The Cyclical Behaviour of Fiscal Policy During the Covid-19 Crisis

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Abstract

This paper analyses the cyclicality of fiscal policy (discretionary versus automatic) for 28 advanced economies over 1995-2021 by paying special attention to the Covid-19 crisis. We find evidence that discretionary fiscal policy during the Covid-19 crisis (2020-2021) was significantly more countercyclical than before – in particular in the Eurozone. We do not find comparable evidence for more counter-cyclicality during the financial crisis or Euro crisis, which lends support to the argument that discretionary fiscal policy responded especially forceful to stabilise the economy during the Covid-19 crisis. Furthermore, automatic fiscal stabilisers contributed significantly to counter-cyclical stabilisation, although their performance over 2020-2021 was more in line with the past than for discretionary fiscal policy. Overall, fiscal policy in non-Eurozone advanced countries is more countercyclical than in the Eurozone. However, the cyclicality varies markedly across countries. Our findings shed light on how the cyclical behaviour of fiscal policy varies across countries and time.

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1. Introduction

Fiscal policies were at the forefront of responding to the economic repercussions of the Covid-19 crisis (e.g. Gourinchas et al. 2021; Deb et al. 2021). Given the pace and magnitude of the economic downturn due to the impact of the spread of Covid-19, governments relied on fiscal policy for macroeconomic stabilisation, as central banks in advanced economies were constrained by the zero lower bound while firms and households were in special need of support (e.g. IMF 2021; Carvalho et al. 2021). What can we say about the behaviour of fiscal policy during the Covid-19 crisis in the context of broader business cycle developments? Although most economists would advise policy-makers to pursue a countercyclical fiscal policy stance, previous studies have uncovered evidence of procyclical fiscal policy prior to the Covid-19 crisis. Despite the finding that the procyclicality is typically more pronounced in developing countries (e.g. Thornton 2008; Alesina et al. 2008; Bergman and Hutchison 2020), there is also some evidence for procyclicality in advanced economies, especially for countries in Europe (e.g. Candelon et al. 2010; Larch et al. 2021; Gootjes and de Haan 2022). The results reported in the literature, however, suggest that the cyclicality of fiscal policy may vary over time (e.g. Gali and Perotti 2003; Benetrix and Lane 2013).

This paper poses the question whether the cyclical performance of fiscal policy during the Covid-19 crisis in advanced economies was indeed different from the past. What can we learn from distinguishing the behaviour of discretionary fiscal policy (active changes in taxes and spending by government) from automatic fiscal stabilisers (endogenous changes of tax revenue and spending given variation in economic activity due to the nature of the underlying fiscal systems)? The paper contributes to the literature by providing the first estimates with ex-post data on the cyclical behaviour of discretionary fiscal policy and automatic stabilisers during the Covid-19 crisis (2020-2021) compared to previous episodes with a data set covering 28 advanced countries over the time period 1995-2021.

We tackle endogeneity issues between (discretionary) fiscal policy and cyclical conditions by using a two-stage instrumental variable estimator, where output gaps are instrumented by the lag of the country's own output gap as well as the contemporaneous value of the US output gap (e.g. Gali and Perotti 2003; Fatas and Mihov 2010). As a robustness check, we provide system-

GMM estimates based on internal instruments (Blundell and Bond 1998). We find empirical support for the argument that discretionary fiscal policy was, on average, significantly more counter-cyclical during the Covid-19 crisis than in the past – both in the Eurozone and in non-Eurozone advanced countries; however, the evidence is even stronger for the Eurozone sample. Overall, automatic fiscal stabilisers show an endogenous counter-cyclical response in all countries, but their cyclicality during 2020-2021 was typically more in line with the past than for discretionary fiscal policy. Furthermore, country-by-country regressions reveal that the cyclicality of both discretionary fiscal policy and automatic stabilisers varies markedly across countries.

The rest of the paper is structured as follows. Section 2 contextualises the paper based on a survey of the literature on the cyclicality of fiscal policy. Section 3 explains the data set and the econometric approach. Section 4 presents the panel regression results. Section 5 shows the country-by-country regressions. Section 6 discusses the results and concludes.

2. Literature survey

Analysing the cyclical behaviour of fiscal policy requires us to make a conceptual distinction between discretionary fiscal policy and automatic fiscal stabilisers. While discretionary fiscal action is about active changes in taxes and/or spending in order to reach specific policy goals, automatic stabilisers arise endogenously from parts of the fiscal system as changes in the business cycle lead to variation in tax revenue and spending (e.g. Fatas and Mihov 2012; Paulus and Tasseva 2020).

There is little disagreement among economists that discretionary fiscal policy should avoid procyclicality. In Keynesian theory, fiscal policy stabilises the economy countercyclically by being expansionary in recessions and restrictive in booms. While the standard IS-LM model provides the general intuition (e.g. Blanchard 2020), recent New-Keynesian DSGE models have validated in a dynamic setting under optimisation behaviour of households and firms that fiscal policy should better avoid pro-cyclicality (e.g. Fernandez et al. 2021). In neoclassical tax-smoothing models, fiscal policy is supposed to remain neutral over the business cycle, which also requires policy-makers to avoid procyclicality (e.g. Aiyagari et al. 2002).

