled by the authors based on Eurostat data.
European Economic Forecast. Spring 2020. Institutional paper 125 | May 2020. Available at: https://www.politico.eu/wp-content/uploads/2020/05/Spring-2020-Economic-Forecast.pdf; European Economic Forecast. Summer 2020 (Interim). Available at: https://ec.europa.eu/info/sites/info/files/economy-finance/summer_2020_economic_forecast_-_statistical_annex.pdf

Due to the lack of statistical data, the effects of fiscal measures taken by EU countries in response to the pandemic have not been analyzed yet. However, the IMF has already published descriptive statistics[10] summarizing the key fiscal responses of EU countries (Table 4).

Figure 2 illustrates the fiscal measures undertaken by EU countries in response to the pandemic.

The Czech Republic and Ireland used most of the tax instruments – 4 out of 5.

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[10] Policy responses to COVID-19. Policy Tracker. Available at: https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19#A.

These countries are the leaders in terms of diversity of their anti-crisis fiscal measures. They are followed by Austria, Hungary and the UK (3 out of 5 instruments). The majority of countries resorted to 2 instruments – Belgium, Bulgaria, Cyprus, Finland, France, Greece, Italy, Malta, Poland, Romania, Slovakia, Slovenia, and Spain.

Some countries used only one – Croatia, Denmark, Estonia, Germany, Luxembourg, Netherlands, Portugal, Sweden, while some did not use any at all, for example, Latvia and Lithuania.

Our analysis of EU countries' fiscal policy responses to the COVID-19 pandemic is summarized by Figure 3.

Table 4

Fiscal responses of EU countries to the COVID-19 pandemic

Country	Deferral of taxes	Reduction of tax rates		Carry forward losses	Temporary tax breaks	Social security contributions (cancellation/reduction)
		VAT	income tax			
Austria	+	–	+	–	+	–
Belgium	+	–	–	+	–	–
Bulgaria	+	+	–	–	–	–
Croatia	+	–	–	–	–	–
Cyprus	+	+	–	–	–	–
Czechia	+	+	–	+	–	+
Denmark	+	–	–	–	–	–
Estonia	–	–	–	–	–	+
Finland	+	–	–	–	+	–
France	+	–	–	–	+	–
Germany	–	+	–	–	–	–
Greece	+	+	–	–	–	–
Hungary	+	–	–	–	+	+
Ireland	+	+	–	+	+	–
Italy	+	–	–	–	–	+
Latvia	–	–	–	–	–	–
Lithuania	–	–	–	–	–	–
Luxembourg	–	–	–	–	+	–
Malta	+	–	–	–	+	–
Netherlands	+	–	–	–	–	–
Poland	+	–	–	+	–	–
Portugal	+	–	–	–	–	–
Romania	+	–	–	–	+	–
Slovakia	+	–	–	+	–	–
Slovenia	+	–	–	–	+	–
Spain	+	+	–	–	–	–
Sweden	+	–	–	–	–	–
United Kingdom	+	+	–	–	+	–

Source: compiled by the authors based on IMF data.
Policy responses to COVID-19. Policy Tracker. Available at: https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19#A.
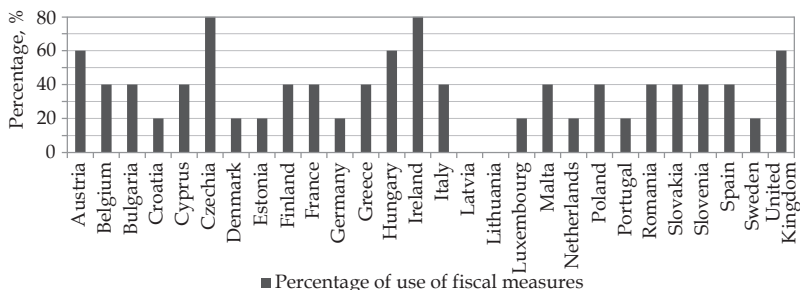
***Fig. 2.* Fiscal responses of EU countries to the COVID-19 pandemic**

Compiled by the authors based on on IMF data
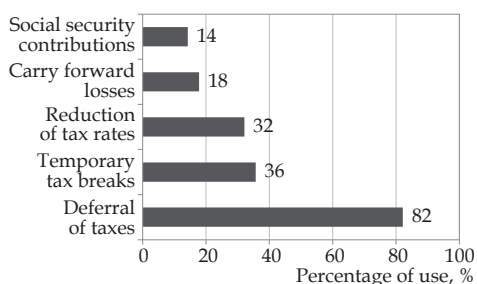Policy responses to COVID-19. Policy Tracker. Available at:
https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19#A

***Fig. 3.* Analysis of fiscal instruments used by EU countries in their policy responses to the pandemic**

Compiled by the authors based on IMF data
Policy responses to COVID-19. Policy Tracker.
Available at: https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19#A

Most European countries (82%) resorted to deferral of taxes to cope with the consequences of the COVID-19 pandemic. Other instruments, such as temporary tax breaks (36%) and reduction of tax rates (32%), were used much less frequently. The third group of instruments includes tax loss carryforwards (18 %) and cancellation or reduction of social security contributions (14 %).

