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## Article

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# Which Crisis Support Fiscal Measures Worked During the Covid-19 Shock in Europe?

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## Abstract

We build a comprehensive database that categorizes COVID-19 fiscal measures announcements in 12 European Union countries into 7 distinct spending categories. Through our empirical analysis, we investigate the impact of these support packages on the economy. Overall, the fiscal measures played a crucial role in promoting output recovery without significant inflationary pressures. However, we observed substantial variations across different spending categories. Assistance provided to small and medium enterprises and specific sectors proved to be highly effective in stimulating the output while maintaining inflation. Direct pandemic spending and measures aimed at sustaining employment levels generated substantial output and employment multipliers and enhanced business sentiment without leading to inflationary costs. Conversely, universal help had inflationary effects and transfers to households primarily aroused consumer and business sentiment without producing significant economic impacts.

**Keywords** COVID-19 crisis · Fiscal measures · Multipliers · Sentiment · Transfers · Assistance to SMEs · Inflation

**JEL Classification** C23 · E62

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## 1 Introduction

In response to the record-breaking COVID-19 recession, governments worldwide implemented extraordinary fiscal stimuli, effectively mitigating the most severe consequences of the crisis. According to Fig. 1, the pandemic-related cumulative fiscal spending between October 2020 and July 2021 varied from 45% of GDP in Italy to around 8% in Romania and the average spending in the 27 EU countries was a bit below 20%. These figures are surely exceptional and, moreover, mask a lot of heterogeneity in spending categories across countries. While all countries seem to have used to some extent fiscal measures to support small and medium enterprises, some activated measures to support employment and others opted for non-targeted help to both consumers and firms or used direct transfers to households to assist the economic recovery.

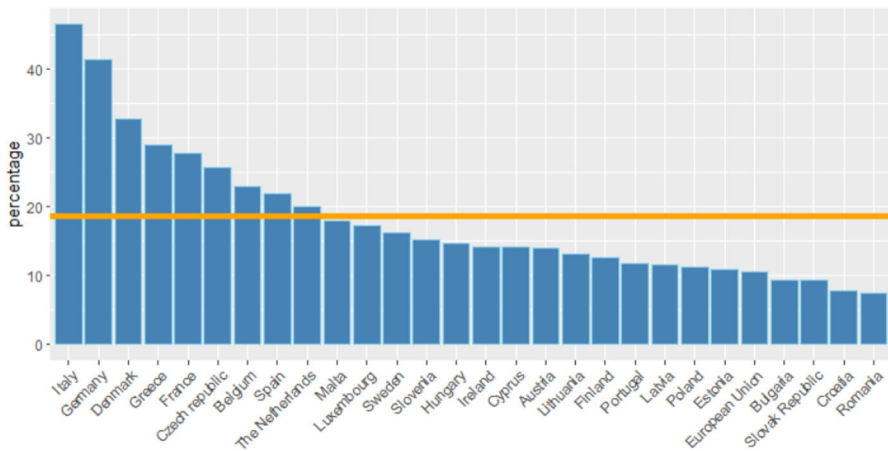
In this paper, we construct a unique database on fiscal spending categories announced during the COVID-19 crisis in 12 European Union (EU) countries.<sup>1</sup> The database is constructed using three primary sources: (a) the Fiscal Monitor database of country fiscal measures in response to the COVID-19 pandemic by the International Monetary Fund (IMF), (b) the European Commission (EC) report on European COVID-19 measures, and (c) the report on COVID-19 policy measures compiled by Bruegel, an economics-focused think tank based in Brussels. We also use national sources for some countries to overcome data availability problems when, for example, the IMF database provides only the measure but not the associated expenditure amount. The database includes the EU countries for which we found the relevant information. These measures, which encompass a range of functions, are classified into seven distinct categories to provide a comprehensive understanding of their intended purposes: (1) Assistance to small and medium enterprises (SMEs) and specific sectors, (2) Measures targeted to transform the economy, (3) Pandemic spending (e.g., on health-care), (4) Transfers to households, (5) Unemployment benefits and measures to sustain employment, (6) Universal help, and (7) Other COVID-19 government spending.

To illustrate the usefulness of our data set, we conduct an empirical analysis utilizing a Generalized Method of Moments (GMM) approach to investigate the effectiveness of the different COVID-19 fiscal measures. In particular, we estimate their impact on several key economic indicators, including quarterly Gross Domestic Product (GDP) growth, changes in consumer confidence and business sentiment, inflation and employment. To account for the evolving nature of the pandemic, our regressions incorporate control variables such as an index reflecting the stringency of lockdown measures and the number of COVID-19 fatalities per million inhabitants. Our empirical findings indicate that the fiscal measures implemented during the COVID-19 crisis were effective in stimulating economic recovery without leading to notable inflationary effects.

The output multiplier is estimated to be smaller than one for the total fiscal packages. However, there is substantial heterogeneity regarding the different fiscal measures. The multipliers associated with assistance to SMEs and specific sectors are in line with the aggregate spending multipliers. By contrast, we obtain output multipliers larger than

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<sup>1</sup> It is important to point out that our data include fiscal measures that were either announced or actually implemented.



**Fig. 1** Pandemic-related cumulative fiscal spending (% GDP) in 27 EU countries, from October 2020 to July 2021. Source: IMF Fiscal Monitor database of country fiscal measures in response to the COVID-19 pandemic. The GDP share of each measure in every quarter is calculated using data for 2020Q3 GDP to avoid changes caused by GDP variations. The horizontal line depicts the average across the 27 EU countries

one for (i) direct pandemic spending and (ii) unemployment benefits and measures to sustain employment levels. Employment rates and business sentiment also react substantially and significantly to these measures. For transfers to households, the estimated output multipliers are not statistically significant but consumer and business confidence multipliers are. Therefore, even if transfers did little to regain economic losses, they were important in backing up sentiment.<sup>2</sup> Finally, non-targeted assistance (universal help) to both firms and households had positive effects on inflation and boosted business sentiment mostly.

Hence, we conclude that the fiscal packages during the COVID-19 crisis successfully helped the economic recovery in Europe. Different fiscal measures had differential effects with unemployment benefits and measures to sustain employment as the best measure to maintain employment and business sentiment and assistance to SMEs as the most effective in stimulating output. Non-targeted help was the measure that put upward pressure on the inflation dynamics.

