Saving lives and the economy: the role of fiscal policy in the Covid-19 recession*

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October 29, 2021

Abstract

Since the beginning of the COVID-19 pandemic, many countries have had intense debates over how to combine the necessary social distancing and health measures along with the economic response. This study takes a step forward by estimating the impact of the government responses on the economic performance of a group of countries worldwide in 2020. Gathering information from the OECD weekly tracker of economic activity, The Oxford COVID-19 Government Response Tracker, and Google Mobility, we built a comprehensive dataset for 45 countries in 2020 and 2021. By estimating two-way fixed effects, our results suggest that fiscal stimuli were very significant in mitigating the recession. The potential short-term negative impact on GDP, resulting from the necessary social distancing and restrictions on production, could be more than offset by an active fiscal policy and a commitment by public managers to health policies. In particular, the budgetary effort measure, which includes expenditures aimed at preserving family income and providing relief to companies, is the only variable that, regardless of the specification used in the model, has a positive and significant effect on the GDP projections variation. The results indicate that, during the pandemic, an expansion of 1% in public spending in relation to GDP promoted an increase in the weekly OECD economic activity measure around 1% concerning its initial value.

*The authors thank for the helpful comments from Luis Alvarez, Anna Petherick, Beatriz Kira, Maria Luciana, Rafael Goldszmidt, and Rodrigo Furst. Also, thank Nicolas Woloszko for kindly discussing recent changes in the OECD's Weekly Tracker. As usual, all the remaining mistakes are of our own responsibility.

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1 Introduction

For being originated outside the economic sphere and for its combined supply-side and demand-side shocks (Baqaee and Farhi, 2020; del Rio-Chanona et al., 2020), the Covid-19 recession has an exceptional nature when compared to other global economic crises. In particular, while countries engaged in substantial fiscal and monetary efforts to alleviate the crisis, these responses were not designed for their macroeconomic counter-cyclical role but rather for their health, social and microeconomic implications. As consumers were called to stay at home and businesses in different sectors faced severe sanitary restrictions, stimulating aggregate demand would contradict any effort to contain the dissemination of the virus. Still, government expenditures have substantially increased around the globe to guarantee medical resources, a minimum level of income to impoverished workers, and the survival of businesses. In particular, Wright et al. (2020) have shown that CARES Act stimulus checks in the United States had a significant positive impact on the degree of compliance to stay-at-home orders.

Data from the IMF Fiscal Monitor reveal an average fiscal response to Covid-19 (including additional spending and foregone revenue) of 27,7% of GDP for advanced economies and 6,7% for emerging markets. As a result, public debt has reached 97% of the world's GDP, a new historical record. As found by Benmelech and Tzur-Ilan (2020), countries with poor credit histories were less able to deploy fiscal policy tools during the crisis, while high-income countries, with historically low interest rates, were more likely to combine substantial fiscal expansions with the use of unconventional monetary policy tools. Still, health expenditures represented around 8% of the additional expenditure for both advanced and emerging economies. Also, the total amount destined for employment programs was similar around the globe (about 12% of the total). On the other hand, the average expenditure with households differed substantially, while advanced economies spent 20% of total resources, it reached only 7.8% in emerging markets.

While the search for the potential multiplier effects may not have shaped these responses, such efforts may have still helped attenuate recession through different economic and non-economic channels. Almeida et al. (2020) find that households' disposable income in the EU would fall by -5.9% due to the COVID-19 crisis without discretionary policy measures instead of -3.6% with policy intervention. Microeconometric evidence by (Casado et al., 2020) suggests that the federal supplements to Unemployment Insurance (UI) in the United States have substantially attenuated the fall in consumer spending. In particular, the exercise based on data from the state of Illinois points towards a 5% decrease in consumer spending due to a reduction in $300 in UI benefits.

This paper aims to contribute to this incipient literature by investigating the macroeconomic effects of the fiscal response to the Covid-19 crisis for a panel of 45 countries. The use of high-frequency data in our two-way fixed effect estimations helps in our identification strategy, which seems to be robust to different measures of the Tracker and heterogeneity effects of the treatment. Besides, event study estimations indicate the validity of the parallel trend hypothesis. Additionally, because our main explanatory variable is non-stationary we provide evidence that justify the validity of our estimations, following the discussion presented in Bai and Ng (2004). After briefly describing our data and methodology, we present our main results and robustness checks. A final section concludes the paper.