The anti-crisis fiscal measures taken by EU countries, including tax reliefs, will result in the decline of tax revenue to these countries' state budgets.

7. Clustering of EU countries depending on the efficiency of their fiscal anti-crisis measures and GDP forecasts

We used cluster analysis to show the connection between fiscal anti-crisis measures and GDP forecasts. Figure 4 illustrates clustering of EU countries depending on the direction of their fiscal policy responses.
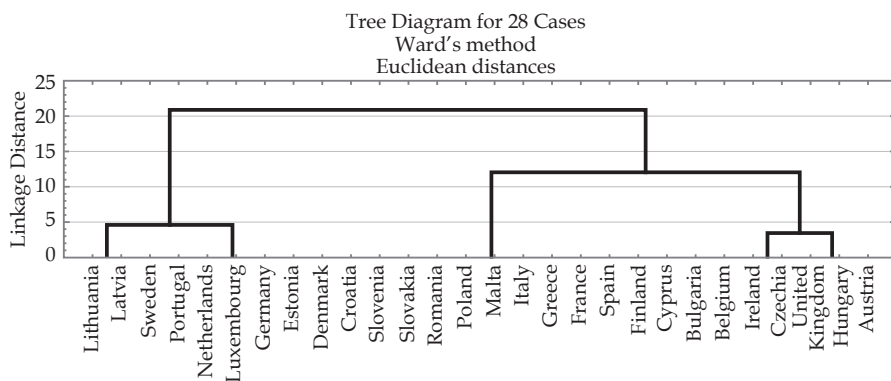
***Fig. 4.* Dendrogram of hierarchical clustering of EU countries depending on the direction of their fiscal policy responses**

Compiled by the authors based on IMF data
Policy responses to COVID-19. Policy Tracker. Available at:
https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19#A

Table 5 illustrates how EU countries were grouped into clusters depending on the direction of their fiscal anti-crisis measures.

Table 5

Grouping of EU countries depending on the direction of their fiscal anti-crisis measures

1	Croatia, Denmark, Estonia, Germany, Netherland, Luxembourg, Sweden, Portugal, Lithuania, Latvia	Min = 0; Max = 20
2	Cyprus, Greece, Malta, Bulgaria, Slovenia, Romania, Belgium, Slovakia, Italy, Spain, France, Poland, Finland	Min = 20; Max = 40
3	Austria, Hungary, United Kingdom, Czechia, Ireland	Min = 60; Max = 80

Source: compiled by the authors based on IMF data.
Policy responses to COVID-19. Policy Tracker. Available at: https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19#A.

It should be noted that, in addition to taxation, EU countries implemented ac-

tive anti-crisis measures in other spheres. Remarkably, those countries that made the most active use of fiscal measures, such as the Czech Republic and Ireland, also implemented a wide range of other anti-crisis measures.

For example, the government of the Czech Republic introduced a fiscal package of CZK 249.3 billion (€9.4 billion, 4.5 percent of GDP)[11]. The Irish authorities announced a comprehensive fiscal package of €24.5 billion (about 14% of GDP), distributed over 2020 and 2021, which includes €20.5 billion in direct support and €4 billion in indirect support.

To analyze the effect of fiscal anti-crisis measures on GDP indicators, we conducted a hierarchical cluster analysis of EU countries by looking at their GDP growth in 2020 (Fig. 5).

