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Did Fiscal Space Foster Covid-19's Fiscal Stimuli?

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Abstract

Using a large sample of 125 countries we evaluate the effect of the pre-Covid-19 fiscal space on the size of the fiscal stimulus packages in response to the virus. We find that higher ratings and higher tax revenues (to public debt) predict the size of fiscal stimuli, while public debt (to GDP) does not. These findings vary with countries' level of economic development and the type of fiscal stimuli.

JEL Classification: E44, E62, G01, G28, I10, I18

Keywords: Covid-19's fiscal stimuli; fiscal space; economic development.

1 Introduction

Deeply concerned about the severity and spread of the disease, the World Health Organization announced on March 11th 2020 that the Covid-19 outbreak can be qualified as a pandemic. This announcement was followed by an unprecedented sequence of containment plans to curb the spread of the pandemic: the *Great Lockdown* crisis that began is expected to shrink global GDP growth by around 3% in 2020, namely well above the -0.1% decrease in 2009 associated to the Global Financial Crisis (based on World Economic Outlook data).

Taking stock of previous work on the role of fiscal policy in times of crises (see e.g. [Aizenman and Jinjark, 2010](#); [Jordà et al., 2016](#); [Romer and Romer, 2018](#); [Romer and Romer, 2019](#)), an already-large literature exploring the economic impact of the crisis (see e.g. [Abiad et al., 2020](#); [Auerbach et al., 2020](#); [Baqaee and Farhi, 2020](#); [Barro et al., 2020](#); [Casado et al., 2020](#); [Çakmaklı et al., 2020](#); [Deb et al., 2020](#); [ElFayoumi and Hengge, 2020](#); [Eichenbaum et al., 2020](#); [Faria-e Castro, 2020](#); [Gopinath, 2020](#); [Guerrieri et al., 2020](#); [Jordà et al., 2020](#); [McKibbin and Fernando, 2020](#)), called for immediate action from governments and international institutions,

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all the more that—although the second wave of the crisis seems less virulent than the first—GDP still remains well below its pre-crisis level.¹ Converging with these requests, various national fiscal stimuli plans were indeed implemented starting the first half of 2020.²

This paper investigates an important determinant of these fiscal stimuli, namely countries' pre-Covid fiscal space. This issue is currently under an important debate: while a (pre-Covid) established literature praises the benefits of a higher fiscal space in times of crises, more recent Covid-related studies reject these benefits. Consequently, we test the following hypothesis: were countries with higher fiscal space able to provide higher fiscal stimuli for fighting the contraction of the economy caused by the Covid?

Our answer to this question is nuanced. First, fiscal stimuli were found to be disconnected with respect to the public debt-to-GDP ratio, corroborating—in a larger sample—the conclusions of [Benmelech and Tzur-Ilan \(2020\)](#). However, a lower debt-to-tax rate and—particularly—higher sovereign debt ratings were significant and robust (as shown by several tests) determinants of the size of Covid-related fiscal stimuli, in line with the literature supporting the benefits of fiscal space in times of crises (see e.g. [Aizenman and Jinjarak, 2010](#); [Jordà et al., 2016](#); [Romer and Romer, 2018](#); [Romer and Romer, 2019](#)). Second, while these effects were not found to display robust nonlinearities, they vary with countries' level of economic development and the type of fiscal stimuli.

Our nuanced findings may be related to the recent dynamics of public debt, whose increase during the last decade or so—mainly related to major macroeconomic shocks, e.g. the Great Recession or the Covid-19 pandemic—was fueled by persistently-weak interest rates, independently of the initial level of public debt. But let us not believe that such increases in public debt are not without a cost: the governments' intertemporal constraint will—sooner or later—kick in, and too large indebtedness levels, possibly together with the higher risk premia they may trigger, will shrink fiscal space and therefore reduce the possibility of fiscal maneuver in a context of endangered public finance sustainability.

The remainder of the paper is organized as follows. Section 2 presents the data, section 3 illustrates the methodology, section 4 reports our results and assesses their robustness, section 5 explores several sources of potential heterogeneity in the effect of fiscal space on Covid-related fiscal stimuli, and section 6 provides concluding remarks.

1. For example, in October 2020 the IMF wrote (see [Long and Ascent, 2016](#)): *the global economy is climbing out from the depths to which it had plummeted during the Great Lockdown in April. But with the COVID-19 pandemic continuing to spread, many countries have slowed reopening and some are reinstating partial lockdowns to protect susceptible populations. While recovery in China has been faster than expected, the global economy's long ascent back to pre-pandemic levels of activity remains prone to setbacks.*

2. We disregard in this paper other stimuli for mitigating the consequences of the Covid crisis, e.g. (un)conventional monetary policies.

2 Data, and descriptive statistics

2.1 Data

Our data covers 125 countries of which 30 are developed and 95 are developing countries. Our dependent variable—*Covid-related fiscal policy response*—comes from the IMF’s database of fiscal policy responses to Covid-19 until September 11th, 2020. This variable equals the sum of the two fiscal measures taken by governments to alleviate the effect of the Covid crisis on economic activity. First, above-the-line-measures include additional spending or foregone revenues for the health sector and the non-health sector, and accelerated spending/deferred revenues. Second, liquidity support includes below-the-line-measures (i.e. equity injections, loans, asset purchase, or debt assumptions), and contingent liabilities (i.e. government guarantees, and quasi-fiscal operations).

A crucial and complicated task concerns the measure of the abstract concept of *fiscal space*. In their seminal contribution, [Ghosh et al. \(2013\)](#) highlight a negative correlation between public debt (in % of GDP) and fiscal space, i.e. the higher the public debt, the lower the fiscal space. Approaching fiscal space by the *public debt-to-GDP ratio*, [Benmelech and Tzur-Ilan \(2020\)](#) notably reject a significant impact of fiscal space on Covid-related fiscal spending using cross-section data for 85 countries.

However, we believe that there are good reasons for using alternative measures of fiscal space, particularly given its multiple facets. On the one hand, the popular contribution of [Bohn \(2008\)](#) highlights the importance of primary surpluses for debt sustainability; adapted to our analysis that aims at explaining Covid-related public spending, this may suggest that what equally matters is the way public debt is accommodated by fiscal revenues. Consequently, aside from the public debt-to-GDP ratio, we consider *public debt as a ratio of taxes* as an additional measure of fiscal space ([Kose et al., 2017](#)). On the other hand, the theoretical work of [Minea and Villieu \(2009, 2012\)](#), emphasizes the importance of the cost of the debt (i.e. the debt burden) in the government’s budget constraint accountancy, due to its crowding-out effects; adapted to our analysis, this may suggest that—rather than a high public debt-to-GDP ratio—it is the cost of indebtedness that may better seize fiscal space, particularly given its ability to account for potential risk premia ([Blanchard, 2019](#)), which may signal an increasing danger on debt sustainability and therefore shrinking fiscal space. Consequently, we equally measure fiscal space using foreign currency long-term *sovereign debt ratings* from [Kose et al. \(2017\)](#) to capture countries’ ability to access finance on international markets. To tackle reversed causality issues, all our three measures of fiscal space—namely, public debt-to-GDP, public debt-to-taxes, and sovereign debt ratings—are measured in 2019, i.e. *prior to the Covid pandemic*.

2.2 Descriptive statistics

Given the violence of the Covid crisis, the average fiscal stimulus is around 7% of GDP in our sample, namely already more important than the total fiscal package implemented after the Global Financial Crisis (GFC). For example, in the United States the Covid-related fiscal

stimulus topped already to 14.31% of GDP (against 5.9% of GDP after the GFC), and could further increase given that the US is one of the the most affected countries in the world (see <https://www.worldometers.info/coronavirus/>).³

Closer to the goal of our analysis, [Figure 1](#) reports Covid-related fiscal measures (in % of GDP) for relatively low and high values of our various measures of fiscal space, defined using the median value of the sample for each fiscal space variable.

