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Research Report

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Why has COVID-19 hit different European Union economies so differently?

André Sapir

Executive summary

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A preliminary version of this research was presented at the Villa Vigoni Euro Workshop held as a webinar on 17 July 2020. I am grateful to the participants for their comments. I also wish to acknowledge extensive comments from several Bruegel colleagues and Alessio Terzi on a preliminary draft .

ALL EUROPEAN UNION countries are undergoing severe output losses as a consequence of the COVID-19 crisis, but some have been hurt more than others. In response to the crisis, EU leaders have agreed on a Recovery and Resilience Fund (RRF), which will help all EU countries, but those hit hardest will benefit most.

THIS POLICY CONTRIBUTION explores why some countries have been hit economically more than others by COVID-19. Using statistical techniques described in the technical appendices, several potential explanations were examined: the severity of lockdown measures, the structure of national economies, the fiscal capacity of governments to counter the collapse in economic activity, and the quality of governance in different countries.

WE FOUND THAT the strictness of lockdown measures, the share of tourism in the economy and the quality of governance all play a significant role in explaining differences in economic losses in different EU countries. However, public indebtedness has not played a role, suggesting that the European Central Bank's pandemic emergency purchase programme has been effective.

WE USED OUR results to explore why some southern EU countries have been more affected by the COVID-19 crisis than some northern countries. Depending on the pairs of countries or country groupings that we compared, we found that differences in GDP losses were between 30 and 50 percent down to lockdown strictness, between 35 and 45 percent to the quality of governance and between 15 and 25 percent down to tourism.

THIS COULD HAVE implications for the allocation of the RRF between recovery and resilience expenditures. Supporting the recovery through a combination of demand and supply initiatives is important to ensure that countries rebound as quickly as possible from the COVID-19 crisis, without leaving too much permanent damage to their economies. But in many countries, especially some of the southern countries hit hardest by the COVID-19 crisis, resilience is a major sticking point. Too often, in some of these countries, the poor quality of governance has had a negative impact on their resilience, as the relatively large size of their GDP shocks has demonstrated. It is crucial therefore that RRF programmes devote sufficient attention (and resources) to improving the quality of governance in these countries.

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1 Introduction

Understanding why some countries have been hit harder by the COVID-19 shock could help plan how countries should be helped by the Recovery and Resilience Facility

After five days and four nights of arduous negotiations, European Union leaders agreed on 21 July 2020 to set up a €750 billion fund to help EU countries recover from the COVID-19 crisis. All EU countries will benefit from the new fund, but those hit hardest will benefit the most¹.

This Policy Contribution explores first and foremost why some countries have been hit economically more than others by COVID-19. Several reasons for this have been put forward including the number of deaths per million inhabitants, the severity of lockdown measures, the structure of the economy and the ability of the government to counter the collapse in economic activity. But there has been no systematic attempt so far that we are aware of to apportion the responsibility among various potential factors.

Understanding why some countries have been hit more than others could help in planning how countries should be helped by the Recovery and Resilience Facility (RRF), the main instrument of the new fund².

To access money from the RRF, EU countries will have to prepare national recovery and resilience plans setting out their reform and investment agendas. Each plan will be assessed by the European Commission against various criteria, including “*strengthening the growth potential, job creation and economic and social resilience*” of the member state concerned. The Commission’s assessments will be submitted to EU finance ministers for approval by a qualified majority. In addition, payments will be subject to the satisfactory fulfilment of relevant milestones and targets. In case one or several member states consider that there are “*serious deviations from the satisfactory fulfilment of the relevant milestones and targets*” by another member state, payment may be suspended until a positive decision by EU leaders that the milestones and targets have been reached³.

This strict mechanism was introduced at the insistence of the so-called frugal four countries – Austria, Denmark, the Netherlands and Sweden – whose economies have all been relatively less negatively affected by the COVID-19 crisis and will therefore benefit relatively little from the RRF. In addition to wanting to minimise their net contributions to the RRF, the frugal countries feared that some of the main beneficiaries – such as Italy and other southern countries that were badly hit by the crisis – may not otherwise direct sufficiently the new EU funds to improving their economic resilience.

The remainder of the paper is divided into four sections. Section 2 discusses how to measure the economic impact of the COVID-19 crisis. Section 3 explains the differences between countries in terms of the economic impact of the crisis and summarises the results of our analysis of the relative contribution of several variables to the difference in GDP hit experienced by countries. Section 4 makes policy recommendations, including on the design of the RRF. In two technical appendices we provide details of our statistical analysis.

1 See Darvas (2020b) for a careful analysis of the allocation of the €750 billion fund between instruments and EU countries.
2 The size of the RRF is €672.5 billion.
3 All quotations in this paragraph are from European Council (2020).