There is also little disagreement among economists that automatic fiscal stabilisers should be allowed to operate freely. The features of automatic stabilisers are countercyclical: some tax revenue components (e.g. personal income taxes and corporate income taxes) grow as the economy booms and fall in a downturn, so that the fiscal deficit moves countercyclically by rising during a slump and falling during a boom. Similarly, unemployment spending moves in reverse to cyclical swings as it increases in a slump and falls in an upturn. However, empirical research points out that the size of automatic fiscal stabilisers differs markedly across countries and may also vary within individual countries over time as fiscal systems evolve (e.g. Mourre et al. 2019; Maravalle and Rawdanowicz 2020). Countries with larger governments typically have stronger automatic fiscal stabilisers (and vice versa), i.e. fiscal systems with more automatic features of countercyclicality (e.g. Fatas and Mihov 2001; Cottarelli and Fedelino 2010). Automatic stabilisers for countries with larger governments, therefore, provide benefits in terms of macroeconomic stabilisation. However, the literature points to potential costs of automatic stabilisers in terms of losses in efficiency (e.g. Bouabdallah et al. 2020).

How did fiscal policy perform during the Covid-19 crisis compared to the past? Existing studies point out that policy-makers in advanced economies relied heavily on fiscal policy for macroeconomic stabilisation purposes (e.g. IMF 2021; Gourinchas et al. 2021; Deb et al. 2021; Carvalho et al. 2021). However, they highlight that fiscal policy in some advanced economies during past crises exhibited pro-cyclical instead of counter-cyclical behaviour. Does "this time is different" (Reinhart and Rogoff 2009) hold with regard to the cyclicality of fiscal policy during Covid-19 crisis when we consider the severity of the downturn? This paper is the first to provide estimates on the cyclicality of discretionary fiscal policy and automatic fiscal stabilisers by including ex-post data on the Covid-19 crisis years 2020-2021 in a data set comprising 28 advanced countries over the period 1995-2021.

3. Empirical approach and data

We estimate the cyclicality of fiscal policy based on the following 'fiscal reaction function' (e.g. Bohn 1998):

$$FP_{i,t} = FP_{i,t-1} + \beta Cycle_{i,t} + \gamma Z_{i,t} + \tau_i + \epsilon_{i,t}. \tag{1}$$

where $FP_{i,t}$ is a measure of fiscal policy in country i and year t; $FP_{i,t-1}$ is its first lag, which we introduce to capture persistence of fiscal policy; $Cycle_{i,t}$ measures cyclical conditions, proxied by the output gap;[1] $Z_{i,t}$ represents a vector of additional control variables, which will be specified in more detail below; τ_i captures country-fixed effects to account for immeasurable and time-invariant country-specific factors that may influence the response of fiscal policy to the business cycle, which implies that we focus on within-country time-series variation of the fiscal outcomes; and $\epsilon_{i,t}$ is the error term. To test whether the Covid-19 crisis affected the cyclicality of fiscal policy, we will at a later stage include an interaction term of the output gap with a dummy variable for the Covid-19 crisis years 2020-2021 ($Cycle * Covid$) in equation 1.

To measure discretionary fiscal policy and automatic fiscal stabilisers, we use the cyclically-adjusted primary fiscal deficit and the cyclical component of the fiscal deficit, respectively. The primary deficit excludes interest payments, which is a better measure of overall fiscal policy than the headline fiscal deficit because the government does not have direct control over interest costs. By regressing the overall primary fiscal deficit on the output gap, one can obtain useful descriptive insights into the relation between overall fiscal policy and the business cycle, but one cannot identify the reactions of discretionary fiscal policy to cyclical conditions. The reason is that an important component of the primary fiscal deficit relates to the automatic fiscal stabilisers. Addressing this issue requires us to look separately at a discretionary and a cyclical component of the fiscal deficit.

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[1] One strand of literature points to the difficulties in estimating output gaps (e.g. Orphanides and van Norden 2002; Heimberger and Kapeller 2017). While we are aware that measuring cyclical conditions by using output gaps is not an exact science, the model estimates produced by international organisations such as the European Commission and the OECD remain a prominent cycle indicator, which is also essential in assessing the fiscal stance. The data coverage for output gap estimates is very good, which is essential for our task of providing the first estimates concerning the cyclicality of fiscal policy during the Covid-19 crisis based on ex-post data. Future research could provide additional robustness checks by looking at other data vintages or cyclical indicators.

Our preferred measure of the business cycle is the output gap, which captures the difference between actual output and potential output (in % of potential output) to indicate the cyclical position of an economy. An important issue concerns endogeneity: the error term is likely to be positively correlated with the output gap if exogenous fiscal shocks affect both fiscal policy and economic activity. This correlation must be expected to trigger an upward bias in the OLS estimates for the output gap coefficient. The problem can be addressed by running a regression of the cyclically-adjusted primary fiscal deficit on a component of the output gap unaffected by exogenous discretionary fiscal shocks (e.g. Gali and Perotti 2003). To address the endogeneity issue, we use an instrumental variable approach when it comes to estimating the cyclical behaviour of (discretionary) fiscal policy. Our instruments for the output gap are the lag of the country's own output gap as well as the contemporaneous value of the US output gap. This instrument strategy gives us a measure of the "expected output gap". It is based on the assumption that the US output gap does not respond contemporaneously to cyclical developments in other countries, while there is such an impact of US developments on other countries (Fatas and Mihov 2010). Under this assumption, however, we cannot use current foreign gaps to instrument the US output gap. Therefore, we use one lag of the Eurozone output gap as an additional instrument for the US output gap. This instrument strategy has been used before in the literature (Gali and Perotti 2003; von Hagen and Wyplosz 2008; Fatas and Mihov 2010). As a robustness check, we will also look at results based on GMM estimation, where we instrument the fiscal policy variable and the output gap with their own lags (Blundell and Bond 1998).