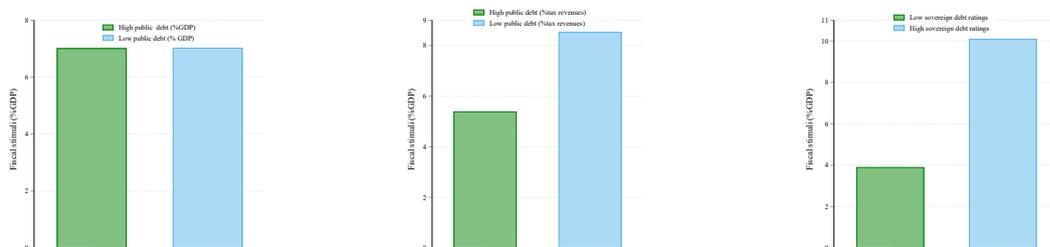


Figure 1 – *Fiscal stimuli (% of GDP) by level of fiscal space*

Table 1 – Fiscal stimuli (% of GDP) by level of fiscal space

Low debt-to-GDP	7.029	Low debt-to-tax	8.530	Low debt ratings	3.901
High debt-to-GDP	7.014	High debt-to-tax	5.391	High debt ratings	10.092
T-test (equal averages)	0.014	T-test (equal averages)	-2.843	T-test (equal averages)	-6.344
P-value	0.989	P-value	0.005	P-value	0.000

As illustrated by [Figure 1](#)—and confirmed by statistical tests of equality of the averages between low and high values in [Table 1](#)—while fiscal stimuli do not seem to vary with respect to the public debt-to-GDP ratio, they are statistically higher in the presence of a higher fiscal space indicated by either lower public debt-to-tax ratios or higher sovereign debt ratings. Keeping these simple statistics in mind, in the following we develop a more formal analysis.

3 Methodology

3.1 The model

We estimate the effect of fiscal space on fiscal stimuli using a cross-section model

$$Fiscal_stimulus_i = \beta_0 + \beta_1 Fiscal_space_i + \beta_{2j} X_i^j + \varepsilon_i, \quad (1)$$

with $Fiscal_stimulus_i$ the fiscal stimulus (in % of GDP) of country i due to Covid-19, $Fiscal_space_i$ the pre-Covid fiscal space measure in country i , X_i^j the vector of j control variables, and ε_i the error term.

The selection of the control variables, namely: GDP per capita (in log), infection fatality rate (IFR) proxied by the case fatality rate (CFR), population density (in log), and inflation, is guided by [Aizenman and Jinjarak \(2010\)](#) and [Benmelech and Tzur-Ilan \(2020\)](#), while

3. Similarly, the fiscal stimulus in Spain equals 17.7% of GDP (against 3.7% during the GFC), and 7.5% of GDP in China (against 4.8% of GDP during the GFC; see [Prasad and Sorkin, 2009](#); [Auerbach et al., 2010](#), or [Aizenman and Jinjarak, 2010](#), for analyses on the GFC).

democracy is included to capture potential political budget cycles and transparency in the crisis management. The parameter of interest is β_1 : to confirm our hypothesis, β_1 should be statistically-significant and indicate a favorable effect of higher pre-Covid fiscal space on fiscal stimuli.

3.2 Identification

A traditional regression that aims at capturing the effect of fiscal space in period $t - 1$ on public spending in period t would suffer from an endogeneity bias arising from reversed causality: public spending in $t - 1$ can hardly be considered not to have influenced fiscal space in $t - 1$, which would require an appropriate instrumentation strategy to purge this reversed causality.

However, our analysis is not likely to be influenced by such a reversed-causality issue: since our public spending variable contains *exclusively* Covid-related public spending, it captures only the "surprise" public spending fully driven by an exogenous shock, i.e. the unexpected Covid pandemic. Put simpler, since 2020 Covid-related spending were fully unexpected, they cannot act on the 2019 fiscal space. From a broader perspective, our analysis can be compared with natural experiment studies that equally draw upon unexpected variation to establish a causal effect, such as climate shocks (for example, unusual drought phenomena), (mostly-)unexpected institutional reversals (for example, the fall of communist regimes in Central and Eastern Europe), and so forth. Besides, since we tackle a possible omitted-variable bias through our vector of control variables—that includes in particular key potential determinants of Covid fiscal stimuli, such as the infection fatality rate—we can, with some comfort, state that our simple OLS estimations provide a causal effect in this particular case.

4 Results

4.1 Baseline results

Our baseline results are presented in [Table 2](#). The naive regression reported in column [1] reveals a lack of significant association between fiscal space measured by the public debt-to-GDP ratio and fiscal stimuli. To protect this effect from a potential omitted-variable bias, we include in regression [2] the entire set of control variables. Although control variables present the expected sign and are mostly significant (in particular, a higher level of economic development captured by GDP per capita, the magnitude of the shock of the virus captured by IFR, and higher levels of democracy are associated with higher fiscal stimuli), the effect of the pre-Covid public debt-to-GDP ratio on Covid-related fiscal stimuli remains statistically not significant. Consequently, we confirm that the results of [Benmelech and Tzur-Ilan \(2020\)](#) still hold when increasing the number of countries by up to almost 50%.

In the following, given the various facets of fiscal space, we consider alternative measures of it. First, regressions [3]-[4] consider public debt as a ratio of taxes (instead of GDP). Interestingly, a higher public debt-to-tax ratio is associated with a lower fiscal stimuli on average,

Table 2 – Pre-Covid fiscal space and Covid-related fiscal stimuli

Fiscal stimuli (%GDP)	[1]	[2]	Fiscal stimuli (%GDP)	[3]	[4]	Fiscal stimuli (%GDP)	[5]	[6]
<i>Debt-to-GDP ratio</i> (log)	0.1302 (0.7615)	0.1054 (0.8621)	<i>Debt-to-tax ratio</i> (log)	-2.3388*** (0.6718)	-1.6920** (0.6765)	<i>Sovereign debt ratings</i>	0.8059*** (0.0916)	0.5871*** (0.1235)
GDP per capita (log)		1.6153*** (0.5409)	GDP per capita (log)		1.6661*** (0.5286)	GDP per capita (log)		-0.1547 (0.5426)
Inf. fatality rate (IFR)		0.5540*** (0.1879)	Inf. fatality rate (IFR)		0.5837*** (0.1801)	Inf. fatality rate (IFR)		0.5006*** (0.1734)
Pop. density (log)		0.1397 (0.4209)	Pop. density (log)		0.3584 (0.4444)	Pop. density (log)		0.2437 (0.3817)
Index Democrat.		0.1568*** (0.0583)	Index Democrat.		0.1002* (0.0583)	Index Democrat.		0.1618*** (0.0549)
Inflation		-0.0122 (0.0281)	Inflation		-0.0204 (0.0299)	Inflation		0.0129 (0.0278)
Constant	6.4941** (2.9359)	-12.5966* (6.7647)	Constant	20.243*** (3.9432)	-3.0103 (6.3693)	Constant	-2.3423** (0.9533)	-3.7236 (4.8037)
Observations	124	107	Observations	123	107	Observations	125	107

Robust standard errors in brackets. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

an effect that remains statistically-significant when introducing the vector of control variables (whose effect is comparable to our previous estimations). In particular, although purging the effects of other fiscal stimuli determinants reduces the magnitude of the impact of the debt-to-tax ratio, its size remains economically important: a one standard deviation increase in the (log of) debt-to-tax ratio reduces on average fiscal stimuli by 1.42 percentage points, namely a decrease of around 20% relative to the mean fiscal stimuli value.