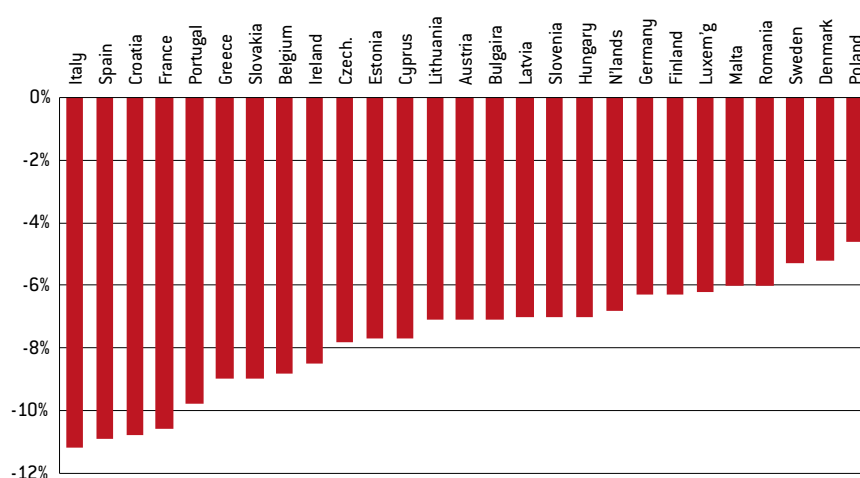
2 Measuring the economic shock suffered by each country

How should we measure the economic impact of the COVID-19 pandemic on EU countries?

Most reports use the fall or expected fall in the real GDP growth rate in 2020. For instance, in its summer 2020 economic forecast released a couple of weeks ahead of the July 2020 European Council meeting, the European Commission (2020b) stated that *“The EU economy will experience a deep recession [in 2020] due to the coronavirus pandemic... The EU economy is forecast to contract by 8.7 percent”*.

Figure 1 shows the July 2020 Commission forecast for GDP growth of the 27 EU countries, with the countries arranged according to the size of the GDP decline.

Figure 1: Forecast GDP decline in 2020: July 2020 Commission forecast (percentage points)



Source: Bruegel based on European Commission (2020b).

There are major differences between the 27 countries. The five most-affected countries are Italy (-11.2 percent), Spain (-10.9 percent), Croatia (-10.8 percent), France (-10.6 percent) and Portugal (-9.8 percent), with Greece ranking sixth (-9 percent). The five least-affected countries are Poland (-4.6 percent), Denmark (-5.2 percent), Sweden (-5.3 percent), Romania (-6 percent) and Malta (-6 percent), a group that includes two of the frugal four (F4). The (unweighted) average decline for the F4 is 6.1 percent. This contrasts with a decline of 10.2 percent for the group of four southern countries (S4) (Greece, Italy, Portugal, and Spain), to which we will compare the F4 countries throughout this Policy Contribution.

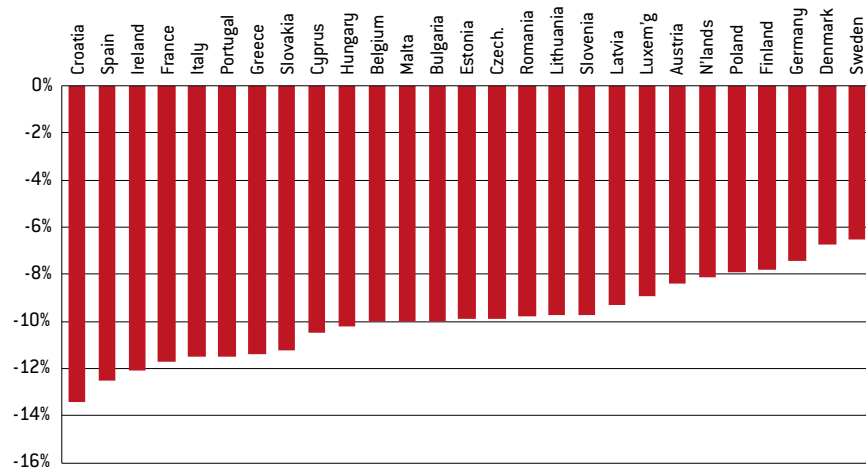
We prefer however to follow Darvas (2020a) and use the Commission's downward revision of GDP growth forecasts between winter 2020 and summer 2020 to measure the severity of the pandemic's economic shock⁴. In practical terms this means subtracting the February 2020

⁴ Darvas (2020a) used the autumn 2019 (published in November 2019) and spring 2020 (published in May 2020) forecasts. We use instead the winter 2020 and summer 2020 forecasts. The winter 2020 forecasts were published on 13 February 2020, well before the coronavirus reached epidemic level in Europe and more than a month before it was declared a global pandemic by the World Health Organisation. In its winter forecasts, the European Commission (2020a) simply regarded the coronavirus as *“a downside risk for the EU economy”* – so much so that those economic forecasts were basically the same as the autumn 2019 forecasts published before the outbreak of the coronavirus in China. We also use the summer instead of the spring 2020 forecasts because they are the most recent at the time of writing.