Notably, we only use instrumental variable estimation when dealing with overall and discretionary fiscal policy, i.e. when either the primary fiscal deficit or the cyclically-adjusted fiscal deficit is the dependent variable in equation (1). We use the actual output gap – not the "expected" output gap based on the instrumental variable approach – when dealing with automatic fiscal stabilisers, i.e. when the cyclical component of the fiscal deficit is the dependent variable in equation (1). This is justified because of the nature of automatic fiscal stabilisers, where changes in cyclical conditions automatically (i.e. endogenously) lead to changes in tax revenue and unemployment spending that drive changes in the fiscal balance. These automatic changes depend on actual rather than expected output gaps (e.g. Gali and Perotti 2003; Fatas and

Mihov 2010).

If fiscal policy is counter-cyclical, the output gap should be signed negatively, which would imply that an increase in the (expected) output gap is related to a fall in the (cyclically-adjusted) primary fiscal deficit. Vice versa, a positive coefficient estimate would point to pro-cyclicality. When it comes to the cyclicality of fiscal policy during the Covid-19 crisis, we would expect the interaction term of the output gap with the Covid-19 dummy for the years 2020-2021 to be negative (and significant) in the case of a more counter-cyclical fiscal policy response than in the past.

We include two additional control variables: $PDebt_{t-1}$ captures the initial (i.e. one-year-lagged) public-debt-to-GDP ratio. This variable is included to test whether higher initial public debt levels affect the fiscal policy stance. The theoretical expectation is that the coefficient estimate for $PDebt_{t-1}$ should be negative (i.e. the primary fiscal deficit falls as the initial debt level increases) to support public debt sustainability (e.g. Bohn 1998; Mauro et al. 2015). $Election$ is a dummy variable that is set to 1 in each federal election year. This is a proxy for the political business cycle, and we include it to control for the possibility that governments run more expansionary fiscal policy during election years to attract voters (e.g. De Jong and Gilbert 2020; Gootjes et al. 2021), which would imply a positive election coefficient.

The data on fiscal policy variables, public-debt-to-GDP ratios, inflation and output gaps for the Eurozone countries were all obtained from the AMECO (May 2022) database of the European Commission; and the data for the non-Eurozone advanced countries were taken from the OECD Economic Outlook (June 2022) database. As a robustness check, we also used output gap estimates from the IMF World Economic Outlook database (April 2022). Data on elections were obtained from various election data sources, including the website electionresources.org. Descriptive statistics (mean, standard deviation, minimum, maximum) are available in the supplementary appendix A.

The data set covers the time period 1995-2021, and it includes 28 advanced countries. 16 countries are Eurozone member states: Austria, Belgium, Cyprus, Germany, Spain, Estonia, Finland, France, Greece, Italy, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Slovakia. The other 12 countries in the sample are OECD countries from outside of the Eurozone: Canada, Czech Republic, Denmark, Hungary, Japan, Poland, South Korea, Switzerland, New Zealand,

Sweden, United Kingdom, United States of America.

We distinguish between Eurozone countries and non-Eurozone advanced countries, because Eurozone countries share a common institutional setup. The institutiona structures are special because a fully-integrated supra-national monetary policy is combined with a comparably much less integrated fiscal policy, where the competences for the latter largely remain in the hands of national fiscal policy-makers. This set-up changes the nature of the public debt issued by individual Eurozone member countries, which makes them more fragile to experiencing government bond sell-offs induced by self-fulfilling market sentiments; and it increases the requirements for fiscal policy coordination among monetary union members (e.g. Bianchi and Mondragon 2022). In the context of the Eurozone, the cyclicality of fiscal policy could differ from other advanced countries, which we are able to test for by focusing the panel regressions on these two sub-samples.

Figure 1
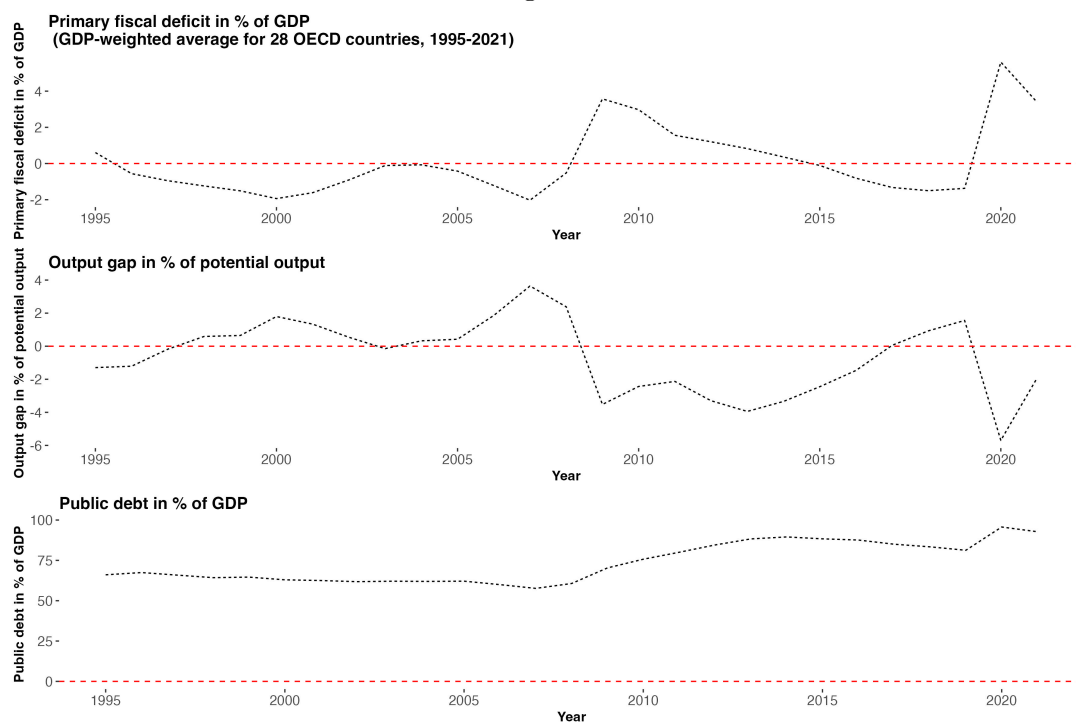
Source: OECD Economic Outlook (June 2022), AMECO (Spring 2022); own calculations.