2 Data and methodology

To tackle whether the fiscal policy effectively prevented a significant economic downturn during the pandemic, we built a comprehensive panel of 45 countries during 86 weeks. We combine three data sets that have information on a high-frequency: the Oxford COVID-19 Government Response Tracker, Google Mobility data, and the OECD Weekly Tracker of GDP growth. In addition, we used a variety of specifications of two-way-fixed effect models that ensure the robustness of results. This section briefly describes each data source and also discusses the methodology and identification hypothesis.

The Oxford Covid-19 Government Response Tracker (OxCGRT)[1] has been responsible for systematizing information regarding public policies adopted to fight the pandemic and provides the total number of daily deaths at a daily basis. This project is responsible for publishing information in three dimensions: social distancing, sanitary measures, and economic measures. The first is made up of eight specific policies, which includes closing schools and workplaces, restricting the number of people in meetings, among others.

[1]For further reference see Hale et al. (2021)

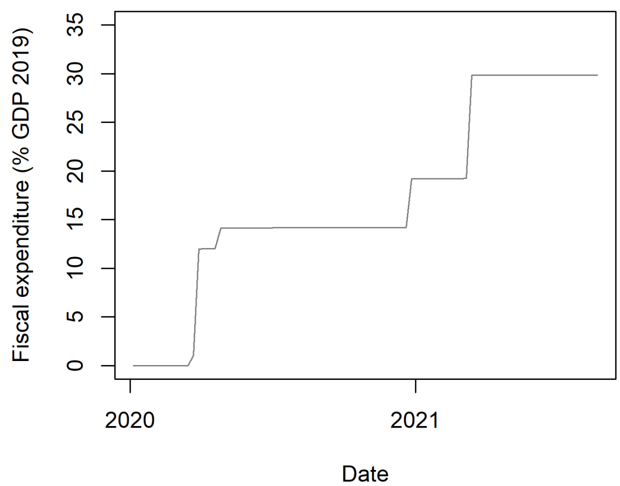
Sanitary measures cover seven different policies, including the mandatory use of masks, vaccination coverage, investment in vaccines, among others. Finally, social distancing and health measures are aggregated into an index that changes every time the government announces a new policy.

Economic information considers three distinct policies: income guarantee, debt relief, and central government spending on exclusively economic measures (including the previous two). The latter is our variable of interest. It expresses how much spending governments have already approved in Congress to mitigate households' income losses and ensure the survival of companies, not including spending in health. To allow for country comparisons, we compute the total accumulated expenditures announced up to that week relative to each country's 2019 GDP obtained from Our World in Data. Since this variable is non-stationary by construction, we show in the Stationarity tests section that its properties do not jeopardize the inference procedures as the idiosyncratic non-stationarity is non-pervasive in the sense discussed by Bai and Ng (2004).

To illustrate the fiscal measures considered by the OxCGRT, Figure 1 shows how it has evolved for the United States, always measured as a percentage of 2019's GDP. The federal government was responsible for expenditures that reached US$ 5,335 bn, while local governments jointly spent US$ 23.3 bn. In IMF's Fiscal Monitor, the figure resembles many similarities; federal expenses are only US$ 8 bn smaller in their calculations. From those measures, the largest one was the Coronavirus Aid, Relief, and Economic Security Act (CARES Act), enacted on March 27th with a budget of US$ 2,200 bn, from which US$ 1,960 bn were focused on non-health expenditures. Among other measures, the package had US$ 300 bn dedicated to a one-time cash transfer - which averaged U$ 1,200 for a single person - and more than US$ 850 bn in loans to businesses. Nonetheless, before its approval, the national government had already enacted laws that would result in an additional US$ 193 bn spending with the Families First Coronavirus Response Act, a paid leave program, and the Coronavirus Preparedness and Response Supplemental Appropriations Act, which funded federal agencies initial response to the pandemic.

Furthermore, we incorporate a weekly average of the daily metrics from the Google COVID-19 Community Mobility Report for transit stations. This variable measures, in

Figure 1: Cumulative expenditure on non-health policies for the USA



Source: OxCGRT, 2021

percentage terms, how the number of people changed from a reference period considering several transit places, such as subway stations, taxi stands, rental car agencies, bus stop stations, among others. Hence, it provides a high-frequency measure of how presence in public transit places was altered during the pandemic and quantifies the dynamics of social distancing.

At last, the dependent variable used is the OECD Weekly Tracker of GDP growth, developed by Woloszko (2021), which relies exclusively on Google Trends data to generate nowcasts for economic activity. Since the information used by the Tracker is of high frequency, it is capable of assessing the temperature of the economy weekly, which makes it suitable with the daily data of government responses built by the OxCGRT. Its calculation considers the intensity of searches in Google's engines for several economic features and uses an aggregation of words made by the own website. For instance, the category "Auto and Vehicles" will include all terms related to cars, auto companies, etc. Also, those measures are set to be compatible and comparable across countries, matching words from different languages. One example is the topic "economic crisis," which will look after searches for "crise économique" if the filter is set to France, but will consider "crisis economica" if it is filtered to Spain, instead.