forecast from the July forecast shown in Figure 1. To understand the reason for this adjustment and the difference it makes, consider the examples of Austria and Bulgaria, two countries that will see the same GDP decline of 7.1 percent in 2020 according to the summer 2020 forecasts. Clearly, because of its much lower GDP per capita, Bulgaria was on a higher growth trajectory than Austria before the COVID-19 crisis. This was reflected by the fact that, in its winter 2020 forecast, the Commission predicted that GDP would grow in 2020 by 2.9 percent in Bulgaria but only 1.3 percent in Austria. Taking account of this correction, we now obtain a GDP shock of 10 percent (7.1 + 2.9 percent) in Bulgaria and 8.4 percent (7.1 + 1.3 percent) in Austria.

Figure 2 shows the GDP shock in 2020 on the basis of this approach, with the countries arranged according to the size of the economic shock.

Figure 2: GDP shock in 2020: difference between the July and February 2020 Commission forecasts (percentage points)



Source: Bruegel based on European Commission (2020a,b).

As in Figure 1, Figure 2 shows major differences in the GDP shocks felt by the 27 countries, but there are also some significant changes in the country rankings. The five most-affected countries are now Croatia (-13.4 percent), Spain (-12.5 percent), Ireland (-12.1 percent), France (-11.7 percent) and Italy (-11.5 percent), a group that includes again three of the S4 countries, although Portugal ranks a close sixth. The five least-affected countries are now Sweden (-6.5 percent), Denmark (-6.7 percent), Germany (-7.4 percent), Finland (-7.8 percent) and Poland (-7.9 percent), a group that includes two of the F4 countries, but with the Netherlands and Austria ranking sixth and seventh. The (unweighted) average negative shock to the S4 countries is now 11.7 percent and 7.4 percent for the F4 countries.

Notably, the shocks to Croatia and Ireland increase substantially when considering their high growth rates anticipated before the crisis, of respectively 2.6 percent and 3.6 percent. By contrast the negative shock to Italy appears relatively less severe when considering that before the COVID-19 crisis its expected growth rate for 2020 was only 0.3 percent. In the remainder of this paper, we focus entirely on the economic shocks reported in Figure 2.

3 Explaining differences between countries

What could explain the major differences between countries in the economic shocks they are undergoing in the wake of the COVID-19 crisis?

The first factor that comes to mind is the strictness of lockdown measures implemented by national, regional or local authorities to cope with the coronavirus pandemic⁵. We use the stringency index provided by the Oxford COVID-19 Government Response Tracker (OxCGRT, Oxford University, 2020). This index, which varies between 0 and 100 is available on a daily basis for most countries, including 26 of the 27 EU countries⁶. We constructed an aggregate index, by computing the average of the Oxford stringency index over the first semester of 2020. Our index of strictness, therefore, reflects both the daily intensity of the measures and their duration. This aggregate index averages 42 for the 26 EU countries (using an unweighted average), and ranged from 25 in Sweden to 55 in Italy. It averaged 48 for the S4 and 38 for the F4 countries, meaning that in the F4 countries, lockdowns were less strict.

A second possible factor is the economic structure of countries. Measures taken to combat the spread of the coronavirus have affected economic activities differently, depending mainly on whether they involve proximity between consumers and producers, which is often the case with services. Among services, those viewed by consumers (or sometimes also public authorities) as less essential, such as leisure and tourism, have been more affected than activities such as shopping, which also involve some proximity between consumers and producers, although less so with the development of e-commerce. We use the share of tourism in GDP as a proxy for the impact of a country's economic structure on the economic shock due to sanitary measures to combat coronavirus. In 2019, tourism averaged 4.8 percent of GDP in the 26 EU countries (using a simple rather than a weighted average) and ranged from 1.1 percent in Germany to 19.9 percent in Croatia. It was twice as high for the S4 countries (5.9 percent) as for the F4 countries (2.9 percent).