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[11] Policy responses to COVID-19. Policy Tracker. Czech Republic. Available at: https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19#A.
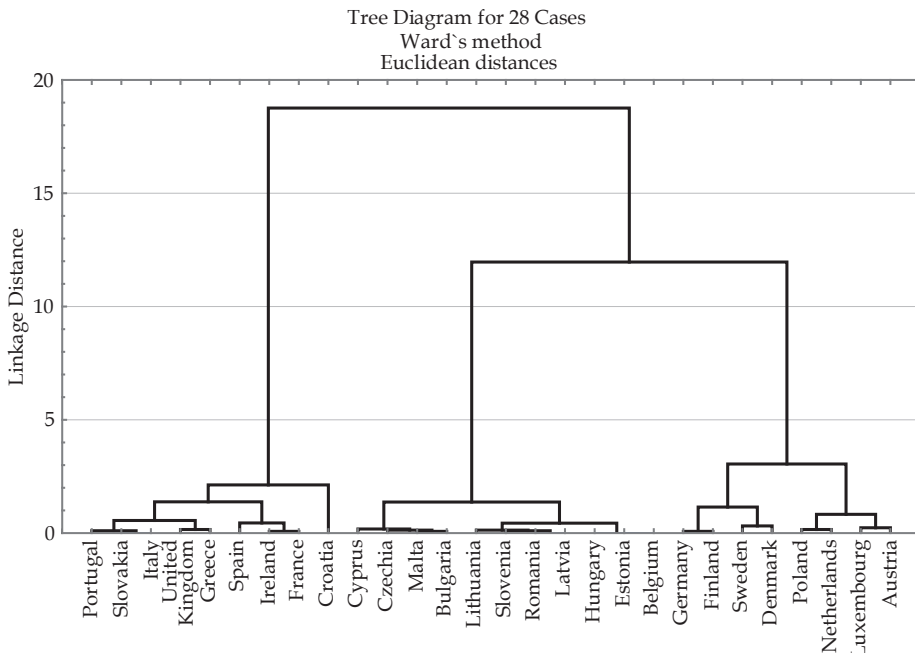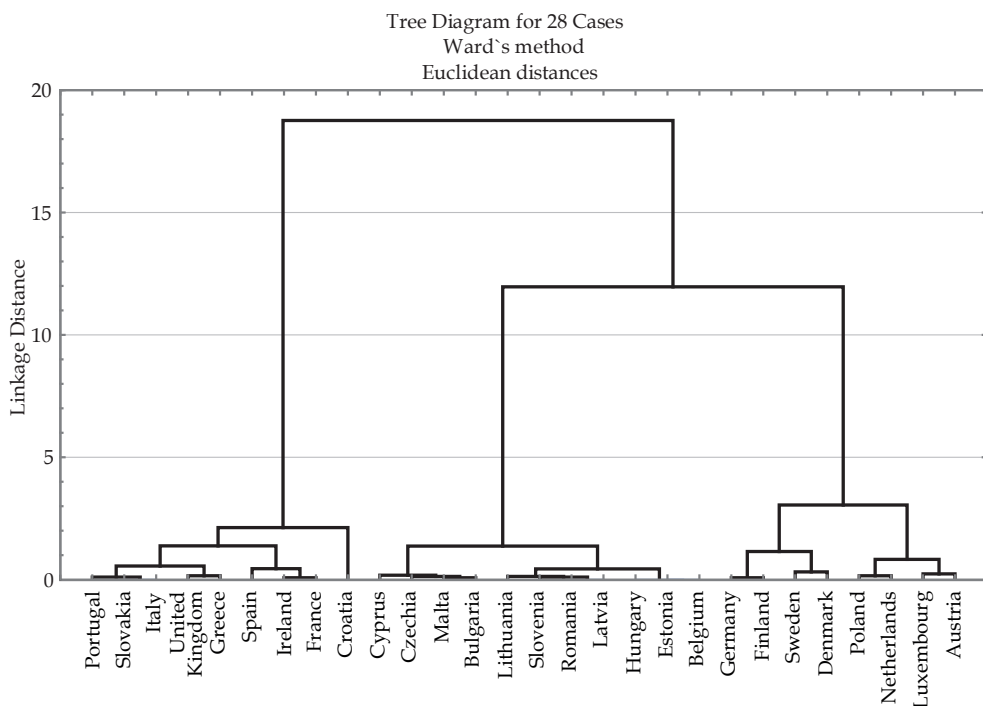

Fig. 5. **Dendrogram of hierarchical clustering of EU countries depending on their GDP growth in 2020**

Compiled by the authors based on IMF data

Policy responses to COVID-19. Policy Tracker. Available at: https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19#A

Table 6 illustrates the allocation of EU countries to clusters depending on their GDP growth in 2020.

Figure 6 illustrates the clustering of EU countries depending on their GDP growth in 2021.

Characteristics of the clusters are given in Tables 7 and 8.

Table 6

Grouping of EU countries into clusters depending on their GDP growth in 2020

Cluster	Country	Characteristic
1	Portugal, Slovakia, Italy, United Kingdom, Greece, Spain, Ireland, France, Croatia	Min = –13.4; Max = –11.1
2	Cyprus, Czechia, Malta, Bulgaria, Lithuania, Slovenia, Romania, Latvia, Hungary, Estonia, Belgium	Min = –10.3; Max = –9.5
3	Denmark, Finland, Germany, Sweden, Poland, Austria, Netherland, Luxembourg	Min = –8.8; Max = –6.3

Table 7

Grouping of EU countries into clusters depending on their GDP growth in 2021

Cluster	Country	Characteristic
1	Romania, Poland, Sweden, Finland	Min = 0.7; Max = 1.8
2	Ireland, Slovenia, Netherland, Hungary, Greece, Latvia, Estonia, Luxembourg, Denmark, Malta, Czechia, Bulgaria	Min = 2.4; Max = 4.0
3	Austria, United Kingdom, Cyprus, Belgium, Slovakia, Italy, Spain, France, Croatia, Germany, Portugal, Lithuania	Min = 4.2; Max = 6.4