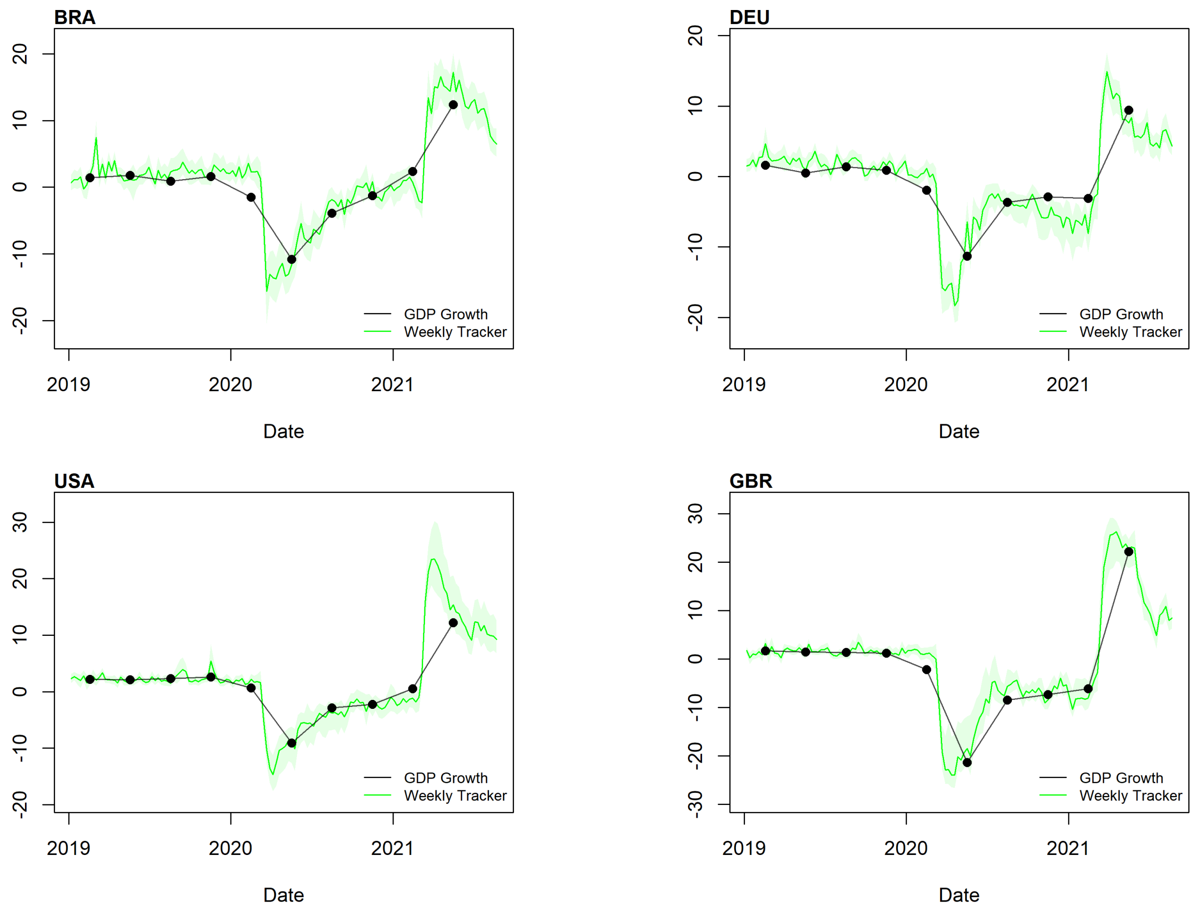
The modeling of the forecast is based on a two-step procedure. Firstly it sets a quarterly model that relates Google Trend's data with economic activity and estimates elasticity measures for each set of subjects. Then it applies the estimated elasticities to the weekly data, obtaining a year-on-year weekly measure for GDP. Since 2021 the Tracker measures the distance between the estimated output level and what was expected in OECD's forecasts in 2019. This measure aims to correct the misleading impression that year-on-year comparisons provide when the 2020's level is used as the reference period; for that reason, it is called counter-factual.

Summing up, the only information on the current state of the economy considered by the Tracker is the intensity of searches being made on Google's engines, not including any other variables from the real economy. Our main hypothesis of identification relies precisely on the nature of this indicator. The model does not include any fiscal variable or other economic variables related to fiscal policies besides those influenced by the very announcement/implementation of those policies - for instance, a surge in searches for "food" or "beverages" after a COVID-19 relief package is announced.