A third potential factor is the level of public indebtedness. It has been argued that some countries with high COVID-19 fatalities (for example Italy, with 590 deaths per million inhabitants as of 18 September 2020) would be unable to borrow money (or unable to do so at a relatively low cost) to meet the costs of the COVID-19 crisis because of their high public debt levels (135 percent of GDP in 2019 in Italy), and that this explains why they were unable to implement enough of a fiscal response to prevent a severe economic contraction. In fact, this line of reasoning seems to have played a major role in the minds of the architects of the recovery fund (see for example Buti, 2020). We use the 2019 debt-to-GDP ratio to measure levels of public indebtedness. We prefer this to using the fiscal stimulus implemented by governments to counter the crisis because the 2019 debt level is clearly unaffected by the COVID-19 crisis, while the fiscal stimulus would not have happened without it⁷. Also, the size of the fiscal stimulus is not observed but must be estimated, and such estimates are not available for all the 26 EU countries considered here. In 2019, the debt-to-GDP ratio in the 26 EU countries averaged 64 percent (using a simple rather than a weighted average) and ranged from 8 percent in Estonia to 180 percent in Greece. It averaged 132 percent for the S4 countries and only 47 percent for the F4 countries.

The fourth and last factor that we consider is the quality of governance. We expect that, for a given degree of severity of lockdown measures, a given structure of the economy and a given

5 In an earlier version of this paper, we used the number of deaths per million inhabitants to measure the severity of the COVID-19 crisis. Several commentators pointed out that this was problematic for two reasons. First, different countries account differently for their COVID-19 deaths. Second, and more importantly, what ultimately matters for the size of the economic shock is not so much the number of deaths as the severity of the measures taken by public authorities in reaction to this number.

6 Malta is missing from the Oxford database.

7 In the language of econometricians, this implies that the 2019 debt-to-GDP is exogenous, while the fiscal stimulus is endogenous to the economic shock.

The level of public indebtedness does not seem to contribute to explaining differences in the economic shocks suffered by EU countries

level of public debt, the degree of resilience of the economy to the COVID-19 shock, resulting from the quality of behaviour of both private and public economic agents, will be greater in countries with a higher quality of private and public governance and institutions⁸. Following Demertzis and Raposo (2018), we construct our indicator of governance by summing up for each country its scores for the six parts of the World Bank Worldwide Governance indicator: voice and accountability; political stability and absence of violence; government effectiveness; regulatory quality; rule of law; and control of corruption. Scores for each of the six indicators can vary from -2.5 to 2.5, so the overall indicator can vary from -15 to +15. In 2018, the latest year available, the quality of governance in the 26 EU countries averaged 6 (using a simple rather than a weighted average) and ranged from 0.9 in Romania to 10.6 in Finland. It averaged 4 for the S4 and 9.8 for the F4 countries.

The appendices detail our model and results. In summary, we found that:

- Countries with stricter lockdown measures witnessed a greater economic collapse, with the causality running from the strictness of the lockdown measures to the economic collapse and not the other way round – so if the countries where the economic collapse was greatest then reduced the strictness of the measures more than others, it was not sufficient to counterbalance the economic hit.
- The share of tourism in the economy and the quality of governance were also significant factors. However, public indebtedness was not, implying that the level of public indebtedness does not contribute to explaining differences in the economic shocks suffered by EU countries. This suggests that the European Central Bank's pandemic emergency purchase programme (PEPP) has been successful in countering the risk that high public debt euro-area countries would be cut off from the market if they attempted to expand their debt issuance to respond to the COVID-19 crisis.
- Together, the factors of lockdown strictness, tourism and governance explain nearly 60 percent of the differences between countries in terms of the economic hit from COVID-19, which is quite remarkable for a rather simple model. Robustness checks (see the Appendix) support this conclusion. Nonetheless, as with any econometric analysis, there is always the possibility of an omitted variable in the model, which could affect our results.

We applied our results to work out the contribution of the variables to the economic shock in selected pairs of countries or country groupings (Appendix 2). We compared Italy and the Netherlands, the two countries that best exemplified the positions of the S4 and the F4 countries during the RRF negotiations, and also compared Greece, Spain and Portugal to the Netherlands. All four countries suffered from a negative shock of more than 11 percent, well above the Netherlands with a negative shock of 8.1 percent. For Greece, Spain and Portugal the severity of the lockdown measures was not far above the Netherlands; Italy is an outlier with much stricter measures than any other country. Greece, Spain and Portugal are also much more dependent on tourism (which contributes more than 5 percent to their GDP) than Italy and the Netherlands (where the share of tourism is only around 2 percent). Finally, all the S4 countries have a low quality of governance compared to the Netherlands, but it is especially low in Greece and Italy.