Recent studies that quantify the macroeconomic effects of fiscal actions in response to the COVID-19 pandemic using fiscal announcements or aggregate fiscal data also suggest that the measures helped the economies recover (e.g., Gourinchas et al. 2021; Chudik et al. 2021; Deb et al. 2021). In this body of research, Gourinchas et al. (2021) conclude that fiscal policy prevented a large increase in firm failures by halving the failure rate, but it was inefficiently targeted. Using detailed regional variation in economic conditions in US data, Auerbach et al. (2022) recently document that the effects of government spending were stronger during the peak of the pandemic recession, but only in cities that were not subject to strong stay-at-home orders.

<sup>2</sup> Using the ECB Consumer Expectations Survey, Georgarakos and Kenny (2022) find that improving perceptions about the adequacy of fiscal interventions stimulated spending, equally strongly for consumers who received government support and for those who did not.

Guerrieri et al. (2022), using a theoretical framework, suggest that fiscal policy can display a smaller multiplier in the case of the COVID-19 shock but suggest that the insurance benefit of fiscal transfers can be enhanced. Faria-e Castro (2021) finds, in a nonlinear Dynamic Stochastic General Equilibrium (DSGE) model, that the COVID-19 pandemic shock changes the ranking of policy multipliers in the United States. Unemployment benefits are the most effective tool to stabilize income for borrowers, while liquidity assistance programs are the most effective if the policy objective is to stabilize employment in the affected sector. In a Heterogeneous Agents New Keynesian (HANK) framework, Bayer et al. (2020) quantify for the US economy the impact of a rise in fiscal transfers in the presence of the COVID-related lockdown. For the short run, they find large differences in the transfer multiplier: it is 0.25 for unconditional transfers and 1.5 for conditional (on recipients being unemployed) transfers. Overall, they conclude that the transfers reduce the output loss due to the pandemic by up to 5 percentage points. The theory in Auerbach et al. (2021) predicts that pandemic fiscal stimulus has weaker economic effects on impact, as households are unable or reluctant to spend on services that potentially pose health risks. But as restrictions are removed and consumers become less reserved, there is a surge in spending and therefore in inflation.

Jordà and Nechio (2023) exploit the differences in pandemic support to identify the effect of these programs on inflation and the pass-through to wages using a sample of both European and non-European countries. Their estimates suggest that a 5 percentage points increase in real disposable income relative to trend (their indirect measure of changes in pandemic fiscal support) translates into roughly 3 percentage points additional inflation after 4 quarters. Using data for 10 large economies, Hale et al. (2023) find that fiscal support measures to consumers, but not firms, had inflationary effects that manifested 5 weeks following the announcement and peaked at 12 weeks. The impact was stronger in an environment of boosting consumer sentiment. Focusing on inflation through February 2022, de Soyres et al. (2022) show that countries with large fiscal stimulus, or with high exposure to foreign stimulus through international trade, experienced stronger inflation outbursts. Their back-of-the-envelope calculations suggest that US fiscal stimulus during the pandemic contributed to a surge in inflation of about 2.5 percentage points in the USA and 0.5 percentage points in the United Kingdom.

Relative to the existing literature, we focus on EU countries and provide evidence on the effectiveness of different fiscal measures for different economic indicators. We look at the effects of the measures for output growth, employment and business sentiment but also in terms of consumer confidence, an important factor for demand recovery, and inflation.

The rest of the paper is organized as follows: Section 2 lays out the data on COVID-19 fiscal measures. Section 3 discusses the empirical methodology. Section 4 presents the main findings. Finally, Sect. 5 concludes.

## 2 COVID-19 fiscal measures in European countries

In this section, we provide a detailed description of the methodology used to construct our database of public spending categories in 12 EU countries during the COVID-19 pandemic. Furthermore, we conduct a comparative analysis among countries to identify the specific measures adopted and examine the evolution of fiscal measures over time.

### 2.1 Construction of the database

We have constructed a novel database that covers the period of 2020-Q2, 2020-Q3, 2020-Q4, 2021-Q1 and 2021-Q2. The database incorporates data from three main sources: (a) the IMF Fiscal Monitor database, which provides information on country fiscal measures implemented in response to the COVID-19 pandemic, (b) the EC report on COVID-19 measures, and (c) the COVID-19 policy measures report by Bruegel.<sup>3</sup> We also used national sources for some countries to overcome data availability problems when, for example, the IMF database provided only the measure but not the associated expenditure amount (see the data methodology in Annex A of our companion policy paper Pappa and Vella 2022). This approach allowed us to compile a comprehensive and reliable dataset that captures the discretionary measures announced and implemented by governments to complement existing automatic stabilizers in selected economies in response to the COVID-19 pandemic (as of September 27th, 2021).

Let us briefly discuss the IMF Fiscal Monitor database, since we follow its classification of expenditure types. The database summarizes key fiscal measures announced or taken by governments in response to the COVID-19 pandemic. The database categorizes different types of fiscal support since January 2020, focusing on government discretionary measures. The IMF data are organized on the basis of the following categories:

1. Above the line:

- Additional spending or foregone revenues (tax cuts) in health and non-health sectors.
- Accelerated spending/deferred revenue (mostly tax deferrals).

2. Below the line support:

- Equity injections, loans, asset purchases or debt assumptions.
- Contingent liabilities in form of guarantees and quasi-fiscal operations (financial schemes used during the pandemic).

The novelty of our work lies in collecting and classifying the above mentioned individual measures taken in EU countries into the following categories, for which we also provide a concrete example taken from the case of Belgium:

<sup>3</sup> See <https://www.bruegel.org/publications/datasets/covid-national-dataset/>.

1. *Assistance to small and medium enterprises (SMEs) and specific sectors*: fiscal measures targeted to the firms or self-employed that suffered losses due to the pandemic; an example here is the Federal loan to Brussels Airlines and various (subordinated) loans provided by regional governments for companies and self-employed affected by COVID-19.
2. *Fiscal measures targeted to transform the economy*: fiscal measures to promote investment activities, particularly in the areas of environmental sustainability and digitization; an example here is the Flemish fiscal stimulus amounting to €1.66 billion for one-off investments in various priority areas, e.g. 5G, hydrogen, water management, infrastructure etc.
3. *Spending caused by the pandemic*: fiscal measures to face the direct effects of the pandemic (e.g., on healthcare); an example here is spending on medical equipment and tests.
4. *Transfers to households*: fiscal measures designed to help households; an example here is the one-off payment of €100 for households to pay their electricity bills and €75 to pay their gas bills in 2020-Q2.
5. *Unemployment benefits and measures to sustain employment levels*: measures that covered the cost of short-time work schemes and maintain jobs; an example here is government payments of a part of employees' salaries when are temporarily laid off due to the circumstances.
6. *Universal help*: non-targeted fiscal measures, mostly tax cuts, to support businesses, employees, and households; an example here in 2020-Q2 is the deferred payment of tax and social security contributions for affected firms, self-employed, and households, without application of interest charges and penalties, estimated at about €10 bn, and exemption of advanced VAT payment in December.
7. *Other*: all COVID-related fiscal measures that do not belong to the previous categories. An example here is foregone revenue.