Second, regressions [5]-[6] consider sovereign debt ratings. Both the unconditional and conditional—upon the vector of control variables—effect of sovereign debt ratings on fiscal stimuli is statistically-significant, and—although weaker in the latter case—economically-meaningful. Based on regression [6], a one standard deviation increase in sovereign debt ratings raises on average fiscal stimuli by 3.01 percentage points, or around 43% relative to their mean value.

To summarize, in light of our baseline estimations we share the conclusion of [Benmelech and Tzur-Ilan \(2020\)](#) on the lack of significant effect of public debt-to-GDP on fiscal stimuli. However, when using other measures of fiscal space, namely the public debt-to-tax ratio or sovereign debt ratings, we reveal that a larger fiscal space was a significant determinant of the fiscal stimuli implemented in response to the Covid, consistent with previous evidence on the importance of the fiscal space for Governments' policy (see e.g. [Aizenman and Jinjarak, 2010](#); [Jordà et al., 2016](#); [Romer and Romer, 2018](#); [Romer and Romer, 2019](#)).

4.2 Robustness

We consider several alternative specifications of our baseline model.

First, we expand our vector of control variables and include additional potential determinants of fiscal stimuli, namely: a fixed exchange rate dummy, a stringency index capturing the severity of the containment measures, the share of the population above 65 years, government

expenditure, an index of government fractionalization capturing government fragmentation, the presence of elections, and the presence of fiscal rules. Estimations in [Table 3](#) show that these additional control variables do not significantly influence fiscal stimuli, with the notable exception of the positive effect of the share of the population above 65 years old—consistent with the particularly-important impact of the Covid on this segment of the population. More importantly, we observe a lack of significant effect of the debt-to-GDP ratio on fiscal stimuli, and a significant and negative (positive) effect of the debt-to-tax ratio (sovereign debt ratings). Consequently, accounting for several additional control variables confirms our baseline findings.

Table 3 – Pre-Covid fiscal space and Covid-related fiscal stimuli: Additional controls

Dependent variable	[1] Add	[2] Add	[3] Add	[4] Add	[5] Add	[6] Add	[7] Add
Fiscal stimuli (% of GDP)	Fix Exchange	Stringency Index	Above 65 yrs	Total Gov. Exp.	Gov. Fraction.	Election	Fiscal Rule
<i>Debt-to-GDP ratio</i> (log)	0.1576 (0.8374)	0.0741 (0.8848)	0.0577 (0.8672)	0.0870 (0.8864)	0.3971 (0.8735)	0.1725 (0.8506)	0.1536 (0.8558)
Additional Control	-1.4148 (1.0131)	0.0173 (0.0305)	0.2162* (0.1143)	0.0224 (0.0719)	-2.3441 (1.9474)	1.4348 (1.2728)	0.9167 (0.9893)
Main Controls	Yes						
Observations	107	104	107	107	102	104	107
<i>Debt-to-tax ratio</i> (log)	-1.6048** (0.6810)	-1.7088** (0.6841)	-1.5184** (0.6985)	-1.7526** (0.7063)	-1.4066** (0.6734)	-1.5505** (0.6684)	-1.6337** (0.6993)
Additional Control	-1.1990 (1.0003)	0.0244 (0.0301)	0.1633 (0.1211)	0.0395 (0.0663)	-2.6003 (1.9474)	1.2912 (1.2180)	0.6071 (1.0081)
Main Controls	Yes						
Observations	107	104	107	107	102	104	107
<i>Sovereign debt ratings</i>	0.5667*** (0.1210)	0.6352*** (0.1219)	0.5894*** (0.1208)	0.5945*** (0.1259)	0.5645*** (0.1227)	0.5729*** (0.1208)	0.5823*** (0.1273)
Additional Control	-0.4988 (0.9215)	0.0414 (0.0267)	0.2209* (0.1133)	0.0384 (0.0643)	-2.9562 (1.8801)	1.1377 (1.0911)	0.1557 (0.9241)
Main Controls	Yes						
Observations	107	104	107	107	102	104	107

Unreported constant included. Robust standard errors in brackets. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Second, we alter our sample by excluding various groups of countries, namely: (i) the Euro zone countries that are subject to fiscal constraints that may influence their fiscal space (e.g. various types of supra-national and national fiscal rules); (ii) major oil exporters that benefit of natural rents that may affect their fiscal space; and (iii) heavily indebted poor countries (HIPC) that present poor fiscal conditions that may influence markets' view of their fiscal space. [Table 4](#) illustrates a non-significant effect of the public debt-to-GDP ratio, and a favorable effect of a lower debt-to-tax ratio (although with some loss of precision when excluding major oil exporters), or a higher sovereign debt rating on fiscal stimuli, consistent with our baseline estimations.

Third, we take a closer look at our dependent variable, namely fiscal stimuli. Compared with our baseline estimations in which we include all Covid-related public spending, we follow [Benmelech and Tzur-Ilan \(2020\)](#) and exclude from this general measure government guarantees. The results reported in [Table A2](#) in the [Appendix](#) are—irrespective of the retained specification,

Table 4 – Pre-Covid fiscal space and Covid-related fiscal stimuli: Altering the sample

Dependent variable	[1] Excl.	[2] Excl.	[3] Excl.	[4] Excl.	[5] Excl.	[6] Excl.	[7] Excl.	[8] Excl.	[9] Excl.
Fiscal stimuli (% GDP)	Euro	Oil exp.	HIPC	Euro	Oil exp.	HIPC	Euro	Oil exp.	HIPC
Debt-to-GDP ratio (log)	0.0318 (1.1035)	-0.2767 (0.9486)	-0.2480 (0.8695)						
Debt-to-tax ratio (log)				-1.9777** (0.7811)	-1.4404 (0.8716)	-2.0118*** (0.6915)			
Sovereign debt ratings							0.6628*** (0.1385)	0.6309*** (0.1269)	0.5855*** (0.1291)
Main Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	92	97	94	92	97	94	92	97	94

Unreported constant included. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

namely naive, with the vector of main, and then additional controls, or when restraining the sample—consistent with our baseline findings: contrary to the lack of significance of the effect of public debt-to-GDP, a higher fiscal space signaled by a lower public debt-to-tax ratio or a higher sovereign rating is associated with higher fiscal stimuli on average.

Finally, [Benmelech and Tzur-Ilan \(2020\)](#) notably reveal that outliers play a fundamental role in the accuracy of their estimates of the effect of the public debt-to-GDP ratio on fiscal policy spending: excluding Japan turns the coefficient into not significant. Capitalizing on this lesson, we *excluded* in our baseline estimations those countries that present too high debt *or* fiscal stimuli, namely: Germany, Italy, and Japan.

However, given the importance of outliers, we imagined two additional tests. On the one hand, we performed our baseline regressions with these three countries included. Estimations in [Table A3](#) in the [Appendix](#) confirm our findings for the debt-to-GDP ratio and sovereign ratings, but reveal that the significance of the debt-to-tax ratio is fragile with respect to these three countries. Due to these findings, we decided—on the other hand—to exclude top and bottom 10% of increasingly-ordered debt-to-GDP observations. Estimations in [Table 5](#) show that while the top 10% observations seem to drive to some extent the results for the variable public debt-to-tax (the coefficient is no longer significant as the p-value equals 0.161), our baseline findings are unchanged irrespective of the measure of fiscal space when excluding the bottom 10% observations, i.e. a non-significant, negative, and positive impact of public debt-to-GDP, public debt-to-tax, and sovereign ratings, respectively.

Overall, the robustness analysis delivers two messages: the debt-to-GDP ratio was not a determinant of fiscal stimuli, contrary to the robust impact of sovereign ratings on fiscal stimuli; and, while the debt-to-tax ratio influences fiscal stimuli, the fact that its significance may be altered by some outliers suggest that we take a closer look at possible heterogeneities in the effect of fiscal space on Covid-related fiscal stimuli.