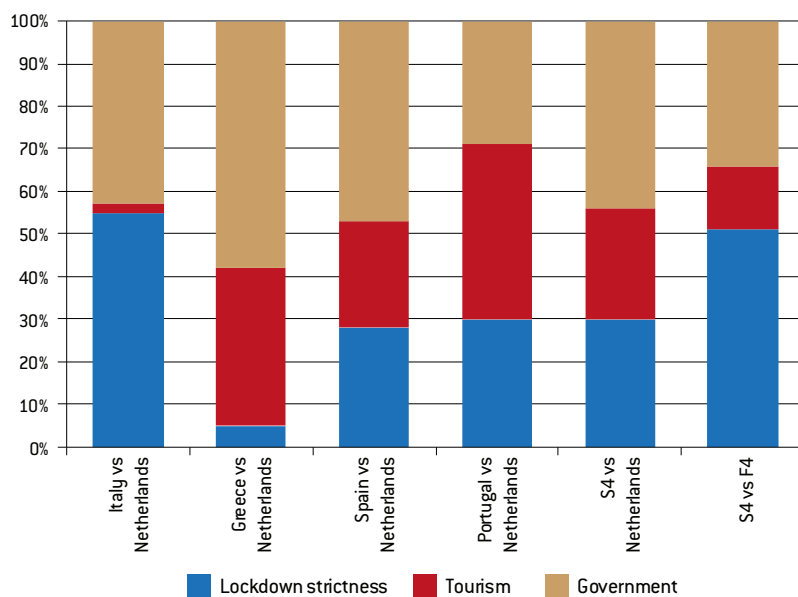
Differences and similarities between the S4 countries explain the differences and similarities in the relative contributions of the three explanatory variables to the predicted differences in their GDP shocks compared to the Netherlands. When comparing Italy and the Netherlands, the lockdown and governance variables each account for about half of the differential between the two countries, while the contribution of the tourism variable is negligible. For the differential between Greece and the Netherlands, the most important factor is governance, followed by tourism, with lockdown strictness playing only a marginal role since the strictness

⁸ There is extensive evidence in the economics literature of a strong correlation between high quality governance/institutions and economic prosperity/growth. See, for instance, Acemoglu and Robinson (2012) and Terzi (2015).

of measures imposed by Greece and the Netherlands was similar. For the differential between Spain and the Netherlands, the most important factor is also governance, with lockdown strictness and tourism having similar weights. For the differential between Portugal and the Netherlands, the most important factor is tourism, followed by lockdown strictness and governance, the relatively small role of which is due Portugal having the best quality of governance among the S4 countries, according to our indicator.

Overall, for the average of the S4 countries compared to the Netherlands, the governance variable explained 44 percent of the differential in terms of the GDP shock, lockdown strictness explained 30 percent, and the tourism variable explained 26 percent. For the average of the S4 compared to the average of the F4, the difference in GDP loss was 51 percent down to lockdown strictness, 34 percent down to governance and 15 percent down to the tourism variable (Figure 3).

Figure 3: Estimated contribution of factors to differences in economic shock from COVID-19, selected country/country group pairs



Source: Bruegel. Note: Based on Table 4 in Appendix 2.

4 Policy implications

What are the policy implications of our results?

First, our finding that the level of public indebtedness prior to the COVID-19 crisis has no impact on the size of the economic shock that EU countries have suffered from the pandemic implies that the ECB's pandemic emergency purchase programme, which was launched in March 2020, has been successful. Even within the euro area, where some countries were cut off from markets a decade ago during the financial crisis, the ability of governments to implement fiscal measures to deal with the COVID-19 crisis does not seem to have been impaired by their debt levels. This is an important result. PEPP is a temporary programme, but the ECB governing council has said that it will not terminate net asset purchases under the PEPP before it judges that the crisis is over and, in any case, not before the end of June 2021. The envelope for PEPP was increased by €600 billion to a total of €1,350 billion in June 2020. This should be sufficient to ensure that governments remain able to support their economies

throughout the crisis, although a further increase cannot and should not be excluded, should the crisis take a turn for the worse.

Second, all EU countries, not just euro-area members, have been badly hit by the COVID-19 crisis. According to our estimates, EU countries will suffer an average GDP loss of nearly 10 percent in 2020, with no country suffering a loss of less than 6 percent. It was right, therefore, that EU leaders decided to set up a fund to help all EU countries recover from the crisis.

Third, although all EU countries are suffering an economic shock, some have been hurt more than others. Some southern countries will suffer GDP losses of around 12 percent in 2020, while some northern countries will see GDP losses of 'only' around 7 percent. It was right, therefore, that EU leaders agreed that the Recovery and Resilience Fund (RRF) should help some countries more than others, and that some southern countries will benefit most.

Fourth, our statistical analysis shows that three factors account for most of the differences in the size of the gross shock felt by EU countries: the strictness of lockdown measures, the structure of the economy (in particular the share of tourism in GDP) and each country's quality of governance. When comparing some of the southern countries with some of the northern countries, we found that the quality of governance explains between roughly 30 percent and 50 percent of the difference in the size of the economic shock. This is significant and should be taken into account when designing and evaluating the RRF programmes that EU countries must submit to the European Commission for approval, before receiving the green light from EU finance ministers that the EU money can be spent in the relevant countries.