Subjects included in the modeling process comprise eighth larger groups: consumption of goods (e.g., vehicles brands) and services (e.g., travel); labor market (e.g., unemployment insurances); housing (e.g., mortgages); business services (e.g., bankruptcy); industrial activity (e.g., agricultural equipment); trade (e.g., freight); economic sentiment (e.g., economic crisis) and, lastly, poverty (e.g., food banks). Each group weighs differently accordingly to the level of the Tracker since their relative importance changes during the cycle. Hence, searches for "unemployment insurance" weigh more heavily during downturns, than it does in times of activity growth.

The model fits actual data well for a high number of periods and countries. Figure 2 depicts this adherence for four selected countries: Great Britain, the United States, Brazil, and Germany. Comparing model predictions with data provided by the IMF, the range predicted by the model correctly included the year's overall growth for 69% of the sample in 2017 - the first year with available data. In the two following years, this accuracy rose to 75% and 73%, respectively. Lastly, Figure 2 illustrates the advantage of developing the counter-factual measure. The beginning of 2021 shows a massive upturn of output in a year-on-year comparison since it is collated with the worst moment of mobility restrictions,

Figure 2: GDP growth and the Weekly Tracker for selected countries



Source: OECD Economic Outlook and OECD Weekly Tracker, 2021

which had a relevant impact on economic activity. But still, we verified that for the entire period of analysis, the point estimate growth of a specific quarter is following the tracker on-time previous forecasts.

At last, estimates are obtained in a two-way fixed effects regression, absorbing countries' idiosyncratic effects and week-specific impacts, using log transformations for both dependent and independent variables. Hence, the estimated regression is the following:

$$GDP_{it} = \beta_0 + \gamma Fiscal_{it} + \beta X_{it} + \alpha_i + \delta_t + \epsilon_{it} \tag{1}$$

Where GDP_{it} stands for the Weekly Tracker for country i at week t; X_{it} is a vector of controls that includes health and sanitary policies, total deaths and mobility index[2].

[2]In this preliminary version of the study, we do not include a monetary policy measure. This is because

$Fiscal_{it}$ is the measure of total fiscal policy aimed to fight the COVID-19 pandemic as proportion of 2019 GDP. Finally, α_i and δ_t are the country and week dummies, respectively; ϵ_{it} is the error term of the estimation.

3 Results

This section presents the main results of our study, assessing how fiscal measures were responsible for lifting economic activities during the pandemic. As discussed above, the mechanisms for this positive impact to take place are not yet totally understood. Nevertheless, all specifications below and the robustness checks of the next section testify favorably to the understanding of fiscal policies as one of the main tools of intervention in economic activity during the pandemic.

All regressions displayed in this section consider the impact of fiscal measures using two-way fixed effects - controlling for country and week-specific effects -, and standard errors clusterized by country - allowing for arbitrary time series correlation in country-specific time-varying unobservables. Table 1 shows, in the first column, that fiscal policy was positively correlated with economic activity, as measured by the Weekly Tracker, not only presenting statistical significance but also indicating that a 1% change in our fiscal measure impacted almost equivalently the national economy. The following columns add new control variables that were also crucial to set the pandemic environment. In the second one, we introduce the Containment Health Index (discussed above) and Confirmed Deaths. As can be noticed, both variables show a negative coefficient, but none is statistically significant.

This figure, however, changes in the third column as we introduce the Google Mobility measure for the presence in transit stations. Interestingly, this variable presents a positive and significant coefficient, but it is also responsible for reverting the sign of health measures and making it gain statistical significance. Such a change can be seen as the result of directly controlling for social distancing measures, which were responsible for reducing economic

even though we made some tests that indicated a non-significant coefficient for different measures, we believe that more discussion is needed to assess how to incorporate unconventional monetary policy through available data.

activity in large sectors of the economy, especially services. While social distancing is considered jointly with other health measures, as the Containment Health Index does, the point estimation of the coefficient is mainly determined by its negative impact on economic activity. However, as it is possible to disentangle specific health measures from restrictions on mobility, it is also possible to identify that health policy measures were beneficial to increasing output. On the other hand, directly assessing transit measures can also indicate that restrictions on mobility were responsible for reducing economic activity, as expected.