Tree Diagram for 28 Cases
Ward`s method
Euclidean distances

Fig. 6. **Dendrogram of hierarchical clustering of EU countries depending on their GDP growth in 2021**

Compiled by the authors based on IMF data

Policy responses to COVID-19. Policy Tracker. Available at: https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19#A

Table 8

**Final results of the cluster analysis of EU countries depending on their fiscal
anti-crisis measures and the impact of these measures on GDP growth in 2020–2021**

Country	Cluster		
	direction of anti-crisis measures in fiscal policy	change in GDP for 2020	change in GDP for 2021
Austria	3	3	3
Belgium	2	2	3
Bulgaria	2	2	2
Croatia	1	1	3
Cyprus	2	2	3
Czechia	3	2	2
Denmark	1	3	2
Estonia	1	2	2
Finland	2	3	1
France	2	1	3
Germany	1	3	3
Greece	2	1	2
Hungary	3	2	2
Ireland	3	1	2
Italy	2	1	3
Latvia	1	2	2
Lithuania	1	2	3
Luxembourg	1	3	2
Malta	2	2	2
Netherlands	1	3	2
Poland	2	3	1
Portugal	1	1	3
Romania	2	2	1
Slovakia	2	1	3
Slovenia	2	2	2
Spain	2	1	3
Sweden	1	3	1
United Kingdom	3	1	3

Only in 4 countries out of 28 (Austria, Bulgaria, Malta, Slovenia), the results of clustering according to the type and number of anti-crisis fiscal measures coincide with clustering according to the changes in the level of GDP in 2020–2021. Interestingly, these four countries do not belong to the group of countries that implemented anti-crisis fiscal measures most actively.

In view of the above, a conclusion can be made that Hypothesis 1 regarding the direct connection between the anti-crisis fiscal packages implemented by the countries and a drop in economic growth was not confirmed since the results of country clustering have not shown a correlation between their fiscal policy responses and GDP growth.

8. Conclusions

Our study has brought to light challenges in forecasting tax revenue due to the uncertainty surrounding the COVID-19 pandemic. The best way to tackle the problem of variation in forecasts is to monitor the situation and adjust the estimates accordingly.

Our analysis of the coefficient of tax elasticity for EU countries in 2017–2020 has shown a high elasticity of taxes. Although elasticity cannot be considered a reliable indicator for tax revenue forecasts due to the higher-than-usual degree of uncertainty during the pandemic, we can still argue that there is an indirect relationship between fiscal anti-crisis measures in EU countries and GDP growth. Thus, Hy-

pothesis 1 about the indirect connection between fiscal anti-crisis measures and GDP growth is confirmed while Hypothesis 2 is refuted.

We analyzed the variations in GDP forecasts for 2020 and conducted a cluster analysis of European countries, which led us to identify the countries whose forecast estimates of GDP growth are most prone to variation – Croatia, Spain, Ireland and France.

Our analysis of anti-crisis fiscal measures and clustering showed that the countries which made the most active use of such measures were the Czech Republic and Ireland as these countries used 4 instruments out of 5. These are followed by Austria, Hungary and the UK (3 instruments).

Clusters of EU countries that took anti-crisis fiscal measures generally do not coincide with the clusters of countries grouped according to forecast estimates of their GDP growth. At the same time, since GDP forecasts take into account, among other things, changes in tax revenues, which to some extent result from anti-crisis fiscal measures, we could make a tentative evaluation of the relationship between these two indicators.

The countries that are actively implementing fiscal anti-crisis measures (leading to a reduction in tax revenues) are not among those with the most alarming GDP growth figures. Interestingly, the re-

vised GDP projections for such countries do not significantly differ from base ones. This can be explained by the fact that GDP growth is also affected by other indicators, for example, national monetary policies. In our view, this confirms the hypothesis that fiscal anti-crisis measures adopted in EU countries do not have a direct impact on GDP indicators.

It takes time for anti-crisis fiscal measures to produce noticeable effects. However, the projections for those countries that have made the most active use of such measures already demonstrate positive dynamics. Thus, for European governments it would make sense to analyze the experience and achievements of the leading countries in this sphere (the Czech Republic, Ireland and the UK) and add the most efficient instruments to their own anti-crisis packages.

Our study has revealed a non-uniform impact of fiscal policy responses on economic indicators of individual EU countries since, on top of everything else, anti-crisis measures may affect gross national income and thereby EU budget's own resources used to finance different kinds of projects and programs, inclu-ding those aimed at countering the effects of the pandemic. As a result, the EU budget's own resources may decrease, which will inevitably hit national budgets of European countries affected by the pandemic.

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