The sample of EU countries included in our analysis comprises Belgium, Bulgaria, the Czech Republic, Denmark, Finland, France, Germany, Italy, the Netherlands, Poland, Romania, Spain, and Sweden. However, it is important to note that we have limited data availability for Portugal and Poland. For Portugal, we only have data for June 2021, while for Poland, we encountered data issues in the previous quarters, and therefore, we could only use the data for the last quarter. As a result, these two countries are excluded from the econometric analysis discussed in Sect. 3 of our study. For a complete understanding of the data construction process, we refer readers to Annex A of Pappa and Vella (2022).<sup>4</sup>

## 2.2 Cross-country comparison

Next, we compare the fiscal measures adopted by different countries. Figure 2 shows the percentage distribution of various expenditure types within the total public expenditure related to COVID-19 for a subset of EU countries with available data. Notably, the variations in expenditure allocation across different countries and categories reflect

<sup>4</sup> The full database is available online in the following address: <https://sites.google.com/site/evipappapersonalhomepage/home/research>.



the diverse approaches adopted by different countries in response to the COVID-19 pandemic.

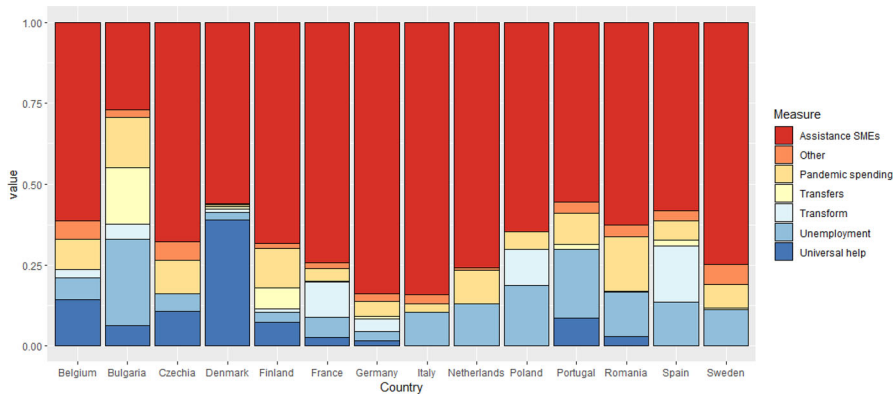
All countries but Bulgaria allocated more than half of their exceptional fiscal measures to “Assistance to SMEs and specific sectors”. Italy and Germany stand out, with over 80% of their measures directed towards this category. Regarding “Fiscal measures targeted to transform the economy”, Spain emerges as the clear leader with 17%, followed by France and Poland, both at around 11%. Other countries in our sample generally have values close to or below 4%, or even zero. In terms of “Spending caused by the pandemic”, Romania and Bulgaria take the lead with approximately 17% and 15%, respectively. Most other countries hover around or below 10%, except for Finland, which stands at 12%. All countries in the sample have engaged part of the extra spending to finance “Unemployment benefits and measures to sustain employment rates”. Bulgaria shows the highest figure (26%), followed by Portugal (21%) and Poland (19%).

Contrary to general perceptions, the numbers in Fig. 2 indicate that “Transfers to households” were not widely used during the pandemic in the countries included in our sample. Bulgaria and Finland had the highest shares, with approximately 18% and 6% of total expenses allocated to this category, respectively. The remaining eight countries that implemented transfers as a fiscal measure dedicated less than 2% of their total expenditures to this category. Regarding “Universal help”, Denmark stands out with a remarkably high value close to 40% in non-targeted fiscal measures. In contrast, other economies have values well below 15%, and countries such as Italy, Poland, Spain, Sweden, and the Netherlands did not implement any non-targeted measures.

In Fig. 3, we examine the quantitative evolution of COVID-19 expenditure types as percentage of GDP over the period from 2020Q2 to 2021Q2 for countries with available information by presenting cumulative data. The analysis reveals shifts in fiscal measures across time, particularly towards “Assistance to SMEs”. Here are the key observations. Romania primarily increased its “Assistance to SMEs” from 3% of GDP initially to roughly 5% of GDP in the last quarter. Belgium and Italy increased over time “Assistance to SMEs”, which reached a cumulative of 14% of GDP in Belgium and 40% of GDP in Italy, as well as “Unemployment benefits”, which reached roughly 2% of GDP in both countries. Bulgaria adjusted upwards “Pandemic spending” in the last quarter of 2020, from less than 0.5% of GDP initially to 1.5% of GDP, and “Transfers to households”, from 0.3% of GDP initially to 1.4% of GDP in 2020Q4 and increased again these transfers in 2021Q2. The fiscal measures in the Czech Republic increased continuously during the whole period with most expenditures destined to the assistance of small and medium enterprises and with other types of assistance increasing markedly in 2021Q2.

Denmark adjusted upwards in 2021Q1 its “Assistance to SMEs”, roughly tripling its share in GDP, and “Universal help”, roughly doubling its share in GDP. France followed a similar pattern for assistance to SMEs, which reached cumulatively 20% of GDP in the last quarter, and increased measures to “Transform the economy” in 2020Q4. Spain and the Netherlands adjusted persistently upwards “Assistance to SMEs”, “Unemployment benefits” and “Pandemic spending”. Specifically, in the Netherlands “Assistance to SMEs” climbed from 9% of GDP to more than 15% of GDP cumulatively in the second quarter of 2021, whereas in Spain it reached cumula-





**Fig. 2** Cross-country comparison of COVID-19 expenditure types (% of total spending, cumulative data in July 2021). Authors' own calculations based on the constructed database (see Sect. 2)

tively 13% of GDP. Finally, Germany and Sweden did not adopt additional measures after the initial period.