Table 1: Fiscal measures' impact on economic activity

	Dependent variable:		
	Weekly Tracker OECD		
	(1)	(2)	(3)
Fiscal/GDP	0.981^{**}	0.886^{*}	1.318^{***}
	(0.476)	(0.486)	(0.472)
Containment Health Index		−0.007	0.037^{**}
		(0.008)	(0.017)
Confirmed Deaths		−0.012	−0.006
		(0.016)	(0.012)
Transit			0.437^{***}
			(0.103)
Two-way Fixed Effects	Yes	Yes	Yes
Observations	3,870	3,857	3,507
R^2	0.691	0.692	0.803
Adjusted R^2	0.680	0.681	0.796
Residual Std. Error	0.225 (df = 3739)	0.225 (df = 3724)	0.185 (df = 3380)
F Statistic	64.328^{***} (df = 130; 3739)	63.312^{***} (df = 132; 3724)	109.496^{***} (df = 126; 3380)
Note:			*p<0.1; **p<0.05; ***p<0.01

In Table 2, other measures of the Weekly Tracker are used as the dependent variable, while all other regressors remain the same. The first two columns are the minimum and the maximum values forecasted by the Tracker mostly used in this study - which analyzes economic activity relative on a year-on-year basis. Both coefficients estimated are smaller than our base model. Still, the one for the worst-case scenario presents a higher value than the one for the best-case, indicating a higher potential for the fiscal policy to act in the plunge than in the surge of economic activity.

Table 2: Further results on fiscal measures' impact on economic activity

	Dependent variable:				
	Weekly Tracker OECD (Min)	Weekly Tracker OECD (Max)	Weekly Tracker-C OECD	Weekly Tracker-C OECD (Min)	Weekly Tracker-C OECD (Max)
	(1)	(2)	(3)	(4)	(5)
Fiscal/GDP	1.105***	1.060***	0.744***	0.588***	0.564**
	(0.375)	(0.386)	(0.242)	(0.192)	(0.233)
Containment Health Index	0.014	0.044**	0.025**	0.006	0.031**
	(0.011)	(0.018)	(0.012)	(0.009)	(0.012)
Confirmed Deaths	0.003	−0.014	−0.002	0.003	−0.008
	(0.011)	(0.011)	(0.008)	(0.007)	(0.007)
Transit	0.349***	0.417***	0.311***	0.223***	0.279***
	(0.060)	(0.119)	(0.057)	(0.034)	(0.066)
Two-way Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	3,507	3,507	3,507	3,507	3,507
R^2	0.826	0.788	0.710	0.747	0.688
Adjusted R^2	0.819	0.780	0.699	0.737	0.677
Residual Std. Error (df = 3380)	0.156	0.192	0.167	0.124	0.166
F Statistic (df = 126; 3380)	126.967***	99.791***	65.746***	79.021***	59.208***

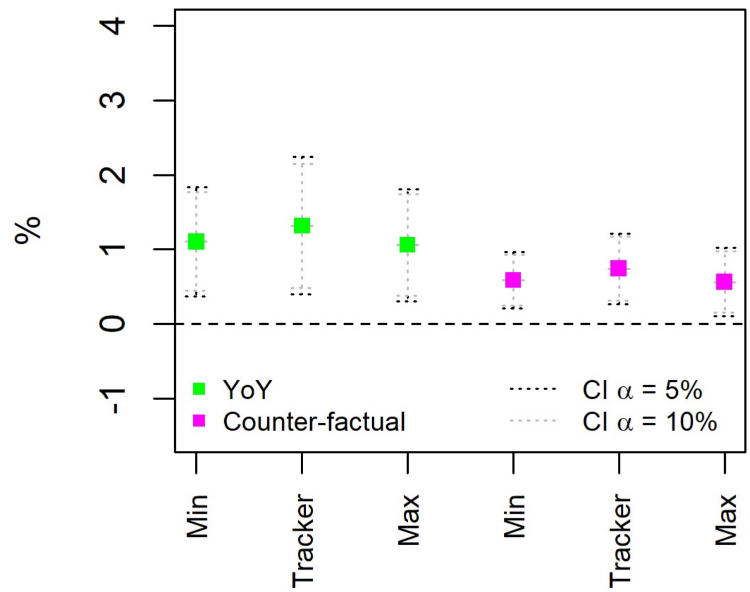
Note: *p<0.1; **p<0.05; ***p<0.01

Columns 3 to 5 indicate a similar result, but now considering the Counter-factual Weekly measure as the endogenous variable. Again, the estimated coefficients preserve their primary interpretation, although its values are significantly reduced as all three are almost halved. Such behavior is due to how the measure is calculated. Different from the year-on-year tracker, it displays the distance between the output estimation in that specific week and the growth projection made before the pandemic.