5 Heterogeneity

We investigate in this section if the effect of fiscal space on Covid-related fiscal stimuli may be subject to heterogeneity. We focus on three stances that are closely related to our analysis:

Table 5 – Pre-Covid fiscal space and Covid-related fiscal stimuli: Outliers

Dependent variable	[1]	[2]	[3]	[4]	[5]	[6]
Fiscal stimuli (% of GDP)	Drop top 10%	debt-to-GDP obs.		Drop bottom 10%	debt-to-GDP obs.	
Debt-to-GDP ratio (log)	0.1054 (0.8621)			-0.1799 (1.2983)		
Debt-to-tax ratio (log)		-1.4796 (1.0472)			-1.5706* (0.7907)	
Sovereign debt ratings			0.5344*** (0.1337)			0.6219*** (0.1818)
Main Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	107	96	96	94	98	96

Unreported constant included. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

the level of economic development, the initial level of fiscal space, and various disaggregated types of Covid-related fiscal stimuli.

5.1 The level of economic development

Using the IMF’s classification of countries, simple statistics reported in [Table 6](#) reveal that developed countries were more affected by Covid-19 than developing countries, i.e. a statistically higher average infection fatality rate of 5.31% against 2.95%, and responded with statistically higher fiscal stimuli (14.24% of GDP against 4.74% of GDP).

Table 6 – Descriptive statistics: developed *versus* developing countries

	Fiscal stimuli	IFR	Debt-to-GDP (log)	Debt-to-tax (log)	Debt ratings
Developed countries	14.235	5.305	4.023	5.429	17.618
Developing countries	4.744	2.953	3.821	5.752	9.725
T-test	-9.492	-3.546	-1.344	1.851	-9.732
P-value	0.000	0.000	0.182	0.067	0.000

However, such differences in fiscal stimuli may be equally driven by differences in fiscal space. As shown by the right-hand side part of [Table 6](#), although debt-to-GDP ratios were statistically equal on average, developed countries present a higher fiscal space signaled by a slightly lower public debt-to-tax ratio (5.43 versus 5.75) and higher sovereign debt ratings (17.62 versus 9.73). Fueled by these simple statistics, below we explore this intuition of a differentiated relationship between fiscal space and fiscal stimuli in developed versus developing countries.

The first two columns of the top of [Table 7](#) show that the public debt-to-GDP ratio is not significantly associated with fiscal stimuli. Regarding the public debt-to-taxes, the subsequent two columns reveal an interesting heterogeneity: while a lower public debt-to-tax ratio significantly increases fiscal stimuli in developing countries (with a higher magnitude than the baseline effect for the full sample), it is not a significant determinant of fiscal stimuli in developed countries. Lastly, although fiscal stimuli significantly responded in both developing and developed countries to sovereign debt ratings, the magnitude of the effect is higher in absolute terms in the latter: a one standard deviation increase in fiscal space is associated on average with a

Table 7 – Heterogeneity: developed *versus* developing countries

Dependent variable	[1]	[2]	Dependent variable	[3]	[4]	Dependent variable	[5]	[6]
Fiscal stimuli (% GDP)	Developing	Developed	Fiscal stimuli (% GDP)	Developing	Developed	Fiscal stimuli (% GDP)	Developing	Developed
<i>Debt-to-GDP</i> (log)	-0.5608 (0.9552)	-1.6672 (1.8168)	<i>Debt-to-tax</i> (log)	-1.9150*** (0.6957)	-2.3615 (1.9184)	<i>Sovereign debt ratings</i>	0.3993** (0.1623)	0.7858** (0.2914)
Main Controls	Yes	Yes	Main Controls	Yes	Yes	Main Controls	Yes	Yes
Observations	79	28	Observations	79	28	Observations	79	28

Dep. var.: Fiscal stimuli <i>w/o Gov. Guarantees</i> (%GDP)	[1]	[2]	Dep. var.: Fiscal stimuli <i>w/o Gov. Guarantees</i> (%GDP)	[3]	[4]	Dep. var.: Fiscal stimuli <i>w/o Gov. Guarantees</i> (%GDP)	[5]	[6]
<i>Debt-to-GDP</i> (log)	Developing	Developed	<i>Debt-to-tax</i> (log)	Developing	Developed	<i>Sovereign debt ratings</i>	Developing	Developed
<i>Debt-to-GDP</i> (log)	-0.4072 (0.7843)	-1.2927 (1.3840)	<i>Debt-to-tax</i> (log)	-1.5089** (0.5832)	-1.8778 (1.5706)	<i>Sovereign debt ratings</i>	0.2810** (0.1219)	0.8874** (0.3660)
Main Controls	Yes	Yes	Main Controls	Yes	Yes	Main Controls	Yes	Yes
Observations	79	28	Observations	79	28	Observations	79	28

Dep. var.: Fiscal stimuli <i>with outliers included</i> (%GDP)	[1]	[2]	Dep. var.: Fiscal stimuli <i>with outliers included</i> (%GDP)	[3]	[4]	Dep. var.: Fiscal stimuli <i>with outliers included</i> (%GDP)	[5]	[6]
<i>Debt-to-GDP</i> (log)	Developing	Developed	<i>Debt-to-tax</i> (log)	Developing	Developed	<i>Sovereign debt ratings</i>	Developing	Developed
<i>Debt-to-GDP</i> (log)	-0.5608 (0.9552)	2.5905 (2.9330)	<i>Debt-to-tax</i> (log)	-1.9150*** (0.6957)	2.5197 (2.8012)	<i>Sovereign debt ratings</i>	0.3993** (0.1623)	0.3922 (0.6095)
Main Controls	Yes	Yes	Main Controls	Yes	Yes	Main Controls	Yes	Yes
Observations	79	31	Observations	79	31	Observations	79	31

Unreported constant included. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

higher fiscal stimulus of 4.03 percentage points in developed countries (i.e. around 28% of their mean), namely twice—in absolute terms—compared with the increase of only 2.05 percentage points in developing countries (i.e. around 43% of their mean).

These findings remain fairly stable if we modify our measure of fiscal stimuli to exclude government guarantees (i.e. the effect is never significant for debt-to-GDP, significantly only in developing countries for debt-to-tax, and stronger in developed countries for sovereign ratings, see the middle of Table 7), or if we introduce the three outlier countries in the sample (except for an imprecise estimation of the effect of sovereign ratings in developed countries, see the bottom of Table 7).

Consequently, except for the debt-to-GDP ratio, estimations seem to support a differentiated effect of the fiscal space on fiscal stimuli in developed versus developing countries: a lower debt-to-tax ratio significantly increases fiscal space only in the later, and—although they significantly increase fiscal space in both developed and developing countries—higher sovereign debt ratings are on average associated with a stronger (in absolute terms) effect in the former.

5.2 The initial level of fiscal space

Our previous estimations revealed that in some cases outliers may influence our findings. An appealing way to better account for the presence of outliers is to allow for nonlinearities. For example, Minea and Villieu (2012) and Ghosh et al. (2013) illustrate theoretically and empirically the importance of debt-driven nonlinearities in the effect of deficits on economic growth, and fiscal reaction functions, respectively. Taking stock of these findings, we extend our model to include the square of each of our fiscal space measure, in order to search for potential nonlinearities in the impact of fiscal space on Covid-related fiscal stimuli driven by the initial level of the fiscal space measure.