Fifth, and finally, the central question that this paper raises is how to manage the RRF and, in particular, how the RRF should be divided between recovery and resilience expenditures. Supporting the recovery through a combination of demand and supply initiatives is important to ensure that countries rebound as quickly as possible from the COVID-19 crisis, without leaving too much permanent damage to their economies. But in many countries, especially some of the southern countries that have been hit hardest by the COVID-19 crisis, resilience is a major sticking point. Too often, in some of these countries, the poor quality of governance has had a negative impact on their resilience, as the relatively large size of their GDP shocks has demonstrated. It is crucial therefore that RRF programmes devote sufficient attention (and resources) to improving the quality of governance in these countries. Obviously, improving the quality of governance, and ultimately resilience, will take time. In the meantime, countries should implement recovery policies, but it would be good to remember that the better the quality of the governance and the resilience of an economy, the faster it will recover and the better it will be prepared for future shocks. All this has clear implications for the governance of the RRF fund and for the respective roles of the member states and the various EU institutions (Commission, Council and Parliament), but this goes beyond the scope of this Policy Contribution⁹.

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⁹ See Wolff (2020) for a comment on how the recovery fund should be governed.

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Appendix 1: An econometric model to explain differences between countries

The full model that we estimated is

$$Y = \text{constant} + \alpha \text{ LOCKDOWN} + \beta \text{ TOURISM} + \gamma \text{ DEBT} + \delta \text{ GOVERNANCE} + \varepsilon$$

where Y is the difference between the July 2020 and February 2020 forecasts of the growth rate of GDP for 2020 (in percentage points), LOCKDOWN is the index of strictness of lockdown measures to stop the spread of the coronavirus (on a scale from 0 to 100), TOURISM is the share of tourism in GDP (in percent), DEBT is the public debt-to-GDP ratio (in percent), GOVERNANCE is the score of the governance indicator (on a scale from -15 to +15) and ε is the error term.

Table 1 presents the estimation results for our model, using the ordinary least-squares (OLS) method. The OLS method seems appropriate for our model since simultaneity between the dependent and explanatory variables is either non-existent or unlikely. TOURISM, DEBT and GOVERNANCE are clearly exogeneous since they are dated in 2018 or 2019, prior to the time horizon of the dependent variable. The timing of LOCKDOWN (the first semester of 2020) largely overlaps with the dependent variable, so in principle there could be a problem of simultaneity between the two. However, the negative correlation between these two variables suggests that the causality runs from the strictness of the lockdown measures to the economic collapse and not the other way round¹⁰. Even if the countries where the economic collapse was important reduced the strictness of the measures more than the others, it was not sufficient to counterbalance the fact that countries with stricter measures witnessed a greater economic collapse.

¹⁰ The correlation between Y and LOCKDOWN is -0.6.

Table 1: Estimation results for the GDP shock in 2020: July 2020 forecast minus Feb 2020 forecast

	Equation (1)		Equation (2)	
	Coefficient	t-value	Coefficient	t-value
Constant	-4.875	-2.237*	-4.500	-2.222*
LOCKDOWN	-0.119	-2.242*	-0.134	-3.331**
TOURISM	-0.142	-2.377*	-0.148	-2.584**
DEBT	-0.004	-0.524	--	--
GOVERNANCE	0.173	1.943*	0.175	1.993*
Adjusted R Squared	0.560		0.575	

Source: Bruegel. Note: ** means significant at the 1% level; * means significant at the 5% level.

Equation (1) shows that the coefficients of LOCKDOWN, TOURISM and GOVERNANCE are all significant at the 5% level. By contrast, the coefficient of DEBT is not significantly different from zero, which implies that the level of public indebtedness does not contribute to explaining cross-country variations in the economic shock among EU countries. This suggests that the ECB's pandemic emergency purchase program (PEPP) has been successful in countering the risk that high public debt euro area countries would be cut off from the market if they attempt to expand their debt issuance to respond to the COVID-19 crisis.

In equation (2), we re-estimated the model without DEBT. The estimated coefficients of the three remaining explanatory variables and their degree of significance, increased slightly as a result, as did the adjusted R Squared.

The results in Table 1 suggest that LOCKDOWN, TOURISM and GOVERNANCE all contribute significantly to explaining cross-country differences in the covid economic shock. Together these three factors explain nearly 60% (the adjusted R squared equals 0.575 in equation 2), which is quite remarkable for a rather simple model estimated with just 26 data points.

We conducted two robustness checks of our estimates in equation (1).

First, we checked whether our results for the effect of GOVERNANCE may be spurious and linked to the omission of a variable, which would be linked to both Y and GOVERNANCE. One possible omission is the fact that Latin countries have been more affected by the covid crisis due to their greeting habits that makes the spread of the coronavirus more important than in countries with other cultures. These countries may therefore have a lower Y but, to the extent that culture is also correlated with governance, they could also have a lower value for GOVERNANCE. We checked this possibility by adding a LATIN dummy to the model with a value of 1 for the four Latin countries (France, Italy, Portugal, and Spain) and 0 for all the other countries. We also constructed a LATINB dummy, where we added Belgium to the group of Latin countries.