It is worth noticing that for both dependent variables considered in Table 2, the coefficient associated with health measures has only shown statistical significance for the base and the best-case scenarios. Also, its coefficient is higher for the latter than for the former. In other words, these results seem to indicate that health measures, excluded social distancing, such as public campaigns, and the use of masks are so more responsible for the regaining of economic traction as the more heated the economy already is. Finally, the transit variable behaves similarly to the fiscal measure for all the tracker indexes included in Table 2. Although it does not have its value reduced as much as the fiscal one when considering the counter-factual index, its coefficient shows a higher value for the base-case scenario, followed by the best and the worst-case scenarios, respectively.

At last, the coefficient associated with the total number of deaths did not present statistical significance in any model. After controlling for sanitary measures included in the health index and for the tight and loosening of restrictions on mobility, the direct count of how many people were victims of the Covid-19 does not seem to impact economic performance directly. Figure 3 summarizes the coefficient of interest considering both year-on-year and the counter-factual measure estimated in our most complete models.

Figure 3: Impact of fiscal measures on economic activity



Source: Own elaboration.

4 Identification

The identification hypothesis for estimating the coefficient associated with fiscal measures (γ in Equation 1) relies on the assumption that, using two-way fixed effects and controlling for other health and sanitary policies aimed to contain the pandemic, the only channel through which those policies affect the Weekly Tracker is by lifting economic activity - measured by Google's search intensity. Additionally, the Tracker is not a tool used by governments to endorse policy interventions, and the index only captures economic policy by its effects on the real economy.

Also, as the response magnitude matters and all countries eventually made a fiscal policy aimed at the pandemic, it was preferred not to reduce those policies to dummy indexes and adopt difference in differences procedures. Robust standard errors clusterized by country are implemented to reduce the relevance of incorrect weighting that fixed effects can produce when heterogeneous effects are in place.

There are two scenarios under which the assumptions made for our estimations would not be valid. One is considering countries that were more affected by the pandemic and undertook a considerable fiscal expansion to tackle it. This story would potentially break our underlying assumption of parallel trends in the absence of the treatment. However, this supports our estimations: if a country facing a decreasing economic performance boosts its fiscal policy and this effort indeed raises its estimated output in relation to non-treated units, then we can infer that in the parallel trends scenario, the estimated effect of fiscal policy would be even higher. On the other hand, there could be a case where economies that were recovering more quickly were also the ones capable of expanding their expenditures, as the literature suggests a greater fiscal space for developed economies. In that sense, our estimations will be capturing a previous trend of an economic upturn.

To further investigate the validity of our parallel trends hypothesis, we estimate an event study for the main specification in which two lagged values and two leads of the fiscal measure variable are included. Table 3 reports the results of these estimations.

The results reinforce our previous assumptions. First, we can identify that by including the lags, the contemporaneous fiscal policy loses its significance. At the same time, the two-week lagged level of expenditures appears as significant for both the tacker and its lowest boundary. This fact is coherent with the narrative that it takes some time before the policy enhances changes in people's behavior, confirming the temporal precedence of fiscal policy in relation to economic activity.

Additionally, the leads are statistically not different from zero. If one of those alternative hypotheses were true, one would expect a significant and negative coefficient for future policy in the first case, where fiscal policy responds to dire economic performance. That is, higher expenditure in the future is associated with less growth in the present. The opposite is valid for the second case. If fiscal policy today is only due to higher growth in the past,

Table 3: Fiscal meausures' impact on economic activity - Event study design

	Dependent variable:		
	Weekly Tracker OECD	Weekly Tracker OECD (Min)	Weekly Tracker OECD (Max)
	(1)	(2)	(3)
Fiscal/GDP	0.925	0.648	−0.014
	(0.725)	(0.652)	(0.414)
Fiscal/GDP (lag 1)	−0.579	−0.542	−1.600
	(0.962)	(0.648)	(1.797)
Fiscal/GDP (lag 2)	2.037*	1.482**	3.012
	(1.048)	(0.716)	(2.009)
Fiscal/GDP (lead 1)	−0.111	−0.277	−0.209
	(0.374)	(0.348)	(0.287)
Fiscal/GDP (lead 2)	−0.989	−0.159	0.0003
	(1.298)	(0.641)	(0.713)
Containment Health Index	0.036**	0.015	0.045**
	(0.017)	(0.011)	(0.019)
Confirmed Deaths	−0.004	0.005	−0.011
	(0.012)	(0.011)	(0.011)
Transit	0.438***	0.351***	0.420***
	(0.105)	(0.060)	(0.122)
Two-way Fixed Effects	Yes	Yes	Yes
Observations	3,425	3,425	3,425
R^2	0.807	0.827	0.794
Adjusted R^2	0.800	0.821	0.786
Residual Std. Error (df = 3296)	0.185	0.156	0.191
F Statistic (df = 128; 3296)	107.730***	123.398***	98.964***

Note: *p<0.1; **p<0.05; ***p<0.01

then we should see a positive and significant coefficient for future expenditures. The fact that most of the lead coefficients are negative, although not statistically different from zero, suggests that if one of those narratives were true, it would be the first one. Thus, we would be underestimating the actual effect of fiscal policy.