### 3 Econometric methodology

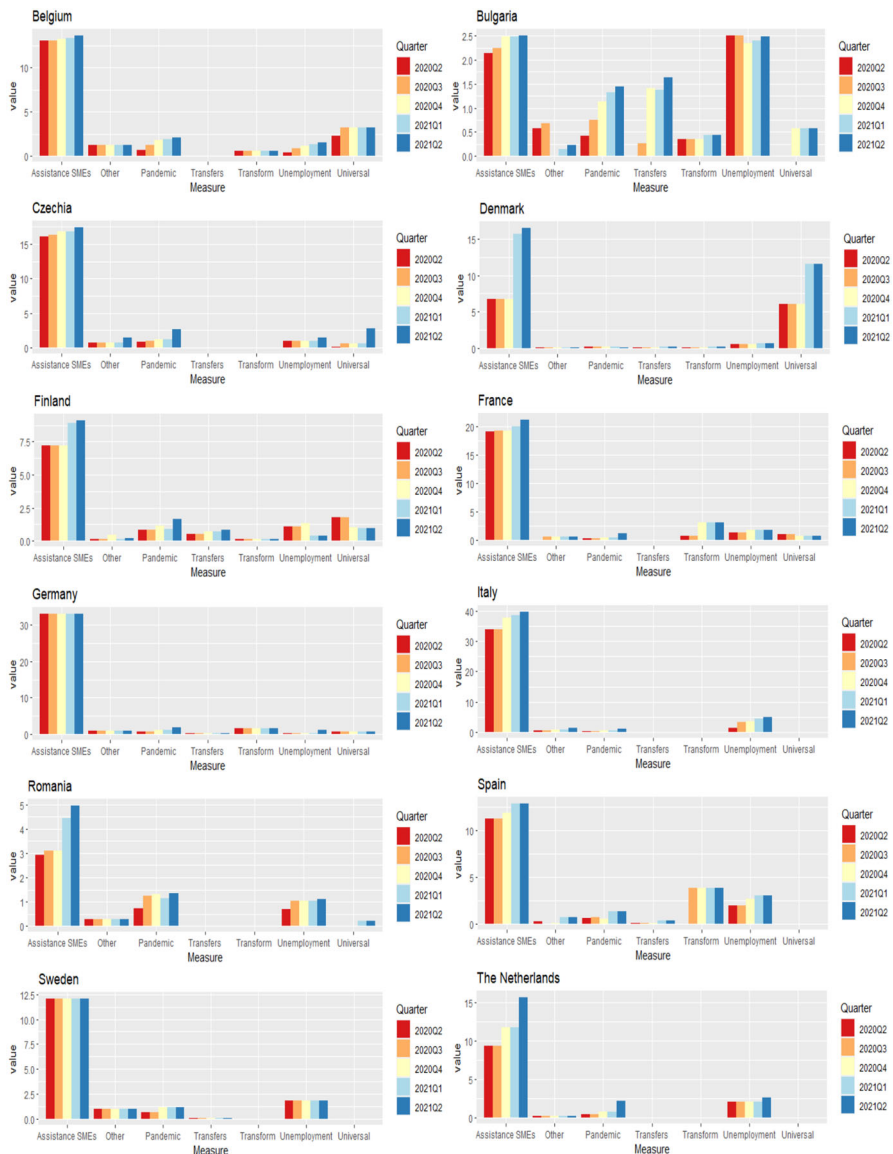
In this section, we outline the econometric methodology and complementary data sources that we use in the empirical analysis. Our goal is to test whether the fiscal choice in response to the pandemic makes a difference for the economic and sentiment recovery and whether it matters for inflationary pressures in the economy.

#### 3.1 Model specification

Given that our data include fiscal measures that were either announced or actually implemented, we adopt the following regressions specification. We estimate the multiplier effect of a change in spending as a percentage of GDP on the dependent variable of interest up to  $h$  periods ahead, where  $h \in \{1, 2, 3\}$ , as follows:

$$\sum_{j=1}^h y_{i,t+j} = \alpha_{i,h} + \sum_{j=1}^h \sum_{l=1}^p \gamma_{l,h} y_{i,t+j-l} + \beta_{1,h} \sum_{j=1}^h \Delta \text{SPEND}_{i,t+j-1} + \beta_{2,h} X_{i,t} + \epsilon_{i,t}, \quad (1)$$

where  $i$  and  $t$  denote countries and periods, respectively;  $y_{i,t+j}$  is the variable affected by the fiscal measures (GDP growth, confidence change, CPI change, employment rate, and the Economic Sentiment Indicator (ESI) change);  $\Delta \text{SPEND}_{i,t}$  represents the change either in total COVID-19 spending (% GDP) or in a specific COVID-19 spending component. We also incorporate a set of controls, represented by  $X_{i,t}$ , to account for endogenous movements in the dependent variable. These controls include



**Fig. 3** Evolution of the COVID-related fiscal measures (% GDP, cumulative data). The graphs plot the different cumulative spending measures adopted by the countries as % of GDP over the period from 2020Q2 to 2021Q2. Source: Authors' own calculations based on the constructed database (see Sect. 2)

the stringency of the lockdowns index, the number of COVID-19 fatalities per million inhabitants, and quarter fixed effects.<sup>5</sup> Additionally, in the regressions for the CPI

<sup>5</sup> As König and Winkler (2021) show, including time fixed effects decreases the significance of the stringency indicators. For that reason, the specific controls used vary depending on the dependent variable being analyzed to ensure the best fit of the model.

change, we include oil prices and long-run interest rates as controls. In all the regressions, we control for the lagged value of total spending, aiming to capture differences in the total level of spending among the countries in our sample.<sup>6</sup>

The coefficient of interest is  $\beta_{1,h}$  measuring the cumulative multiplier effect, up to  $h$  periods ahead, of an increase in the corresponding spending category (% GDP) on the dependent variable. Notice that, since our data include fiscal measures that were either announced or actually implemented, we allow in Eq. (1) for a different timing between the dependent variable and the main independent variable, which refers to COVID-19 government spending.

Equation (1) also includes  $p$  lags of the dependent variable to capture the typical dynamics that appear when regressing macroeconomic variables. By construction, the unobserved panel level effects are correlated with the lags of the dependent variable, creating a problem of endogeneity and inconsistency of the traditional panel data estimation methods. To overcome this problem, we use the Arellano and Bond (1991) method. In the framework of a Generalized Method of Moments (GMM) estimator, we can determine how many lags of the dependent variable are valid instruments and how to combine these lagged levels with first differences of the exogenous variables into a large instrument matrix.<sup>7</sup> Given the scarce degrees of freedom with the available data, we estimate Eq. (1) separately for each dependent variable of interest and each category of spending.

### 3.2 Identification: limitations

The Arellano and Bond (1991) approach is useful for addressing the typical endogeneity problems in dynamic panel models. However, it does not account for other sources of endogeneity that are inherent in the fiscal responses of countries to negative shocks, such as the COVID-19 pandemic. Particularly, countries heavily impacted by the pandemic may adopt more aggressive fiscal policies, which can confound the estimation of the effects of fiscal measures on macroeconomic indicators. Additionally, policy-makers were concerned about public health consequences of the pandemic. Since a positive correlation between public health and macroeconomic performance seems likely, an additional source of endogeneity in the fiscal response potentially arises.