Figure 1 shows a GDP-weighted average of the primary fiscal deficit, output gap estimates, and public-debt-to-GDP ratios over time. The average primary fiscal deficit for advanced coun-

tries was below 0 before the global financial crisis of 2007/2008, i.e. advanced economies ran primary surpluses. However, the primary fiscal deficits increased with the impact of the financial crisis, and then fell steadily until the Covid-19 crisis hit; the year 2020 again brought a massive increase in deficits. Average output gap estimates suggest economic overheating before the financial crisis, negative output gaps during and after the financial crisis (indicating under-utilisation of economic resources), then again a move towards positive output gaps in 2019, and then large negative output gaps during the Covid-19 crisis years, indicating substantial slack. Furthermore, public-debt-to-GDP ratios slightly declined in the years running up to the financial crisis, increased during the financial crisis and Euro crisis episode, again fell slightly until 2019; and then public debt ratios reached new highs in the context of the Covid-19 crisis. Given the similarity in the mirrored patterns of the primary fiscal deficit and the output gap, endogeneity is an issue: third factors could simultaneously drive changes in the fiscal balance and in the output gap. As we already explained above, we will, therefore, use an instrumental variable approach to estimate the link between (discretionary) fiscal policy and cyclical conditions.

4. Panel regression results

We start by discussing the panel regression results without including the Covid-19 dummy variable and its interaction with cyclical conditions. This will allow us to judge whether the introduction of the Covid-19 variable has an overall impact not only on the cyclicality coefficient but also on the other controls. Table 1 presents the baseline panel-regression results for three different samples: all 28 advanced countries, 16 Eurozone countries, and 12 non-Eurozone advanced countries, respectively. We distinguish estimates for overall fiscal policy (where the primary fiscal deficit, PDEF, is the dependent variable) from those for discretionary fiscal policy (cyclically-adjusted primary fiscal deficit, CAPD) and automatic fiscal stabilisers (cyclical component of the fiscal deficit, CD). When it comes to estimating the cyclicality of (discretionary) fiscal policy, we instrument the output gap by its own lag and the US output gap; on the underlying rationale and assumptions, see the previous section. Test results - which are available in supplementary appendix B - suggest that the instruments are highly correlated with the instrumented variable; weak instrument tests reject that the instruments are weak,

so that we can move forward with the assumption that the instrumental variable approach is sufficiently st rong. Ho wever, it is to be no ted th at we do no t us e IV 2SLS wh en it co mes to automatic stabilisers, since automatic changes to the fiscal deficit depend on actual rather than expected output gaps (e.g. Gali and Perotti 2003; Fatas and Mihov 2010).

Columns (1), (2) and (3) of Table 1 show the regression results with the full country sample for overall fiscal p olicy, d iscretionary fi scal po licy an d au tomatic st abilisers, re spectively. In column (1), the output gap coefficient is negative and statistically si gnificant. This is evidence in support of an overall counter-cyclical fiscal p olicy s tance: as t he expected output g ap increases by 1 percentage point, the primary fiscal d eficit fa lls by 0. 27 pe rcentage po ints. Th e other control variables are signed as expected: when the initial public debt level is higher, countries tend to run smaller primary fiscal d eficits. An d el ection ye ars ar e po sitively as sociated with primary fiscal deficits, although the coefficient is not sign ificant. The big difference in comparing column (2) to column (1) is that the output gap coefficient ha s a sm aller ab solute va lue and loses statistical significance. This s uggests t hat discretionary fiscal policy, on average, is rather a-cyclical in advanced economies. The other two control variables retain the sign from the first model, and the election variable now turns significant. The results in column (3) then show that the counter-cyclicality of fiscal p olicy is d ue t o t he a utomatic fiscal st abilisers. A 1 percentage point increase in the actual output gap is related to a fall in the cyclical component of the fiscal deficit by 0.43 p ercentage points.

In comparing the results for the Eurozone and the non-Eurozone advanced sample, the following findings a re n oteworthy. Discretionary fiscal policy is, on average, si gnificantly counter-cyclical in the non-Eurozone advanced sample, while we cannot reject a-cyclicality for the Eurozone. The counter-cyclicality of automatic stabilisers is, on average, very similar in Eurozone and non-Eurozone advanced countries. In the Eurozone, there seems to be a stronger link between initial public debt levels and (discretionary) fiscal p olicy. F urthermore, t he political budget cycle in the Eurozone seems to be stronger, as elections are significantly associated with higher primary fiscal d eficits fo r the Eu rozone co untries bu t no t for th e OECD sample.