The results of the first robustness check are shown in equations (3) and (4) in Table 2, which need to be compared to equation (1) in Table 1. The coefficients of the LATIN and LATINB variables are both negative and significant, implying that, as suspected, Latin countries did suffer a bigger GDP shock than other countries, controlling for the other variables in the model. But the striking result is that the presence of LATIN or LATINB does not lower the coefficient of GOVERNANCE nor its degree of significance. On the contrary, they both increase somewhat with the addition of LATIN or LATINB. On the other hand, the coefficient of LOCKDOWN decreases drastically, and becoming not significantly different from zero at the 5% level. This suggests that Latin countries had to take stricter confinement measures than other countries because of their different cultural habits and that when LATIN is present in the model it directly affects the Y variable and lowers the impact of LOCKDOWN on Y. But what is more important for our results is that the presence of LATIN does not take away the importance of GOVERNANCE. If anything, it increases it a bit.

Second, we computed differently the size of the economic shock, comparing the July

Commission forecast for 2020 to the actual GDP growth in 2019 instead of the February Commission forecast for 2020. In equation (5) we re-estimate equation (4) with the new Y variable. The results are very similar to those for equation (4). The only difference is that the coefficient of LATINB is no more significantly different from zero at the 5% level.

These two robustness checks suggest that the estimates reported in Table 1 can be read with some degree of confidence.

Table 2: Robustness checks

	Equation (3)		Equation (4)		Equation (5)	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Constant	-6.443	-2.843**	-6.443	-2.861**	-6.651	-2.257*
LOCKDOWN	-0.085	-1.661	-0.085	-1.652	-0.089	-1.630
TOURISM	-0.156	-2.703**	-0.156	-2.802**	-0.162	-2.127*
DEBT	0.000	0.290	0.000	0.200	0.011	1.069
GOVERNANCE	0.190	2.217*	0.190	2.305*	0.210	1.860*
LATIN	-1.392	-1.745*	--	--	--	--
LATINB	--	--	-1.356	-1.759*	-1.474	-1.454
Adjusted R squared	0.599		0.600		0.428	

Source: Bruegel. Note: ** means significant at the 1% level; * means significant at the 5% level.

Appendix 2: The relative contribution of the factors explaining differences between countries

We use the results of equation (2) to compute the economic shock predicted by the model for individual EU countries. We focus initially on Italy (IT) and the Netherlands (NL), the two countries that best exemplify the positions of the S4 and the F4 countries during the RRF negotiations. Our results are shown in Table 3.

Table 3: Actual and predicted values for Italy and the Netherlands

	Actual values			Predicted values by eq. (2)			
	IT	NL	IT-NL	IT	NL	IT-NL	
Constant	--	--	--	-4.5	-4.5	0.0	--
LOCKDOWN	55	43	12	-7.3	-5.7	-1.6	55%
TOURISM	2.3	1.9	0.4	-0.3	-0.3	0.0	2%
GOVERNANCE	2.92	10.16	-7.24	+0.5	+1.8	-1.3	43%
Y variable	-11.5	-8.1	-3.4	-11.8	-8.5	-2.9	100%

Source: Bruegel. Note: ** means significant at the 1% level; * means significant at the 5% level.

We begin by examining the left-hand panel of Table 3, which shows the actual values for the GDP shock (the Y variable) and the four explanatory variables discussed in Section 2. There are also important differences between IT and NL for three of the four explanatory variables. In Italy, the strictness of the lockdown measures was 12 points higher, public debt 86 points higher and the governance score 7 points lower than in the Netherlands. By contrast, there was very little difference in the share of tourism in GDP between the two countries.

We then turn to the right-hand panel of Table 3, which uses equation (2) to compute the contribution of each of the four explanatory variables to the GDP shocks.

We first note that our preferred model does a remarkable job at predicting the two countries' GDP shocks. The predicted values of Y (which is computed by summing up the estimated constant and the estimated contributions of the three other explanatory variables) are very close to the actual values: -11.8% vs. -11.5% for IT and -8.5% vs. -8.1% for NL.