We acknowledge the challenges associated with addressing these sources of endogeneity and establishing causal effects from policy measures to macroeconomic variables. Ideally, having instrumental variables or plausibly exogenous measures of fiscal spending would provide a solution. However, in our context, it is particularly challenging to find suitable instruments, especially considering that the validity of an instrument for one spending category may not hold for others. To mitigate these concerns, we include controls for fatalities and the stringency of the lockdowns in our analysis, aiming to partial out the impact of the pandemic on countries from the

<sup>6</sup> We considered also other controls such as the current account to GDP ratio, trade openness, industrial production, and tourism flows. However, these variables were not relevant for our main findings, so we decided to leave them out of the empirical analysis due to the reduced sample size.

<sup>7</sup> In what follows, for each dependent variable considered we present results for the specifications that maximize the efficiency of the IV estimator.

estimates. Given this second-best solution, we recommend the reader to interpret our findings with some caution.

### 3.3 Additional data sources

Data on fatalities and the stringency index come from Ritchie et al. (2020). Data on the consumer confidence and ESI indices, seasonally adjusted, are taken from the consumer surveys conducted by the Directorate General for Economic and Financial Affairs.<sup>8</sup> For inflation, we use the Harmonized Index of Consumer Prices (HICP), from Eurostat. Data on employment rates are also taken from Eurostat. The Europe Brent Spot Price from Thomson Reuters is used as the oil price measure. Long-run interest rates are from the Monetary and Financial Statistics (MEI) by the OECD. Our quarterly sample for estimation starts in 2020-Q2 and ends in 2021-Q2.

## 4 Empirical results

In this section, we present the estimation results for the effects of COVID-19 fiscal measures on output growth, consumer confidence, CPI inflation, employment, and business confidence (ESI). Our estimation results pass various diagnostic and robustness checks, which we discuss at the end of the section.

### 4.1 COVID-19 fiscal multipliers

The results of our analysis highlighting substantial heterogeneity in the impact of different fiscal measures on specific dependent variables. Next, we discuss the regression estimates for each dependent variable individually.

#### 4.1.1 Output

Table 1 reports estimation results for Eq. (1) when the dependent variable is output growth.<sup>9</sup> For the EU countries considered, the output multiplier of total COVID-19 spending is statistically significant at all horizons considered and, on average, its value is below one (in the range of 0.33–0.46). This result is in line with Deb et al. (2021), who find an average fiscal multiplier of 0.2 for a sample of 52 countries, using daily data of announcements for fiscal policy interventions in 2020. Assistance to SMEs generates significant and positive multipliers that are lower than one. This evidence squares well with the results presented in Gourinchas et al. (2021) according to which assistance to SMEs was inefficiently targeted. For transfers to households and universal help (i.e., fiscal measures, mostly tax cuts, to support businesses, employees, and households), output multipliers are not statistically significant. For the fiscal measures to transform

<sup>8</sup> Available at: <https://ec.europa.eu/info/business-economy-euro/indicators-statistics/economic-databases/business-and-consumer-surveys>.

<sup>9</sup> In this set of regressions, we have included fixed effects for 2020-Q2 to control for the strong fall in output growth that is an outlier.

the economy, the output multiplier is below one and is statistically significant (at the 10% level) only for  $h = 1$ . By contrast, we obtain sizeable multipliers exceeding one for spending caused by the pandemic and for unemployment benefits and measures to sustain employment levels ( $h = 1$  and  $h = 3$ ).

#### 4.1.2 Consumer confidence

Next, we examine in Table 1 estimation results for the consumer confidence index as the dependent variable in Eq. (1).<sup>10</sup> Total spending appears to affect positively confidence only in the short-run. When we look at the specific categories, it is direct pandemic spending and transfers to households that have prolonged significant and sizeable effects on economic confidence. Transfers increase confidence significantly and persistently, two and three quarters after the fiscal measures are in place or announced.

#### 4.1.3 Inflation

The impact of the COVID-19 shock on inflation entails both downward pressures, such as the collapse in consumption due to the lockdowns, but also upward pressures, due to the reduction in production and the disruptions in supply chains. In Table 1, we report the results from estimating Eq. (1) with changes in the CPI as the dependent variable.<sup>11</sup> Since our data stop in 2021-Q2, the results on the upward pressures on inflation are not contaminated by the increase in energy prices that started in 2021-Q3. Nevertheless, to control for possible pressures coming from the price of energy we included the electricity prices for household consumers as an additional control but results (available upon request) were not affected. The results indicate that assistance to SMEs has a negative but mild impact on inflation, which is statistically significant at all horizons considered.

This result seems to point to the fact that assistance to SMEs helped to ease supply shortages. This finding seems also to be the driver of the small negative effects found for total spending after two and three quarters. By contrast, universal help spending had positive and larger effects on inflation. For the other spending categories, the estimated multipliers are not statistically significant.

Hale et al. (2023) find that fiscal support measures to consumers, but not firms, had inflationary effects which were stronger in an environment of boosting consumer sentiment. Our findings are hard to compare as we differ in the classification of the measures, the sample of countries, and the sample period. For example, the two samples share only three countries in common (namely, France, Germany, Spain). Yet, according to our analysis, we reconfirm that transfers boost sentiment but we fail to detect significant inflationary effects of transfers. Instead, non-targeted measures to both household and firms seem to generate inflationary effects without affecting at all consumers' confidence but seem to propagate through business sentiment instead (see last column of Table 1).

<sup>10</sup> In this set of regressions, we have included fixed effects for 2020-Q2 and the number of COVID-19 fatalities per million of inhabitants.

<sup>11</sup> In terms of controls, in this set of regressions we have included fixed effects for 2020-Q2, long-run interest rates and oil prices.