Table 2 then introduces the Covid-19 dummy and its interaction with cyclical conditions. In comparing the findings f or t he f ull c ountry s ample i n T able 1 , w e c onfirm th at hi gher initial public debt levels are significantly related to tighter fiscal policy, and that election years are

Table 1: Baseline results without Covid-19 dummy

Fiscal policy var. Sample Estimator	(1) overall full IV2SLS	(2) discr. full IV2SLS	(3) autom. full OLS	(4) overall Euro IV2SLS	(5) discr. Euro IV2SLS	(6) autom. Euro OLS	(7) overall OECD IV2SLS	(8) discr. OECD IV2SLS	(9) autom. OECD OLS
$PDEF_{t-1}$	0.519*** (0.049)			0.430*** (0.054)			0.631*** (0.084)		
$CAPD_{t-1}$		0.642*** (0.042)			0.578*** (0.051)			0.644*** (0.060)	
CD_{t-1}			0.159*** (0.043)			0.144*** (0.048)			0.166** (0.072)
ogap	−0.274*** (0.067)	−0.058 (0.053)	−0.426*** (0.020)	−0.369*** (0.082)	−0.051 (0.058)	−0.419*** (0.026)	−0.218 (0.134)	−0.166** (0.061)	−0.432*** (0.030)
$PDebt_t-1$	−0.018*** (0.005)	−0.019*** (0.006)	0.002 (0.003)	−0.034*** (0.007)	−0.031*** (0.007)	0.006** (0.003)	−0.009 (0.005)	−0.011* (0.005)	0.0002 (0.001)
election	0.155 (0.102)	0.304** (0.122)	−0.085* (0.047)	0.219 (0.133)	0.443*** (0.141)	−0.114 (0.073)	0.005 (0.151)	0.097 (0.186)	−0.041 (0.055)
Observations	745	745	745	426	426	426	319	319	318
R^2	0.617	0.697	0.832	0.545	0.639	0.866	0.722	0.741	0.750
Adjusted R^2	0.600	0.683	0.825	0.524	0.622	0.860	0.709	0.728	0.738

Notes: All regressions include country-fixed effects, where results are not reported for brevity. Standard errors (clustered at the country level) are given in parentheses. PDEF... primary fiscal deficit (overall fiscal policy); CAPD... cyclically-adjusted primary deficit (discretionary fiscal policy); CD... cyclical component of the fiscal deficit (automatic stabilisers); ogap... output gap; $PDebt_{t-1}$... lagged public-debt-to-GDP; election: dummy for federal elections. *p<0.1; **p<0.05; ***p<0.01

linked with higher primary deficits. Importantly, we find that while the evidence on overall fiscal policy points to counter-cyclicality of fiscal policy in advanced economies, the counter-cyclicality was significantly stronger during the Covid-19 crisis years 2020-2021 – as indicated by the negative and significant interaction term in the Eurozone and the OECD sample, respectively. In separately looking at discretionary fiscal policy and automatic fiscal stabilisers, we find that the countercyclicality in 2020-2021 was significantly stronger in both areas, but the negative coefficients of the interaction terms are much larger for discretionary fiscal policy, indicating stronger additional counter-cyclicality than for automatic stabilisers. However, the econometric evidence suggests that while the counter-cyclical behaviour of automatic stabilisers in the Eurozone during 2020-2021 was similar to the past, automatic stabilisers were somewhat more counter-cyclical during Covid-19 for the non-Eurozone advanced sample.

In a next step, we additionally include dummy variables for two other crisis episodes: the financial crisis of 2008-2009 and the Euro Crisis of 2011-2012 (e.g. Lane 2012; Tooze 2018). We do so to check whether we find similar effects on more counter-cyclicality during these crisis episodes as during the Covid-19 crisis. However, the results reported in Table 3 suggest that this is not the case: while the interaction term of the Covid-19 dummy with the output gap remains negative in all cases (and shows significance in almost all cases), we do not obtain

Table 2: Covid-19 dummy and interaction with (expected) output gap included

Fiscal policy var. Sample Estimator	(1) overall full IV2SLS	(2) discr. full IV2SLS	(3) autom. full OLS	(4) overall Euro IV2SLS	(5) discr. Euro IV2SLS	(6) autom. Euro OLS	(7) overall OECD IV2SLS	(8) discr. OECD IV2SLS	(9) autom. OECD OLS
$PDEF_{t-1}$	0.583*** (0.038)			0.496*** (0.052)			0.674*** (0.050)		
$CAPD_{t-1}$		0.667*** (0.039)			0.605*** (0.047)			0.680*** (0.074)	
CD_{t-1}			0.186*** (0.043)			0.178*** (0.053)			0.182*** (0.059)
ogap	−0.165*** (0.046)	0.002 (0.047)	−0.394*** (0.024)	−0.250*** (0.061)	0.006 (0.053)	−0.393*** (0.030)	−0.110* (0.061)	−0.082* (0.041)	−0.386*** (0.028)
$PDebt_t − 1$	−0.024*** (0.006)	−0.023*** (0.006)	0.001 (0.003)	−0.040*** (0.007)	−0.034*** (0.007)	0.004 (0.003)	−0.014** (0.005)	−0.015*** (0.005)	−0.001 (0.001)
election	0.300** (0.125)	0.399*** (0.131)	−0.062 (0.044)	0.473*** (0.151)	0.601*** (0.148)	−0.079 (0.066)	−0.013 (0.157)	0.086 (0.202)	−0.042 (0.051)
Covid	−0.995 (0.707)	−0.494 (0.629)	0.283 (0.209)	0.008 (0.717)	−0.232 (0.477)	0.339 (0.241)	−1.537 (2.011)	−1.183 (1.515)	0.211 (0.307)
ogap*Covid	−1.120*** (0.201)	−0.691*** (0.170)	−0.130** (0.063)	−0.987*** (0.201)	−0.624*** (0.120)	−0.116 (0.090)	−1.087* (0.590)	−0.875* (0.448)	−0.152*** (0.036)
Observations	745	745	745	426	426	426	319	319	318
R^2	0.694	0.723	0.848	0.662	0.672	0.880	0.766	0.754	0.772
Adjusted R^2	0.680	0.711	0.841	0.644	0.655	0.873	0.753	0.740	0.759

Notes: All regressions include country-fixed effects, where results are not reported for brevity. Standard errors (clustered at the country level) are given in parentheses. PDEF... primary fiscal deficit (overall fiscal policy); CAPD... cyclically-adjusted primary deficit (discretionary fiscal policy); CD... cyclical component of the fiscal deficit (automatic stabilisers); ogap... output gap; $PDebt_{t-1}$... lagged public-debt-to-GDP; election: dummy for federal elections; Covid... dummy variable for Covid-19 crisis (2020-2021). *p<0.1; **p<0.05; ***p<0.01

similar findings for the cyclical behaviour of fiscal policy during the financial crisis or the Euro crisis: the coefficients of interaction terms are typically much smaller in absolute value and mostly lack significance, with the exception of some evidence for more counter-cyclicality in automatic fiscal stabilisers for the Eurozone sample during 2011-2012. These findings suggest that there was indeed something special about the cyclicality of fiscal policy during the Covid-19 crisis compared to the past, including prior crisis episodes.