We present estimations for all three fiscal space measures, augmented with all the specifications considered in the robustness section. According to the top of Table 8, both coefficients of the public debt-to-GDP terms are not significant when considering the naive or the baseline

Table 8 – Heterogeneity: the initial fiscal space level

Fiscal stimuli (% of GDP)	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
<i>Debt-to-GDP</i> (log)	-1.8399** (0.7363)	0.7503 (6.2260)	-0.6800 (6.1092)	0.4657 (6.1504)	2.0185 (6.1089)	1.2331 (6.5221)	-1.8273 (6.6599)	0.6566 (6.2227)	0.7219 (6.2201)	-0.4316 (10.8558)	1.0309 (6.6912)	1.7895 (6.1878)
<i>Debt-to-GDP</i> (log) squared	0.3618 (0.2410)	-0.0852 (0.8584)	0.1107 (0.8433)	-0.0517 (0.8488)	-0.2592 (0.8372)	-0.1516 (0.9003)	0.2967 (0.9274)	-0.0640 (0.8604)	-0.0751 (0.8545)	0.0608 (1.4632)	-0.1716 (0.9140)	-0.2706 (0.8493)
Main Controls	No	Yes	Yes	Yes								
Additional Controls	No	No	Yes	No	No	No						
Altering the Sample	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Observations	124	107	107	104	107	107	102	104	107	92	97	94
Fiscal stimuli (% of GDP)	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
<i>Debt-to-tax</i> (log)	0.9340 (0.9849)	1.0621 (4.6676)	0.0766 (4.7862)	0.6185 (4.6632)	1.0208 (4.8772)	3.1296 (4.9409)	0.1722 (4.7955)	1.6909 (4.5474)	0.8380 (4.8223)	-1.8235 (6.2304)	1.5795 (6.9750)	0.5402 (4.8221)
<i>Debt-to-tax</i> (log) squared	-0.3221*** (0.1093)	-0.2342 (0.3669)	-0.1433 (0.3768)	-0.1976 (0.3639)	-0.2161 (0.3811)	-0.4177 (0.4017)	-0.1344 (0.3736)	-0.2754 (0.3598)	-0.2105 (0.3804)	-0.0128 (0.4759)	-0.2680 (0.5971)	-0.2172 (0.3831)
Main Controls	No	Yes	Yes	Yes								
Additional Controls	No	No	Yes	No	No	No						
Altering the Sample	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Observations	123	107	107	104	107	107	102	104	107	92	97	94
Fiscal stimuli (% of GDP)	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
<i>Debt ratings</i>	-0.2452 (0.3740)	0.0451 (0.4455)	0.0424 (0.4454)	-0.0187 (0.4425)	-0.1720 (0.4418)	0.0583 (0.4470)	0.0646 (0.4439)	0.1584 (0.4684)	0.0003 (0.4564)	-0.2347 (0.4550)	-0.3121 (0.4085)	0.3026 (0.4779)
<i>Debt ratings</i> squared	0.0414*** (0.0155)	0.0224 (0.0195)	0.0218 (0.0196)	0.0273 (0.0196)	0.0315 (0.0195)	0.0222 (0.0197)	0.0206 (0.0195)	0.0172 (0.0203)	0.0238 (0.0198)	0.0380* (0.0203)	0.0386** (0.0176)	0.0118 (0.0214)
Main Controls	No	Yes	Yes	Yes								
Additional Controls	No	No	Yes	No	No	No						
Altering the Sample	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Observations	125	107	107	104	107	107	102	104	107	92	97	94

Note: The *main controls* are those from Table 2. The *additional controls* are those from Table 3 in the same order. The *altering of the sample* is the one from Table 4 in the same order. Unreported constant included. Robust standard errors in brackets. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

specification, adding subsequent controls, or restricting the sample; adding to our baseline findings, it comes that the public debt-to-GDP ratio was not a robust determinant of fiscal stimuli. Moreover, a comparable lack of nonlinear effects of the public debt-to-tax ratio is suggested by the middle of Table 8, irrespective of the assumed specification; consequently, it appears that the effect of the debt-to-tax ratio is likely linear as illustrated by our baseline results. Lastly, as shown by the bottom of Table 8, except for some significant and positive squared terms when restricting the sample (by excluding euro countries and major oil exporters) suggesting an acceleration of the favorable effect of sovereign ratings on fiscal stimuli as the former increase, estimations mostly reject a robust nonlinear impact of sovereign debt ratings.⁴

5.3 Disaggregated types of fiscal stimuli

Finally, in search for channels that may explain the effect of fiscal space on fiscal stimuli, we perform estimations when decomposing fiscal stimuli into their various types in Table 9, namely: additional spending or foregone revenues for the health sector (HS, column [1]); additional spending or foregone revenues for the non-health sector (NHS, column [2]); accelerated spending/deferred revenues (AS/DR, column [3]); equity injections, loans, asset purchase, or debt assumptions (EI/L/AP/DA, column [4]); government guarantees (GG, column [5]); and

4. Comparable results arise if we exclude government guarantees from our measure of fiscal stimuli; see Table A4 in the Appendix.

quasi-fiscal operations (QFO, column [6]).

Table 9 – Heterogeneity: Disaggregated types of fiscal stimuli

Disaggregated fiscal stimuli (% of GDP)	[1] HS	[2] NHS	[3] AS/DR	[4] EI/L/AP/DA	[5] GG	[6] QFO
<i>Debt-to-GDP</i> (log)	-0.0538 (0.0971)	0.8162 (0.6284)	-1.0430 (0.6878)	-0.2051 (0.4121)	0.0672 (0.7234)	0.6173 (0.4167)
Main Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	91	91	44	55	56	24
Disaggregated fiscal stimuli (% of GDP)	[1] HS	[2] NHS	[3] AS/DR	[4] EI/L/AP/DA	[5] GG	[6] QFO
<i>Debt-to-tax</i> (log)	-0.0796 (0.1010)	-0.3701 (0.6636)	-0.9903* (0.4939)	-0.3925* (0.2242)	-0.1129 (0.5011)	-0.1144 (0.3320)
Main Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	91	91	44	55	56	24
Disaggregated fiscal stimuli (% of GDP)	[1] HS	[2] NHS	[3] AS/DR	[4] EI/L/AP/DA	[5] GG	[6] QFO
<i>Sovereign debt ratings</i>	0.0069 (0.0177)	0.3457*** (0.1040)	0.1422** (0.0653)	0.0184 (0.0494)	0.0796 (0.1063)	0.0742 (0.0757)
Main Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	91	91	44	55	56	24

Note: Columns [1]-[6] include respectively additional spending or foregone revenues for the health sector (% GDP), additional spending or foregone revenues for the non-health sector (% GDP), accelerated spending / deferred revenues (% GDP), equity injections, loans, asset purchase, or debt assumptions (% GDP), government guarantees (% GDP), and quasi-fiscal operations (% GDP). Unreported constant included. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

The results can be summarized as follows. The public debt-to-GDP ratio is never a significant determinant of the various types of fiscal stimuli, consistent with our baseline results (see the top of Table 9). Next, the favorable effect of a lower public debt-to-tax ratio is driven by a significant response of accelerated spending/deferred revenues (column [3]), and by equity injections, loans, asset purchase, or debt assumptions (column [4]) types of fiscal stimuli (see the middle of Table 9). Lastly, the positive impact of higher sovereign debt ratings on fiscal stimuli in our baseline estimations is related to the significant responses of additional spending or foregone revenues for the non-health sector (column [2]), and of accelerated spending/deferred revenues (column [3]) types of fiscal stimuli (see the bottom of Table 9).

In addition, we explore the presence of possible nonlinearities driven by the initial level of each measure of fiscal space on the various disaggregated types of fiscal stimuli. As shown by Table 10, a favorable effect of a lower public debt-to-GDP on equity injections, loans, asset purchase, or debt assumptions (column [4]) is at work only below a debt ratio estimated around 43% (i.e. a U-shape effect). Besides, a lower debt-to-tax ratio is associated with higher accelerated spending/deferred revenues (column [3]) below a debt-to-tax ratio estimated around 1152% (i.e. a U-shape effect), and with higher government guarantees (column [5]) above a threshold estimated around 305% (i.e. a bell-shape effect). In addition, the favorable effect of higher sovereign debt ratings on additional spending or foregone revenue for the non-health sector (column [2]), or accelerated spending/deferred revenues (column [3]) is at work above sovereign ratings thresholds estimated at 6.96 and 8.71 respectively (i.e. a U-shape effect),

and below a sovereign debt ratings threshold estimated at 12.99 (i.e. a bell-shape effect) on government guarantees (column [5]).