**Table 1** Multiplier effects of COVID-19 fiscal measures on output, sentiment, inflation and employment rates, controlling for the effects of total COVID-19 government spending

Spending category	GDP growth			Confidence change			CPI change			Employment rate			ESI change		
	<i>h</i> = 1	<i>h</i> = 2	<i>h</i> = 3	<i>h</i> = 1	<i>h</i> = 2	<i>h</i> = 3	<i>h</i> = 1	<i>h</i> = 2	<i>h</i> = 3	<i>h</i> = 1	<i>h</i> = 2	<i>h</i> = 3	<i>h</i> = 1	<i>h</i> = 2	<i>h</i> = 3
Total spending	0.372*** (0.000)	0.335*** (0.000)	0.464*** (0.000)	0.142** (0.058)	0.062 (0.483)	0.028 (0.745)	−0.012 (0.121)	−0.026** (0.049)	−0.032*** (0.002)	0.035 (0.721)	1.152** (0.021)	0.911 (0.193)	1.780*** (0.000)	1.794*** (0.000)	1.951*** (0.000)
Assistance SMEs	0.230** (0.021)	0.045 (0.702)	0.520*** (0.000)	0.055 (0.608)	−0.094 (0.484)	−0.052 (0.642)	−0.038*** (0.000)	−0.046** (0.040)	−0.061*** (0.000)	0.004 (0.876)	−0.415 (0.221)	−0.716 (0.140)	−0.247** (0.015)	−0.014 (0.957)	−0.092 (0.796)
Transform	0.851* (0.062)	−0.045 (0.957)	0.402 (0.756)	0.358 (0.642)	0.421 (0.722)	−0.410 (0.599)	0.071 (0.304)	−0.050 (0.162)	0.146 (0.189)	−0.287 (0.242)	−0.599 (0.545)	−0.459 (0.867)	−0.951 (0.342)	−1.687 (0.522)	0.012 (0.995)
Pandemic spending	0.730 (0.505)	−1.297 (0.580)	6.214*** (0.000)	2.109 (0.179)	2.104 (0.537)	5.754** (0.042)	0.239 (0.417)	−0.238 (0.372)	−0.273 (0.548)	−1.673 (0.250)	27.361*** (0.006)	10.302 (0.529)	9.051** (0.015)	12.093** (0.069)	31.924*** (0.000)
Transfers	−2.183 (0.279)	0.353 (0.593)	−0.074 (0.929)	1.292 (0.666)	2.589** (0.022)	3.112* (0.069)	0.096 (0.833)	−0.014 (0.938)	0.337 (0.133)	−1.875 (0.338)	6.842 (0.335)	0.137 (0.987)	2.979 (0.372)	6.583** (0.043)	9.811** (0.030)
Unemployment	1.658* (0.096)	0.340 (0.639)	3.900*** (0.002)	0.303 (0.782)	−0.126 (0.905)	0.616 (0.768)	−0.015 (0.878)	0.190* (0.069)	−0.098 (0.598)	0.739 (0.489)	10.671 (0.124)	14.876*** (0.011)	6.260*** (0.006)	7.408** (0.019)	14.910*** (0.000)
Universal help	−0.237 (0.237)	−0.119 (0.630)	0.460 (0.616)	0.007 (0.983)	0.178 (0.534)	−0.714 (0.273)	0.127*** (0.000)	0.092** (0.014)	0.204** (0.011)	−0.157 (0.593)	0.782 (0.468)	4.694 (0.166)	0.167 (0.819)	1.775** (0.046)	5.775*** (0.003)

Table 1 continued

Spending category	GDP growth			Confidence change			CPI change			Employment rate			ESI change		
	$h = 1$	$h = 2$	$h = 3$	$h = 1$	$h = 2$	$h = 3$	$h = 1$	$h = 2$	$h = 3$	$h = 1$	$h = 2$	$h = 3$	$h = 1$	$h = 2$	$h = 3$
Observations	60	60	60	56	56	56	60	60	60	60	60	60	60	60	60
Number of countries	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Lags	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
2020-Q2 fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
Stringency	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Fatalities	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No
Interest rates	No	No	No	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No
Oil price	No	No	No	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No

The table contains the estimated cumulative multipliers associated to each spending category, in individual regressions, for GDP growth, confidence change, CPI change, employment rates and the ESI index based on equation (1). *P* values of the significance tests are in parentheses. \*, \*\*, \*\*\* denote significance at the 10, 5, and 1% levels, respectively. Observations begin in 2020Q2 and end in 2021Q2. There are 56 observations in the regressions for confidence due to lack of data for Romania after 2020Q3. All the regressions include as a control the total spending as percentage of GDP



#### 4.1.4 Employment

Table 1 also reveals a positive impact of total spending on employment rates, with the highest multiplier estimated to be around 1.152% at  $h = 2$ .<sup>12</sup> We further find that specific categories of fiscal measures also exhibit significant effects on employment. In particular, the multipliers for unemployment benefits and measures to sustain employment are significant at horizon  $h = 2$ , highlighting the effectiveness of these measures in sustaining and even boosting employment rates. Additionally, significant effects are observed for pandemic spending at  $h = 2$ .

#### 4.1.5 Business sentiment

Regarding the Economic Sentiment Indicator (ESI) change, our estimates in Table 1 indicate statistically significant and positive effects of total spending, as well as of specific categories such as pandemic spending, transfers to households, unemployment benefits and measures to sustain employment levels, and universal help. Pandemic spending and unemployment benefits and measures to sustain employment generate the highest multipliers for business sentiment. For assistance to SMEs and measures to transform the economy, the estimated multipliers are not statistically significant.<sup>13</sup>

In summary, our analysis reveals that assistance to SMEs and pandemic-related spending played a crucial role in stimulating the economy, leading to positive effects on GDP growth and employment rates, and boosting confidence and sentiment. Importantly, these measures did not generate inflationary pressures. Similarly, unemployment benefits and measures aimed at sustaining employment levels showed strong positive effects on GDP growth and employment, without contributing to inflation. On the other hand, transfers to households had limited impact, primarily influencing confidence and sentiment but not significantly affecting other economic indicators. Surprisingly, non-targeted measures to both firms and households and only affected the employment recovery with several lags.

### 4.2 Diagnostic tests and robustness

In terms of diagnostic tests, we performed the Arellano–Bond tests to assess the presence of first- and second-order autocorrelation in the first-differenced errors. The results, presented in Table 2, indicate that the null hypothesis of no first-order autocorrelation is rejected in most cases. This is a common finding when the idiosyncratic errors are independent and identically distributed. However, we find evidence of no second-order autocorrelation in the majority of cases, at a significance level of 5%, for the regressions involving GDP growth, consumer confidence change, CPI change, and employment. This suggests that the model is not misspecified for these dependent variables. However, for the ESI index regressions, the null hypothesis of no second-order autocorrelation is rejected for the horizons  $h = 2$  and  $h = 3$ , indicating that caution should be taken when interpreting these estimates.

<sup>12</sup> In this regressions, we control for 2020-Q2 fixed effects and stringency of the lockdown.