As an extension, we split the Eurozone sample into core and periphery countries, as previous literature has argued that countries in these two groups may face different fiscal constraints (e.g. Heimberger and Kapeller 2017). The results reported in Table C.1 in supplementary appendix C, however, show that discretionary fiscal policy during the Covid-19 crisis was more counter-cyclical in both Eurozone core and periphery countries.[2] This suggests that – even though countries in these two groups were on different economic and fiscal development paths when the Covid-19 crisis hit (e.g. Gräbner et al. 2020) – the particularly counter-cyclical fiscal

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[2]Eurozone core: Austria, Belgium, Germany, Finland, Netherlands); Eurozone periphery: Spain, Greece, Italy, Portugal.

response over the years 2020-2021 was not restricted to countries with lower public-debt-to-GDP ratios and a better fiscal outlook. The policy decision to deactivate the EU's fiscal rules in the early phase of the Covid-19 crisis of the year 2020 and the coordination with monetary policy-makers at the European central bank, which kept interest rates low and bought large amounts of government bonds on secondary markets to ensure financial market stability (e.g. van 't Klooster 2021), may have contributed to ensuring a more counter-cyclical fiscal policy response in both core and periphery countries.

Table 3: Euro and financial crisis dummies included

Fiscal policy var. Sample Estimator	(1) overall full IV2SLS	(2) discr. full IV2SLS	(3) autom. full OLS	(4) overall Euro IV2SLS	(5) discr. Euro IV2SLS	(6) autom. Euro OLS	(7) overall OECD IV2SLS	(8) discr. OECD IV2SLS	(9) autom. OECD OLS
$PDEF_{t-1}$	0.643*** (0.065)			0.479*** (0.068)			0.284 (0.764)		
$CAPD_{t-1}$		0.681*** (0.055)			0.594*** (0.087)			0.616*** (0.142)	
CD_{t-1}			0.225*** (0.045)			0.219*** (0.060)			0.220*** (0.056)
ogap	−0.294*** (0.069)	−0.001 (0.048)	−0.366*** (0.027)	−0.427*** (0.059)	0.020 (0.068)	−0.365*** (0.035)	−0.120 (0.271)	−0.041 (0.104)	−0.348*** (0.031)
$PDebt_{t-1}$	−0.065*** (0.022)	−0.017 (0.016)	0.001 (0.003)	−0.089*** (0.020)	−0.030 (0.021)	0.004 (0.003)	0.091 (0.183)	0.020 (0.042)	−0.001 (0.001)
election	4.745 (4.076)	3.078 (2.908)	−0.070 (0.043)	0.721 (4.235)	−0.712 (2.816)	−0.097 (0.063)	8.525 (5.293)	4.075 (2.329)	−0.044 (0.050)
FinancialCrisis	1.351*** (0.345)	1.018*** (0.273)	0.515*** (0.076)	1.158** (0.454)	0.965*** (0.327)	0.594*** (0.110)	2.353* (1.374)	1.420*** (0.427)	0.421*** (0.114)
EuroCrisis	0.288 (0.407)	−0.048 (0.394)	0.150** (0.064)	0.265 (0.557)	−0.235 (0.483)	0.144* (0.084)	−0.354 (1.028)	−0.423 (0.574)	0.199* (0.118)
Covid	−0.704 (1.281)	−0.726 (0.968)	0.260 (0.227)	0.985 (0.949)	−0.123 (0.771)	0.318 (0.272)	−3.949 (4.414)	−2.687 (2.421)	0.185 (0.328)
ogap*FinancialCrisis	−0.175 (0.229)	−0.124 (0.146)	−0.015 (0.031)	−0.080 (0.202)	−0.069 (0.168)	−0.006 (0.040)	−0.555 (0.539)	−0.224 (0.249)	−0.057** (0.025)
ogap*EuroCrisis	0.143 (0.136)	0.064 (0.182)	−0.050*** (0.016)	0.075 (0.200)	−0.081 (0.231)	−0.052** (0.022)	−0.223 (0.582)	−0.100 (0.264)	−0.039 (0.064)
ogap*Covid	−1.223*** (0.425)	−0.822** (0.299)	−0.167** (0.073)	−0.821*** (0.275)	−0.571** (0.203)	−0.151 (0.105)	−1.880 (1.204)	−1.376* (0.680)	−0.202*** (0.034)
Observations	745	745	745	426	426	426	318	319	318
R^2	0.148	0.584	0.857	0.568	0.643	0.888	0.087	0.360	0.784
Adjusted R^2	0.104	0.562	0.850	0.541	0.621	0.881	0.022	0.315	0.769

Notes: All regressions include country-fixed effects, where results are not reported for brevity. Standard errors (clustered at the country level) are given in parentheses. PDEF... primary fiscal deficit (overall fiscal policy); CAPD... cyclically-adjusted primary deficit (discretionary fiscal policy); CD... cyclical component of the fiscal deficit (automatic stabilisers); ogap... output gap; $PDebt_{t-1}$... lagged public-debt-to-GDP; election: dummy for federal elections; Covid... dummy variable for Covid-19 crisis (2020-2021); FinancialCrisis... dummy for financial crisis (2008-2009); EuroCrisis... dummy for Euro Crisis (2011-2012). *p<0.1; **p<0.05; ***p<0.01