Table 10 – Heterogeneity: Nonlinearity with disaggregated types of fiscal stimuli

Nonlinear Disag. fiscal stimuli	[1] HS	[2] NHS	[3] AS/DR	[4] EI/L/AP/DA	[5] GG	[6] QFO
<i>Debt-to-GDP</i> (log)	0.0983 (0.6984)	-1.2428 (4.2772)	-10.7147 (8.5474)	-8.3691*** (1.9110)	4.9897 (3.4273)	-1.4426 (6.3509)
<i>Debt-to-GDP</i> (log) <i>squared</i>	-0.0199 (0.0917)	0.2694 (0.5813)	1.2014 (1.0335)	1.1110*** (0.2866)	-0.6532 (0.4967)	0.2751 (0.8102)
Main Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	91	91	44	55	56	24
Nonlinear Disag. fiscal stimuli	[1] HS	[2] NHS	[3] AS/DR	[4] EI/L/AP/DA	[5] GG	[6] QFO
<i>Debt-to-tax</i> (log)	0.6635 (0.4908)	0.5477 (3.8319)	-7.1336* (3.7466)	-2.3831 (1.5130)	4.2743** (1.9048)	3.4435 (2.2217)
<i>Debt-to-tax</i> (log) <i>squared</i>	-0.0638* (0.0363)	-0.0789 (0.2949)	0.5060* (0.2850)	0.1703 (0.1285)	-0.3737** (0.1453)	-0.2753 (0.1609)
Main Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	91	91	44	55	56	24
Nonlinear Disag. fiscal stimuli	[1] HS	[2] NHS	[3] AS/DR	[4] EI/L/AP/DA	[5] GG	[6] QFO
<i>Sovereign debt ratings</i>	-0.0056 (0.0469)	-0.4717* (0.2750)	-0.4614* (0.2416)	-0.1555 (0.1266)	0.8732*** (0.3082)	-0.2997 (0.3851)
<i>Sovereign debt ratings squared</i>	0.0005 (0.0019)	0.0339** (0.0136)	0.0265** (0.0120)	0.0075 (0.0053)	-0.0336** (0.0141)	0.0162 (0.0152)
Main Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	91	91	44	55	56	24

Note: Columns [1]-[6] include respectively additional spending or foregone revenues for the health sector (% GDP), additional spending or foregone revenues for the non-health sector (% GDP), accelerated spending / deferred revenues (% GDP), equity injections, loans, asset purchase, or debt assumptions (% GDP), government guarantees (% GDP), and quasi-fiscal operations (% GDP). Unreported constant included. Robust standard errors in brackets. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The results from the linear and nonlinear estimations of the impact of the different measures of fiscal space on the various types of fiscal stimuli—summarized in [Table 11](#)—provide insights on the channels that drive our findings. First, consistent with the lack of a significant effect for aggregated fiscal stimuli, the public debt-to-GDP ratio is never a significant determinant of disaggregated fiscal stimuli, except for a favorable effect of lower debt on equity injections, loans, asset purchase or debt assumptions (column [3]) but only for low enough debt ratios—roughly for 40% of observations.

Second, the aggregated effect of the debt-to-tax ratio is supported by its favorable impact on most types of fiscal stimuli. Lower debt-to-tax ratios significantly improve (i) at all debt-to-tax levels the equity injections, loans, asset purchase, or debt assumptions (EI/L/AP/DA, column [4]), and—even in an accelerated way—the additional spending or foregone revenues for the health sector (HS, column [1]); and (ii) for most debt-to-tax levels, namely for roughly 98% of observations, the accelerated spending/deferred revenues (AS/DR, column [3]), and for roughly 41% of observations for government guarantees (GG, column [5]).

Finally, the robust impact of higher sovereign debt ratings on aggregated fiscal stimuli is

explained by its favorable effect at most ratings levels on additional spending or foregone revenues for the non-health sector (NHS, column [2]), namely for roughly 86% of observations; on accelerated spending/deferred revenues (AS/DR, column [3]) for roughly 70% of observations; and on government guarantees (GG, column [5]) for roughly 46% of observations.

Table 11 – Heterogeneity: A summary for disaggregated types of fiscal stimuli

Disaggregated fiscal stimuli	[1] HS	[2] NHS	[3] AS/DR	[4] EI/L/AP/DA	[5] GG	[6] QFO
<i>Debt-to-GDP</i> (log)	ns	ns	ns	U-shape	ns	ns
Threshold	—	—	—	43%	—	—
Higher FSpace → Higher FStimuli	—	—	—	below 43%	—	—
% Observations	—	—	—	40%	—	—
Disaggregated fiscal stimuli	[1] HS	[2] NHS	[3] AS/DR	[4] EI/L/AP/DA	[5] GG	[6] QFO
<i>Debt-to-tax</i> (log)	acceleration	ns	U-shape	negative	bell-shape	ns
Threshold	—	—	1152%	—	305%	—
Higher FSpace → Higher FStimuli	always	—	below 1152%	always	above 305%	—
% Observations	all	—	98%	all	41%	—
Disaggregated fiscal stimuli	[1] HS	[2] NHS	[3] AS/DR	[4] EI/L/AP/DA	[5] GG	[6] QFO
<i>Sovereign debt ratings</i>	ns	U-shape	U-shape	ns	bell-shape	ns
Threshold	—	6.96	8.71	—	12.99	—
Higher FSpace → Higher FStimuli	—	above 6.96	above 8.71	—	below 12.99	—
% Observations	—	86%	70%	—	46%	—

ns=not significant.

We can summarize our findings for disaggregated types of fiscal stimuli as follows:

(i) a higher fiscal space—signaled by lower debt-to-tax ratios or higher sovereign debt ratings—was a significant determinant on average of *accelerated spending/deferred revenues* at all debt-to-tax levels (except one country) and most sovereign debt ratings levels (for example, this was the case for e.g. Canada, the UK, or the US, with reversed effects due to too low ratings for e.g. Argentina, Greece, or Tunisia);

(ii) countries with lower debt-to-tax ratios were on average—irrespective of the debt-to-tax level—capable of significantly increasing their *additional spending or foregone revenues for the health sector*, and their *equity injections, loans, asset purchase, or debt assumptions*;

(iii) countries with higher sovereign debt ratings were on average—in most cases—capable of significantly increasing their *additional spending or foregone revenues for the non-health sector* (for example, this was the case for e.g. Australia, France, or New Zealand, with reversed effects due to too low ratings for e.g. Gabon, Moldova, or Zambia); and

(iv) a higher fiscal space allowed to significantly increase *government guarantees* only when debt-to-taxes were high enough (around 41% of observations; for example, for e.g. Belgium, Spain, or Portugal) and when sovereign debt ratings were low enough (around 46% of observations; for example, for Honduras, Senegal, or Turkey).

However, this *unfavorable* effect of a higher fiscal space on government guarantees for *most countries* does not alter our main results: as illustrated by estimations reported in the robustness (see Table A2 in the Appendix) and heterogeneity sections (see Table A4 in the Appendix and Table 7), our findings still hold when *excluding government guarantees* from the accoun-

tancy of the aggregated measure of fiscal stimuli.

6 Concluding remarks

In response to the dramatic consequences of the Covid-19 *Great Lockdown* crisis, many countries around the world implemented fiscal stimuli. Capitalizing on the literature emphasizing the benefits of fiscal space for fiscal policy in times of crises, this paper investigated the role of the pre-Covid fiscal space as a determinant of national Covid-related fiscal stimuli.