5 Stationarity tests

Traditional panel analysis methods were developed for microeconomic contexts where N, the number of individuals or units, is large and T, the number of time-series observations, is small. Therefore, those models do not have to deal with issues regarding the non-stationarity of the series. However, macro panels are usually characterized by large N and large T; besides, macro series is likely non-stationary. In that scenario, correctly identifying the source of the non-stationary is crucial for determining whether we can adequately use panel data methods and inference tests.

As the temporal dimension of our panel is large relative to N, there is a concern that our results are affected by the non-stationarity of some variables of interest. By construction, both deaths and fiscal measures are non-stationary. The results of Hansen (2007) indicate that the OLS estimator with cluster-robust standard errors are appropriate in the context of panels where N and T are large, provided that we can guarantee, among other regularity assumptions, that the variables do not present explosive moments.

One possible solution to this problem is to estimate our models also in first differences (in contrast to the "within" estimator used so far), as in this case, explosive tendencies are removed by differentiation. We do this in Table 6 presented in the Appendix, and most results are still verified. Yet, because fiscal shocks are persistent and fiscal measures stay the same for many weeks and then eventually jump, it is the level of accumulated expenditures that can identify the policy impact on that week's output rather than its first difference. For that reason, another alternative is to test whether the fixed effects absorb the non-stationarity of the series. In other words, if the idiosyncratic component of those series is stationary, it is possible to guarantee the validity of the estimations of the model in question.

Conventional panel stationary tests assume that units are independent, a highly unreasonable assumption in our case. As a result, when units are correlated, tests tend to over reject the non-stationarity hypothesis. To tackle this problem, we follow the idea proposed by Bai and Ng (2004), which Moon and Perron (2007) applied in a macroeconomic context. Additionally, we also use the panel covariate-augmented Dickey-Fuller (P-CADF) suggested by Costantini and Lupi (2013).

Bai and Ng (2004) present a method of evaluating if the non-stationarity of a series comes from common factors or idiosyncratic terms, or both. As is further discussed by Moon and Perron (2007), when there are non-stationary factors and stationary idiosyncratic components, panel data analyses are still valid. In terms of Hansen (2007), the stationarity of the idiosyncratic terms suggests that the moments are not explosive once the fixed effects absorb the source of non-stationarity.

To proceed with the test, we run the following regression for both fiscal measures and deaths:

$$Y_{it} = \beta_0 + \alpha_i + \delta_t + \epsilon_{it}$$

Where $Y_{it} = Fiscal, Deaths$, α_i is the country-specific intercept and δ_t the time fixed effects[3]. ϵ_{it} is our idiosyncratic term conditional on country-specific features and common factors that vary with time. We then test for the stationarity of u_{it} for each country using the Augmented Dickey-FUller (ADF) test for a unit root, choosing the number of lags with the MAIC criterion of Ng and Perron (2001). We also test for the non-stationarity with the Phillips-Perron test for unit root. We then calculate the proportion of countries for which we can reject the non-stationarity of the idiosyncratic components. The results suggest that the idiosyncratic nonstationarity is non-pervasive.

Finally, we use the P-CADF test, which allows for correlation between units, to test the stationarity of ϵ_{it} panel as a whole. For both Fiscal Measures and Confirmed Deaths, the results suggest that we reject the null hypothesis of non-stationarity of the panel, confirming the procedure described in the previous paragraph. Table 4 summarises these results. A full description of the stationarity of each of the u_{it} components is available in the appendix.

[3] A similar procedure was implemented by Ferman and Pinto (2019)

Table 4: Stationarity tests for covariates

	PP (Proportion)	CADF (Proportion)	Panel CADF (p-value)
Fiscal measures	0.9111111	0.7333333	0.0095
Total deaths	0.9555556	0.7555556	0.0035

6 Conclusion

As the World suffered in 2020 one of the deepest economic recessions in its History, policy-makers faced new challenges. While the experience of the Global Financial Crisis and the following changes in the views of academics, multilateral institutions and government officials contributed to a quick understanding of the need for substantial fiscal and monetary responses, the special nature of the Covid-19 crisis required the use of innovative policy instruments. In particular, fiscal policy tools could not be designed for their macroeconomic countercyclical role in stimulating aggregate demand, but rather for their social, sanitary and microeconomic implications. In this context, countries have varied in the size and the scope of their responses, reflecting different policy choices as well as their initial fiscal space.