We then compute the contribution of each of the three explanatory variables to the differential in the GDP shocks between IT and NL. We find that LOCKDOWN AND GOVERNANCE each account for about half of the differential between the two countries: 55% for LOCKDOWN and 43% for GOVERNANCE, with the remaining 2% being accounted for by TOURISM

We repeated the exercise for compare Greece (EL), Spain (ES) and Portugal (PT) to the Netherlands. The left-hand panel in Table 4, reports the actual values of the GDP shocks and of our three explanatory variables. There are some important similarities and differences between the S4 countries. All four countries suffered from a negative shock of more than 11%, well above the Netherlands with a negative shock of 8.1%. For three of them (EL, ES and PT) the severity of the lockdown measures was not far above the Netherlands; here the outlier is Italy with much stricter measures than any other country. The same three countries (EL, ES and PT) are much more dependent on tourism (with a share in their GDP of more than 5%) than Italy and the Netherlands (where the share of tourism is only around 2%). Finally, all the S4 countries have a low quality of governance compared to the Netherlands, but it is especially low in Greece and Italy.

These differences and similarities between the S4 countries explain the differences and similarities in the relative contributions of the three explanatory variables to the predicted differences in their GDP shocks with the Netherlands, which are reported in the right-hand panel in Table 4. For the differential between EL and the NL, the most important factor is GOVERNANCE (58%), followed by TOURISM (37%), with LOCKDOWN playing only a marginal role (5%) since EL and NL had similar strictness measures (respectively 44 and 43). For the differential between ES and NL, the most important factor is also GOVERNANCE (47%), followed by LOCKDOWN (28%) and TOURISM (25%). Finally, for the differential between PT and NL, the most important factor is TOURISM (41%), followed by LOCKDOWN (30%) and GOVERNANCE (29%), whose relatively small role is due to the fact that Portugal has the best quality of governance among the S4 countries, according to our indicator.

Table 4: Actual and predicted values for the S4 countries vs the Netherlands and the F4 countries

	Actual values				Predicted values by eq. (2)					
	IT	EL	ES	PT	IT-NL	EL-NL	ES-NL	PT-NL	S4-NL	S4-F4
LOCKDOWN	55	44	47	48	55%	5%	28%	30%	30%	51%
TOURISM	2.3	8.3	5.2	7.9	2%	37%	25%	41%	26%	15%
GOVERNANCE	2.92	1.67	4.85	6.43	43%	58%	47%	29%	44%	34%
Y variable	-11.5	-11.4	-12.5	-11.5	100%	100%	100%	100%	100%	100%

Source: Bruegel. Note: ** means significant at the 1% level; * means significant at the 5% level.

Finally, we computed the average contribution of each of our three factors, by simply taking the average for the four southern countries compared to the Netherlands. We found that GOVERNANCE is the most important factor explaining 44% of the differential with the Netherlands, followed by LOCKDOWN (30%) and TOURISM (26%). We also computed the relative contribution of the three factors to the differential between the averages of the S4 and F4 groups. This time, we found that LOCKDOWN is the most important factor explaining 51% of the differential between the two groups, followed by GOVERNANCE (34%) and TOURISM

(15%). The differences between the last two columns, labelled respectively S4-NL and S4-F4, reflect obviously the fact that there are important differences between the Netherlands and some of the other frugal four countries with respect to our three explanatory variables. On LOCKDOWN, the situation of the Netherlands is basically identical to Austria and Denmark, but all three countries were much stricter than Sweden, a clear outlier among the 26 EU countries considered here. On TOURISM, the situation of the Netherlands is similar to Denmark and Sweden, but in all three countries the share of tourism in GDP is much lower than in Austria. Finally, on GOVERNANCE, the Netherlands scores very highly along with Denmark and Sweden, while Austria, though it has a good score, performs less well than the other three F4 countries¹¹.

In summary, we found that LOCKDOWN, TOURISM and GOVERNANCE all account for significant shares of the differences in the GDP shocks between the four southern countries, on the one hand, and the Netherlands or the average of the four frugal countries, on the other. Depending on the individual characteristics of each of the S4 countries, LOCKDOWN accounted for between 5% (in EL) and 55% (in IT) of the differential with the Netherlands, TOURISM for between 2% (IT) and 41% (in PT) and GOVERNANCE for between 29% (in PT) and 58% (in EL). On average for the four countries, GOVERNANCE was either the top or second most important contributor depending on whether the differential was calculated between S4 and the Netherlands or F4; LOCKDOWN was either the second or the top contributor; and TOURISM was in third place in both instances.

¹¹ The implication is that the results of our calculations in Tables 3 and 4 depend crucially on the fact that we used the Netherlands as a comparator country for the four southern countries, except in the last column in Table 4, labelled S4-F4. Had we used Austria, Denmark or Sweden, instead, our results would have been different. For instance, using Sweden, the most extreme EU country in terms of the strictness of lockdown, as comparator country, one finds that the main factor explaining the bigger GDP shock in the S4 countries is LOCKDOWN. To be more precise 76 percent of the Italy-Sweden differential is due to LOCKDOWN, while only 24 percent is due to GOVERNANCE. This compares with our finding of, respectively, 55 percent and 43 percent, for the Italy-Netherlands differential.