Estimations performed on a large sample of 125 countries revealed the following. First, whether pre-Covid fiscal space was a significant determinant of fiscal stimuli varies with the precise measure of fiscal space. On the one hand, Governments seem to have neglected—by and large—their indebtedness levels when having decided the amount of their national fiscal stimuli. On the other hand, however, the degree to which public debt is backed up by fiscal revenues, and particularly the ratings of their sovereign debts were found to be significant predictors of the magnitude of national fiscal stimuli, a result that survived several robustness tests (e.g. when adding various control variables, excluding various groups of countries, or controlling for outliers). Second, these results are found to vary with respect to the level of economic development, and the precise type of fiscal stimulus. Regarding the latter, a higher fiscal space measured by lower debt-to-tax ratios or higher sovereign debt ratings was found to affect both accelerated spending/deferred revenues and government guarantees types of fiscal stimuli.

Consequently, we see several takeaways of our analysis. While our findings confirm in a larger panel of countries the disconnection between public debt-to-GDP and fiscal stimuli illustrated by [Benmelech and Tzur-Ilan \(2020\)](#), we equally provide robust support for fiscal space as a key determinant of the size of Covid-related fiscal stimuli: countries with lower debt-to-tax ratios or higher sovereign ratings are on average significantly more capable of implementing larger fiscal packages to fight the detrimental consequences of the Covid crisis. Next, the size of fiscal stimuli was significantly larger in developing countries with lower pre-Covid debt-to-tax ratios or higher sovereign debt ratings; however, the magnitude of the favorable effect of higher sovereign debt ratings was—in absolute terms—twice higher in developed countries compared with developing countries. Lastly, having a larger fiscal space was found to unevenly support the various types of national fiscal stimuli.

These various types of conditionality in the favorable effect of fiscal space on Governments' national fiscal stimuli require future work on the determinants of fiscal stimuli (including the various dimensions of fiscal space) in a more dynamic setup that may exploit data from the following periods, should—against the *strong* desire of the authors of this study—such Covid-related fiscal stimuli still prove necessary in the future.

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APPENDIX

Table A1 – Descriptive statistics of major variables

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Fiscal stimuli (% GDP)	125	7.0214	6.2591	0.0000	25.9096
Public debt (%GDP) in log	124	3.8699	0.7174	-1.3155	5.1885
Public debt (%GDP)	124	56.7739	29.8841	0.2684	179.2009
Public debt (% tax revenues) in log	123	5.6736	0.8392	0.7259	8.4150
Public debt (% tax revenues)	123	402.6337	489.7068	2.0666	4514.0840
Sovereign debt ratings	125	11.6196	5.1314	2.0575	21
Additional spending or foregone revenues for health sector (%GDP)	107	0.6514	0.5873	0.0359	3.9059
Additional spending or foregone revenues for non-health sector (%GDP)	107	3.5117	3.2378	0.0000	19.1857
Accelerated spending / deferred revenue (%GDP)	51	1.6094	1.8748	0.0000	7.8782
Equity injections, loans, asset purchase or debt assumptions (%GDP)	63	0.7397	0.9386	0.0000	4.7050
Government guarantees (%GDP)	64	3.6797	3.9044	0.0000	16.5153
Quasi-fiscal operations (%GDP)	28	1.2594	1.6005	0.0000	6.5789
Infection fatality rate (IFR)	120	3.5409	3.2960	0.0813	17.3023
GDP per capita (log)	116	9.0189	1.2930	6.1379	11.6039
Population density (log)	116	4.2013	1.3875	0.5037	8.7603
Index of Democratization	121	15.0763	10.8916	0.0000	39.4048
Inflation	118	13.0710	19.4301	1.1066	112.7968

Table A2 – Alternative definition of fiscal stimuli: Without Government Guarantees

Fiscal stimuli w/o Gov. Guarantees (% GDP)	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
<i>Debt-to-tax</i> (log)	-0.3299 (0.5583)	0.0431 (0.7616)	0.0956 (0.7512)	0.0138 (0.7808)	0.0001 (0.7585)	0.0545 (0.7775)	0.2958 (0.7829)	0.0725 (0.7472)	0.0939 (0.7579)	0.2932 (1.0093)	-0.2736 (0.8454)	-0.1781 (0.7767)
Main Controls	No	Yes										
Additional Controls	No	Yes	No	No	No							
Altering the Sample	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Observations	124	107	107	104	107	107	102	104	107	92	97	94
Fiscal stimuli w/o Gov. Guarantees (% GDP)	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[11]	[12]	[13]
<i>Debt-to-tax</i> (log)	-1.8006*** (0.4666)	-1.4843** (0.6070)	-1.3941** (0.6214)	-1.5060** (0.6122)	-1.3267** (0.6158)	-1.4852** (0.6408)	-1.2714** (0.6221)	-1.3982** (0.5944)	-1.4170** (0.6266)	-1.5881** (0.6990)	-1.3081 (0.8114)	-1.7097*** (0.6283)
Main Controls	No	Yes										
Additional Controls	No	Yes	No	No	No							
Altering the Sample	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Observations	123	107	107	104	107	107	102	104	107	92	97	94
Fiscal stimuli w/o Gov. Guarantees (% GDP)	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[11]	[12]	[13]
<i>Debt ratings</i>	0.4996*** (0.0743)	0.4581*** (0.1137)	0.4281*** (0.1080)	0.4891*** (0.1138)	0.4602*** (0.1098)	0.4578*** (0.1129)	0.4356*** (0.1138)	0.4489*** (0.1096)	0.4463*** (0.1189)	0.5152*** (0.1257)	0.4985*** (0.1239)	0.4583*** (0.1174)
Main Controls	No	Yes										
Additional Controls	No	Yes	No	No	No							
Altering the Sample	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Observations	125	107	107	104	107	107	102	104	107	92	97	94

Note: The *main controls* are those from Table 2. The *additional controls* are those from Table 3 in the same order. The *altering of the sample* is the one from Table 4 in the same order. Unreported constant included. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table A3 – Accounting for country outliers: Germany, Italy, and Japan

Fiscal stimuli (% GDP)	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
<i>Debt-to-GDP (log)</i>	1.4687 (1.3610)	1.6548 (1.4435)	1.6662 (1.4016)	1.6492 (1.4804)	1.3461 (1.2384)	1.6334 (1.4636)	1.9841 (1.4569)	1.7600 (1.4644)	1.7042 (1.4393)	1.8524 (1.9089)	1.5019 (1.6133)	1.3402 (1.4879)
Main Controls	No	Yes										
Additional Controls	No	Yes	No	No	No							
Altering the Sample	No	Yes	Yes	Yes								
Observations	127	110	110	107	110	110	105	107	110	93	100	97

Fiscal stimuli (% GDP)	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
<i>Debt-to-tax (log)</i>	-1.5674** (0.8644)	-0.3007 (1.1535)	-0.2237 (1.1555)	-0.3031 (1.1821)	-0.0255 (1.1316)	-0.3563 (1.1914)	0.0419 (1.1691)	-0.1100 (1.1604)	-0.2091 (1.1850)	-0.7549 (1.3730)	0.2553 (1.4491)	-0.6060 (1.1693)
Main Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
Altering the Sample	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Observations	126	110	110	107	110	110	105	107	110	93	100	97

Fiscal stimuli (% GDP)	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
<i>Debt ratings</i>	0.9237*** (0.1158)	0.5963*** (0.1658)	0.5754*** (0.1783)	0.6267*** (0.1687)	0.5965*** (0.1642)	0.6052*** (0.1684)	0.5756*** (0.1673)	0.5767*** (0.1570)	0.5862*** (0.1707)	0.6695*** (0.1308)	0.6423*** (0.1837)	0.5858*** (0.1737)
Main Controls	No	Yes										
Additional Controls	No	Yes	No	No	No							
Altering the Sample	No	Yes	Yes	Yes								
Observations	128	110	110	107	110	110	105	107	110	93	100	97