We conduct two robustness checks with regard to our instrumental variable approach. First, we use an IV2SLS approach in which we consider that the US output gap may affect other countries' output gaps by interacting with country-specific characteristics. In particular, we

now instrument the output gap by the country's own lagged output gap (as before) and the US output gap interacted with the size of government, where the latter is proxied by the tax-revenue-to-GDP ratio. The idea is that countries with larger governments may be affected differently by cyclical conditions in the US compared to countries with smaller governments. However, as Table D.1 in supplementary appendix D shows, our results prove robust when we conduct this variation in the instruments of the IV2SLS approach. Second, Arellano and Bover (1995) argue that a GMM estimator might perform better than our preferred IV2SLS-estimator in the case of dynamic panel models. Although the relative properties of the IV and GMM estimators remain debatable in the econometric literature (e.g. Harris and Matyas 2004), we also ran GMM estimations as a robustness check. System-GMM is potentially less affected by the weak instrument problem than difference-GMM; prior studies point to the preference of system-GMM in the context of fiscal reaction functions with persistent data (e.g. Celasun and Kang 2006; Golinelli and Momigliano 2009; Bernoth et al. 2015). Therefore, we provide results based on a one-step system-GMM approach (Blundell and Bond 1998), where we use the t-2 and t-3 lags of the fiscal policy variable and the output gap as instruments. The GMM results again confirm our main findings. Discretionary fiscal policy was significantly more counter-cyclical during the Covid-19 crisis, which increases our confidence that the results are robust to using different approaches in addressing endogeneity issues. Detailed GMM results are available in Table D.2 of supplementary appendix D.

5. The cyclicality of fiscal policy in individual advanced countries

The panel regression results so far have focused on the average cyclicality of fiscal policy in Eurozone and non-Eurozone advanced countries, respectively, and how the Covid-19 crisis impacted the cyclical behaviour of fiscal policy. In what follows, we analyse fiscal cyclicality in individual countries. We do so by providing country-by-country regressions based on the following equation:

$$FP_t = \beta Cycle_t + \gamma Z_t + \epsilon_t \tag{2}$$

where all the variables are defined as above (FP... fiscal policy; $Cycle$: cyclical conditions captured by the output gap; Z: vector of additional controls including lagged public-debt-to-GDP and an election dummy; ϵ: error term). The index t relates to the observation in year t. At a later stage, we will again include an interaction term of cyclical conditions with the Covid-19 dummy for 2020-2021.

We start by plotting the cyclicality coefficients for discretionary fiscal policy versus automatic stabilisers separately for all the 28 advanced economies in our sample.[3] Figure 2 shows that the cyclicality of fiscal policy varies strongly across countries. Discretionary fiscal policy is most counter-cyclical in the non-Eurozone advanced countries New Zealand, USA, Canada and Japan, followed by Belgium, the UK, Portugal, Finland and Germany. While discretionary fiscal policy in Estonia and Hungary was even pro-cyclical over 1995-2021, there is evidence for a-cyclicality in countries such as Korea, Italy or Switzerland. Plausibly, we find that automatic fiscal stabilisers operate counter-cyclically in all countries; however, the strength of the counter-cyclicality of automatic stabilisers differs markedly, ranging from 0.61 in Austria, 0.6 in Canada and 0.59 in Belgium to 0.33 in Korea, 0.31 in Slovakia and 0.31 in Lithuania, i.e. the counter-cyclicality of automatic stabilisers in some advanced countries is about twice as strong as in others, with a lot of variation in between. We further find a negative correlation between the cyclicality of automatic stabilisers and the size of government (proxied by tax revenue to GDP): countries with larger governments have more counter-cyclical automatic stabilisers (and vice versa). This is consistent with earlier findings (Fatas and Mihov 2001; Cottarelli and Fedelino 2010). Detailed results are available in supplementary appendix F.

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[3]Supplementary appendix E includes a table with the regression results with standard errors and significance levels.

Figure 2

Fiscal cyclicality (1995-2021): Discretionary fiscal policy vs. automatic stabilisers
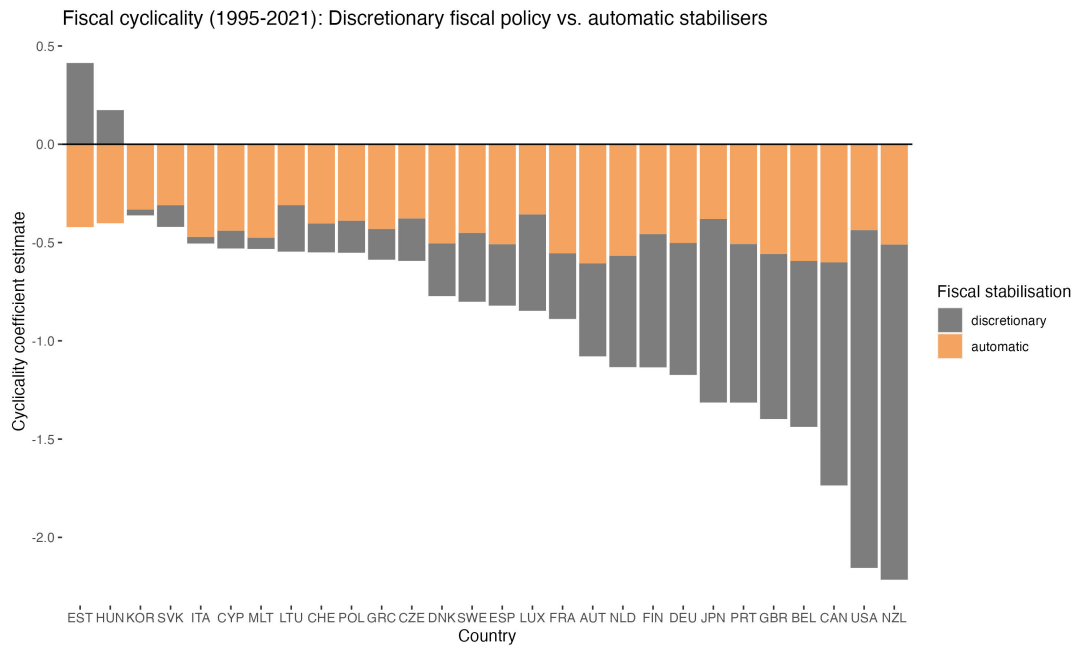
Notes: Own estimations based on equation 2. All regressions include the lagged public-debt-to-GDP ratio and the election dummy, where results are not reported for brevity. More detailed regression results including standard errors are available in supplementary appendix E.