<sup>13</sup> In this set of regressions, we control for 2020-Q2 fixed effects and stringency of the lockdown.

**Table 2** Arellano–Bond test for auto-correlation, multiplier spending regressions

Spending category	Order	GDP growth		Confidence change		CPI change		Employment rate		ESI change	
		$h = 1$	$h = 2$	$h = 1$	$h = 2$	$h = 1$	$h = 2$	$h = 1$	$h = 2$	$h = 1$	$h = 2$
Total spending	$m = 1$	0.030	0.002	0.013	0.037	0.045	0.009	0.018	0.022	0.191	0.001
	$m = 2$	0.088	0.253	0.941	0.648	0.405	0.048	0.116	0.125	0.293	0.202
Assistance SMEs	$m = 1$	0.039	0.001	0.010	0.014	0.035	0.014	0.016	0.024	0.006	0.045
	$m = 2$	0.160	0.030	0.836	0.122	0.391	0.047	0.070	0.120	0.389	0.188
Transform	$m = 1$	0.048	0.002	0.007	0.030	0.008	0.003	0.013	0.023	0.129	0.045
	$m = 2$	0.289	0.044	0.779	0.171	0.247	0.083	0.381	0.275	0.316	0.134
Pandemic spending	$m = 1$	0.035	0.001	0.023	0.027	0.018	0.004	0.013	0.015	0.127	0.005
	$m = 2$	0.293	0.039	0.940	0.444	0.327	0.061	0.198	0.115	0.226	0.071
Transfers	$m = 1$	0.037	0.001	0.006	0.022	0.065	0.006	0.018	0.022	0.030	0.003
	$m = 2$	0.367	0.056	0.586	0.124	0.246	0.034	0.204	0.308	0.218	0.174
Unemployment	$m = 1$	0.021	0.001	0.003	0.037	0.036	0.005	0.015	0.013	0.227	0.010
	$m = 2$	0.161	0.060	0.930	0.077	0.161	0.040	0.230	0.143	0.433	0.609
Universal help	$m = 1$	0.040	0.001	0.005	0.026	0.042	0.009	0.017	0.016	0.108	0.043
	$m = 2$	0.353	0.037	0.573	0.101	0.245	0.039	0.384	0.113	0.260	0.986

The table reports the  $p$  values of the Arellano–Bond test for first ( $m = 1$ )-order and second ( $m = 2$ )-order auto-correlation in the first-differenced errors of each panel regression in Table 1

To ensure the robustness of our findings, we estimated different variants of Eq. 1 incorporating various combinations of additional control variables. These controls aimed to capture specific economic conditions and the evolving nature of the pandemic across countries. Examples of these additional controls included variables such as the current account to GDP ratio, market openness, tourism flows, electricity prices, and industrial production, among others. Despite the inclusion of these additional controls, our main regression results reported in Table 1 remained unchanged. Taking into account the reduced number of observations, the models we reported above were the more parsimonious ones that satisfy the diagnostic checks.<sup>14</sup>

As a complementary exercise, we also estimated the cumulative effect of a change in the spending category based on the following equation:

$$\sum_{j=1}^h y_{i,t+j} = \alpha_{i,h} + \sum_{j=1}^h \sum_{l=1}^p \gamma_{l,h} y_{i,t+j-l} + \beta_{1,h} \Delta \text{SPEND}_{i,t} + \beta_{2,h} X_{i,t} + \epsilon_{i,t}, \quad (2)$$

for  $h \in \{0, 1, 2, 3\}$ . Results are reported in the “Appendix” and provide similar insights to the ones discussed earlier.

## 5 Conclusion

During the COVID-19 pandemic, fiscal measures implemented by EU countries successfully contributed to the recovery of output growth and employment without substantially contributing to inflationary pressures in the economy, except for universal help spending. Assistance to SMEs emerged as the primary measure adopted by most EU countries in our sample, with increased support during the crisis. According to our estimates and findings from other studies (see Gourinchas et al. 2021), this kind of measures, although effective in stimulating output and maintaining inflation, were not sufficiently targeted and generated output multipliers below one.

If policymakers and academics are to take a lesson from the COVID-19 crisis for the different fiscal measures one can use in such circumstances, the results of our exercise suggest that the best fiscal crisis support measure is clearly unemployment benefits and measures to maintain employment levels. According to our estimates, such measures induce sizeable output multipliers and stimulate employment without creating inflationary pressures. Conversely, transfers to households did not assist the economic recovery and only generated stimulative demand effects by recouping confidence and economic sentiment.

Finally, our analysis can be useful for studying in the future the effects of other large fiscal policy packages in the EU such as the Next Generation EU package (NextGen EU), a union-wide equivalent to the CARES and ARP Acts in the USA. This is potentially important to the extent that the Next Gen EU is focused on some of the spending categories analyzed in our paper (transforming the economy is a very important component of NextGen EU for Spain, Portugal or Greece, for example). The program is also unequally distributed across countries, with certain countries receiving a larger

<sup>14</sup> Detailed results are available from the authors upon request.

share of it (relative to population or GDP) and basing their post-pandemic fiscal plans on that program.

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## Declarations

**Conflict of interest** All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

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## A: Appendix

### A.1 Alternative specification

See Table 3.

**Table 3** Effects of COVID-19 fiscal measures on output, sentiment and inflation controlling for the effects of total COVID-19 government spending: alternative specification