While multiplier effects may not have operated in the same way as in previous crises due to stay-at-home rules, sectoral containment measures and the fear of infection by consumers, our study finds that such fiscal responses have been significant in mitigating the fall in economic activity around the world. By means of two-way fixed effect estimations based on high-frequency data on fiscal measures, containment health measures, the number of Covid-19 deaths and a tracker of economic activity for a panel of 45 countries, we conclude that an expansion of 1% in public spending relative to GDP resulted in a general increase in the weekly OECD economic activity measure of around 1%.

This research also contributes to the empirical literature by proposing a new identification strategy for macroeconomic studies based on how the Weekly Tracker is measured. Since it does not rely on current economic variables but uses only the online behavior of economic agents on the internet, it can be interpreted as being exogenously determined by existing policies. Such a strategy is still open to debate; however, this study already indicates fruitful insights into using this new index. Moreover, it also contributes to the literature of non-stationarity in panel data. We provide a simple toolbox to test the source of the non-stationarity and its implications on the estimations.

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7 Appendix

Table 5: Standard errors robust to country and week cluster

	Dependent variable:		
	Tracker YoY Min	Tracker YoY	Tracker YoY Max
	(1)	(2)	(3)
Fiscal/GDP	1.105***	1.318***	1.060***
	(0.386)	(0.508)	(0.400)
Containment Health Index	0.014	0.037*	0.044*
	(0.012)	(0.022)	(0.024)
Confirmed Deaths	0.003	−0.006	−0.014
	(0.010)	(0.012)	(0.012)
Transit	0.349***	0.437***	0.417***
	(0.059)	(0.099)	(0.113)
Two-way Fixed Effects	Yes	Yes	Yes
Observations	3,507	3,507	3,507
R^2	0.826	0.803	0.788
Adjusted R^2	0.819	0.796	0.780
Residual Std. Error (df = 3380)	0.156	0.185	0.192
F Statistic (df = 126; 3380)	126.967***	109.496***	99.791***
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 6: Regressions in first differences

	Dependent variable:		
	Tracker YoY	Tracker YoY Min	Tracker YoY Max
	(1)	(2)	(3)
Fiscal/GDP	0.907***	0.631***	0.075
	(0.218)	(0.193)	(0.238)
Containment Health Index	−0.036*	−0.049***	−0.013
	(0.019)	(0.017)	(0.021)
Confirmed Deaths	−0.009	−0.010	−0.002
	(0.007)	(0.006)	(0.008)
Transit	0.078***	0.061***	0.165***
	(0.014)	(0.012)	(0.015)
Observations	3,459	3,459	3,459
R^2	0.250	0.282	0.217
Adjusted R^2	0.232	0.265	
Residual Std. Error (df = 3376)	0.138	0.122	0.150
F Statistic (df = 82; 3376)	13.711***	16.188***	11.377***

Note: *p<0.1; **p<0.05; ***p<0.01

Table 7: Unit root tests

Country	Fiscal (ADF)	Fiscal (PP)	Conf. Deaths (ADF)	Conf. Deaths (PP)
ARG	S	S	NS	S
AUS	S	S	S	S
AUT	S	S	S	S
BEL	S	S	S	S
BGR	NS	S	NS	S
BRA	NS	S	S	S
CAN	NS	S	S	S
CHE	S	S	S	S
CHL	S	NS	NS	S
COL	S	NS	NS	S
CZE	S	S	S	S
DEU	S	S	S	S
DNK	S	S	S	S
ESP	S	S	S	S
EST	NS	S	S	S
FIN	S	S	S	S
FRA	S	S	S	S
GBR	S	S	S	S
GRC	NS	S	S	S
HUN	S	S	NS	S
IDN	S	S	S	S
IND	S	S	S	S
IRL	S	S	NS	S
ISL	S	S	S	NS
ISR	S	S	S	S
ITA	NS	S	S	S
JPN	S	S	S	S
KOR	S	S	S	S
LTU	S	S	S	S
LUX	S	S	S	S
LVA	NS	NS	S	S
MEX	S	S	S	S
NLD	S	S	S	S
NOR	NS	NS	NS	S
NZL	NS	S	S	NS
POL	NS	S	NS	S
PRT	NS	S	S	S
ROU	S	S	S	S
RUS	S	S	S	S
SVK	S	S	NS	S
SVN	S	S	NS	S
SWE	S	S	S	S
TUR	S	S	S	S
USA	NS	S	S	S
ZAF	S	S	NS	S
Note:				S = "stationary"; NS = "non-stationary"