Note: The *main controls* are those from Table 2. The *additional controls* are those from Table 3 in the same order. The *altering of the sample* is the one from Table 4 in the same order. Unreported constant included. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table A4 – Accounting for non-linearity: Without Government Guarantees

Fiscal stimuli w/o Gov. Guar. (% GDP)	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	
<i>Debt-to-GDP (log)</i>		-1.8654*** (0.5358)	-0.8810 (5.1567)	-2.3489 (5.2167)	-0.6638 (5.1806)	0.2459 (4.9424)	-1.1919 (5.4316)	-3.4654 (5.3215)	-1.0209 (5.2010)	-0.9110 (5.1203)	-2.9502 (9.9163)	-1.0213 (5.6664)	0.1008 (5.1593)
<i>Debt-to-GDP (log) squared</i>		0.2820 (0.1741)	0.1221 (0.7092)	0.3232 (0.7172)	0.0895 (0.7113)	-0.0325 (0.6834)	0.1648 (0.7576)	0.5016 (0.7362)	0.1445 (0.7140)	0.1328 (0.7015)	0.4252 (1.3372)	0.0981 (0.7740)	-0.0370 (0.7103)
Main Controls		No	Yes										
Additional Controls		No	Yes	No	No	No							
Altering the Sample		No	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Observations		124	107	107	104	107	107	102	104	107	92	97	94

Fiscal stimuli w/o Gov. Guar. (% GDP)	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	
<i>Debt-to-tax (log)</i>		-0.7635 (0.7459)	-0.6461 (4.1554)	-1.7167 (4.2471)	-0.7313 (4.2373)	-0.6839 (4.2822)	-0.4866 (4.3260)	-1.1963 (4.4349)	-0.2702 (4.1306)	-0.9202 (4.3277)	-2.0226 (5.7286)	-0.7570 (6.5266)	-0.7505 (4.2172)
<i>Debt-to-tax (log) squared</i>		-0.1021 (0.0847)	-0.0713 (0.3228)	0.0275 (0.3294)	-0.0658 (0.3286)	-0.0547 (0.3302)	-0.0854 (0.3461)	-0.0064 (0.3438)	-0.0958 (0.3229)	-0.0423 (0.3373)	0.0362 (0.4359)	-0.0489 (0.5623)	-0.0816 (0.3285)
Main Controls		No	Yes										
Additional Controls		No	Yes	No	No	No							
Altering the Sample		No	Yes	Yes	Yes								
Observations		123	107	107	104	107	107	102	104	107	92	97	94

Fiscal stimuli w/o Gov. Guar. (% GDP)	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[11]	[12]	[13]	
<i>Sovereign debt ratings</i>		-0.3236 (0.3358)	-0.1862 (0.4059)	-0.2080 (0.3952)	-0.1241 (0.4403)	-0.5789* (0.3244)	-0.1898 (0.4083)	-0.2157 (0.4105)	-0.1117 (0.4253)	-0.2925 (0.3956)	-0.2255 (0.5089)	-0.4924 (0.3911)	0.0050 (0.5006)
<i>Sovereign debt ratings squared</i>		0.0345** (0.0135)	0.0273 (0.0177)	0.0259 (0.0177)	0.0250 (0.0197)	0.0433*** (0.0148)	0.0274 (0.0178)	0.0275 (0.0180)	0.0240 (0.0183)	0.0305* (0.0172)	0.0317 (0.0226)	0.0412** (0.0163)	0.0196 (0.0219)
Main Controls		No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls		No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
Altering the Sample		No	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Observations		128	110	110	107	110	110	105	107	110	93	100	97

Note: The *main controls* are those from Table 2. The *additional controls* are those from Table 3 in the same order. The *altering of the sample* is the one from Table 4 in the same order. Unreported constant included. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Sources, and definitions of the data

Fiscal stimuli (% GDP): COVID-19 total fiscal measures over GDP (until September 11, 2020). *Source*: IMF(2020)

Additional spending or foregone revenues for the non-health sector (%GDP) (until September 11, 2020): detail definition—see IMF’s database of fiscal policy responses to COVID-19. *Source*: IMF (2020)

Additional spending or foregone revenues for health sector (%GDP) (until September 11, 2020): detail definition—see IMF’s database of fiscal policy responses to COVID-19. *Source*: IMF(2020)

Accelerated spending/deferred revenues (%GDP) (until September 11, 2020): detail definition—see IMF’s database of fiscal policy responses to COVID-19. *Source*: IMF (2020)

Equity injections, loans, asset purchase, or debt assumptions (%GDP) (until September 11, 2020): detail definition—see IMF’s database of fiscal policy responses to COVID-19. *Source*: IMF (2020)

Government guarantees (%GDP) (until September 11, 2020): detail definition—see IMF’s database of fiscal policy responses to COVID-19. *Source*: IMF (2020)

Quasi-fiscal operations (%GDP) (until September 11, 2020): detail definition—see IMF’s database of fiscal policy responses to COVID-19. *Source*: IMF (2020)

Public debt (%GDP): Public debt over GDP. It is measured before the Covid-19 crisis. *Source*: [Kose et al. \(2017\)](#)

Public debt (% tax): Public debt over average tax revenues. It is measured before the Covid-19 crisis. *Source*: [Kose et al. \(2017\)](#)

Sovereign debt ratings: Foreign currency long-term sovereign debt ratings. It is measured before the Covid-19 crisis. *Source*: [Kose et al. \(2017\)](#)

Infection fatality rate (IFR): Infection fatality rate (until September 11, 2020). *Source*: Authors’ calculations based on [Max Roser and Hasell \(2020\)](#)

GDP per capita (log): logarithm of GDP per capita. It is measured before the Covid-19 crisis. *Source*: World Development Indicators (WDI)

Population density (log): logarithm of population density (people per sq. km of land area). It is measured before the Covid-19 crisis. *Source*: WDI

Index of democratization: index of democratization. It is measured before the Covid-19 crisis. *Source*: [Teorell et al. \(2020\)](#)

Inflation: inflation, average consumer prices (Percent change). It is measured before the Covid-19 crisis. *Source*: WDI

Fixed exchange rate: dummy variable equal to 1 if a country is classified as having a fixed exchange rate regime, and 0 otherwise. It is measured before the Covid-19 crisis. *Source*: [Ilzetzki et al. \(2017\)](#)

Stringency index: this is a composite measure based on nine response indicators (until September 11, 2020) including school closures, workplace closures, and travel bans, re-scaled to a value from 0 to 100 (100 = strictest). If policies vary at the sub-national level, the index is

shown as the response level of the strictest sub-region. *Source*: [Max Roser and Hasell \(2020\)](#)

Aged 65 older: People aged 65 years or older (until September 11, 2020). *Source*: [Max Roser and Hasell \(2020\)](#)

General government total expenditure (%GDP): general government total expenditure (%GDP). Total expenditure consists of total expense and the net acquisition of nonfinancial assets. It is measured before the Covid-19 crisis. *Source*: IMF World Economic Outlook

Government Fractionalization Index: government fractionalization index. It is measured before the Covid-19 crisis. *Source*: Database of Political Institutions (DPI)

Election years: presidential or legislative Election held. It is measured before the Covid-19 crisis. *Source*: DPI

Fiscal rules: dummy variable equal to 1 if a country had in place a numerical limit on fiscal aggregates (expenditure, revenue, budget balance, debt) and 0 otherwise. It is measured before the Covid-19 crisis. *Source*: IMF Fiscal Rules Dataset