Spending category	GDP growth			Confidence change			CPI change			Employment rate			ESI change		
	<i>h</i> = 1	<i>h</i> = 2	<i>h</i> = 3	<i>h</i> = 1	<i>h</i> = 2	<i>h</i> = 3	<i>h</i> = 1	<i>h</i> = 2	<i>h</i> = 3	<i>h</i> = 1	<i>h</i> = 2	<i>h</i> = 3	<i>h</i> = 1	<i>h</i> = 2	<i>h</i> = 3
Total spending	0.372*** (0.000)	0.441*** (0.000)	0.527*** (0.000)	0.142* (0.058)	0.151 (0.106)	0.318*** (0.001)	−0.012 (0.121)	−0.022** (0.047)	−0.031*** (0.000)	0.035 (0.721)	0.077*** (0.003)	0.021 (0.457)	1.780*** (0.000)	1.798*** (0.000)	2.132*** (0.000)
Assistance SMEs	0.230** (0.021)	0.346*** (0.000)	0.556*** (0.000)	0.055 (0.608)	0.118 (0.194)	0.346*** (0.004)	−0.038*** (0.000)	−0.023 (0.115)	−0.038*** (0.000)	0.004 (0.876)	0.087*** (0.006)	0.026 (0.441)	−0.247** (0.015)	1.096*** (0.000)	1.257*** (0.000)
Transform	0.851* (0.062)	−0.046 (0.979)	0.331 (0.928)	0.358 (0.642)	0.564 (0.747)	1.699 (0.191)	0.071 (0.304)	−0.085 (0.520)	0.573*** (0.000)	−0.287 (0.242)	0.105 (0.859)	−0.603 (0.407)	−0.951 (0.342)	1.368 (0.750)	5.477 (0.387)
Pandemic spending	0.730 (0.505)	8.465*** (0.000)	15.063*** (0.000)	2.109 (0.179)	8.317*** (0.002)	14.418*** (0.000)	0.239 (0.417)	−0.719*** (0.002)	−1.046*** (0.023)	−1.673*** (0.025)	2.870*** (0.000)	0.872 (0.511)	9.051*** (0.015)	30.833*** (0.000)	45.868*** (0.000)
Transfers	−2.183 (0.279)	3.083 (0.142)	12.824 (0.119)	1.292 (0.666)	5.200*** (0.004)	19.571** (0.015)	0.096 (0.833)	−0.018 (0.931)	0.227 (0.828)	−1.875 (0.338)	1.935*** (0.019)	1.311 (0.590)	2.979 (0.372)	21.401*** (0.009)	40.625*** (0.024)
Unemployment	0.658* (0.096)	3.041*** (0.003)	6.136*** (0.000)	0.303 (0.782)	2.968** (0.038)	5.237*** (0.000)	−0.015 (0.878)	−0.120** (0.012)	−0.458*** (0.007)	0.739 (0.489)	0.892*** (0.006)	0.895* (0.062)	6.260*** (0.006)	13.540*** (0.000)	15.731*** (0.000)
Universal help	−0.237 (0.237)	0.699*** (0.003)	2.351** (0.028)	0.007 (0.983)	0.653** (0.034)	1.380** (0.012)	0.127*** (0.000)	−0.025 (0.537)	−0.010 (0.827)	−0.157 (0.593)	0.067 (0.442)	−0.216 (0.262)	0.167 (0.819)	3.832*** (0.000)	7.870*** (0.000)

Table 3 continued

Spending category	GDP growth			Confidence change			CPI change			Employment rate			ESI change		
	<i>h</i> = 1	<i>h</i> = 2	<i>h</i> = 3	<i>h</i> = 1	<i>h</i> = 2	<i>h</i> = 3	<i>h</i> = 1	<i>h</i> = 2	<i>h</i> = 3	<i>h</i> = 1	<i>h</i> = 2	<i>h</i> = 3	<i>h</i> = 1	<i>h</i> = 2	<i>h</i> = 3
Observations	60	60	60	56	56	56	60	60	60	60	60	60	60	60	60
Number of countries	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Lags	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
2020-Q2 fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
Stringency	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Fatalities	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No
Interest rates	No	No	No	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No
Oil price	No	No	No	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No

The table contains the estimated cumulative impacts associated to each spending category for GDP growth, confidence change, and CPI change based on equation (2) of the paper. *P* values of the significance tests are in parentheses. \*, \*\*, \*\*\* denote significance at the 10, 5, and 1% levels, respectively. Observations begin in 2020Q2 and end in 2021Q2. There are 56 observations in the regressions for confidence due to lack of data for Romania after 2020Q3. All the regressions include total spending as percentage of the GDP as a control

**B: Arellano–Bond test for auto-correlation**

See Table 4.

**Table 4** Arellano–Bond test for auto-correlation in regressions of Table 3

Spending category	Order	GDP growth			Confidence change			CPI change			Employment rate			ESI change		
		$h = 1$	$h = 2$	$h = 3$	$h = 1$	$h = 2$	$h = 3$	$h = 1$	$h = 2$	$h = 3$	$h = 1$	$h = 2$	$h = 3$	$h = 1$	$h = 2$	$h = 3$
Total spending	$m = 1$	0.030	0.019	0.026	0.038	0.085	0.064	0.009	0.021	0.026	0.629	0.003	0.031	0.002	0.001	0.010
Assistance SMEs	$m = 2$	0.088	0.154	0.556	0.072	0.082	0.238	0.048	0.160	0.183	0.589	0.030	0.227	0.202	0.228	0.034
	$m = 1$	0.039	0.010	0.019	0.021	0.039	0.057	0.014	0.020	0.021	0.097	0.058	0.005	0.045	0.015	0.003
Transform	$m = 2$	0.160	0.575	0.462	0.128	0.321	0.293	0.047	0.172	0.270	0.375	0.804	0.116	0.188	0.052	0.006
	$m = 1$	0.048	0.001	0.006	0.030	0.023	0.051	0.003	0.012	0.010	0.129	0.029	0.009	0.045	0.002	0.010
Pandemic spending	$m = 2$	0.289	0.042	0.469	0.128	0.133	0.415	0.083	0.190	0.055	0.316	0.980	0.086	0.134	0.015	0.126
	$m = 1$	0.035	0.008	0.014	0.027	0.059	0.045	0.004	0.047	0.018	0.127	0.037	0.059	0.034	0.012	0.020
Transfers	$m = 2$	0.293	0.293	0.103	0.119	0.113	0.185	0.061	0.142	0.135	0.226	0.982	0.111	0.071	0.756	0.129
	$m = 1$	0.037	0.001	0.007	0.022	0.029	0.072	0.006	0.010	0.017	0.072	0.034	0.008	0.031	0.005	0.014
Unemployment	$m = 2$	0.367	0.059	0.688	0.124	0.455	0.296	0.034	0.204	0.126	0.218	0.961	0.125	0.174	0.027	0.146
	$m = 1$	0.021	0.004	0.004	0.037	0.037	0.057	0.005	0.021	0.010	0.227	0.025	0.012	0.069	0.022	0.015
Universal help	$m = 2$	0.161	0.813	0.264	0.077	0.225	0.091	0.040	0.144	0.154	0.433	0.594	0.058	0.383	0.217	0.539
	$m = 1$	0.040	0.002	0.008	0.026	0.029	0.063	0.009	0.014	0.018	0.108	0.040	0.006	0.034	0.003	0.003
	$m = 2$	0.353	0.095	0.984	0.101	0.369	0.253	0.039	0.171	0.104	0.261	0.793	0.092	0.118	0.019	0.126

The table reports the  $p$  values of the Arellano–Bond test for first ( $m = 1$ )-order and second ( $m = 2$ )-order auto-correlation in the first-differenced errors of each panel regression in Table 3



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