We are also interested in testing whether the impact of the Covid-19 crisis on the cyclicality of fiscal policy differs across countries; therefore, we include a Covid-19 dummy for 2020-2021 in each of the individual-country regressions, and interact this Covid-19 variable with the output gap. The results reported in Table 4 suggest that the interaction of the Covid-19 crisis with fiscal policy varies across countries. For Finland, Lithuania, Denmark, Japan, Poland and Switzerland, we find evidence that discretionary fiscal policy during 2020-2021 was significantly more counter-cyclical than before. For most of the other countries, we cannot reject that the cyclical behaviour of fiscal policy during Covid-19 was similar to the past (e.g. Germany, Italy, USA, New Zealand). And for a small set of countries, our results suggest that fiscal policy during Covid-19 was actually less counter-cyclical than before (Belgium, Greece, Slovakia, Czech Republic).

Furthermore, the results in Table 4 confirm that automatic stabilisers in general operate counter-cyclically in all countries, but to a different extent. In most countries, we cannot reject the hypothesis that the Covid-19 crisis did not have an impact on fiscal cyclicality, but we find significant interaction terms for some countries. In Austria, France, Malta, Portugal,

Canada, Denmark, Japan, Poland, the UK, the US and New Zealand, our results indicate that automatic stabilisers operated significantly more counter-cyclical during 2020-2021. Spain is the only country in which the interaction term turns out positive and significant, indicating a less counter-cyclical role for automatic stabilisers during the Covid-19 crisis.

Table 4: Individual-country regressions (28 advanced economies, 1995-2021), including an interaction of the Covid-19 dummy with cyclical conditions

	Discretionary fiscal policy (IV2SLS)		Automatic stabilisers (OLS)	
Country	ogap	ogap*Covid	ogap	ogap*Covid
AUT	-0.44	0.45	-0.48***	-0.14**
BEL	-0.87**	0.64**	-0.46***	0.01
CYP	-0.11	-0.75	-0.44***	0.04
DEU	-0.98*	-0.33	-0.42***	-0.02
ESP	-0.21	0.60	-0.50***	0.13**
EST	0.47***	-0.82	-0.42***	-0.07
FIN	-0.62***	-1.48***	-0.44***	0.01
FRA	-0.11	0.10	-0.52***	-0.06***
GRC	-0.40***	1.40***	-0.41***	0.04
ITA	0.11	0.07	-0.48***	0.12
LTU	-0.18	-21.62***	-0.31***	-1.69
LUX	-0.43**	-0.33	-0.35***	-0.09
MLT	-0.14	0.38	-0.33***	-0.13*
NLD	-0.55*	0.49	-0.54***	0.03
PRT	-0.71*	0.76	-0.47***	-0.14***
SVK	-0.12	2.34**	-0.31***	-0.04
CAN	-0.99***	-0.04	-0.57***	-0.15***
CZE	-0.10	1.25**	-0.33***	0.03
DNK	-0.33***	-1.25***	-0.50***	-0.09*
HUN	0.26	0.57	-0.34***	-0.18
JPN	-0.97**	-1.39***	-0.35***	-0.10***
POL	-0.08	-2.09***	-0.33***	-0.50***
KOR	0.50	-0.58	-0.32***	-0.11***
CHE	-0.06	-0.21**	-0.40***	-0.05***
SWE	-0.30	-0.22	-0.43***	-0.11***
GBR	-1.02*	0.91	-0.53***	-0.05***
USA	-1.68***	0.37	-0.43***	-0.08***
NZL	-1.48***	1.04	-0.50***	-0.06***

Notes: All regressions include the lagged public-debt-to-GDP ratio and the election dummy as additional controls, where results are not reported for brevity. ogap... output gap; Covid... Covid-19 crisis dummy variable (2020-2021). The regressions for discretionary fiscal policy use the cyclically-adjusted primary fiscal deficit as the dependent variable, and the regression for automatic stabilisers use the cyclical component of the fiscal deficit. Standard errors are robust against heteroskedasticity and auto-correlation. $^*p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

6. Discussion and conclusions

This paper has analysed the cyclical behaviour of fiscal policy in advanced economies over 1995-2021 with special consideration of the impact of the Covid-19 crisis (2020-2021). By using a panel-regression analysis, we find support for the argument that discretionary fiscal policy was, on average, significantly more counter-cyclical during the Covid-19 crisis than in the past, including other crisis episodes such as the financial crisis (2008-2009) and the Euro crisis (2011-

2012). While this holds true for both Eurozone and non-Eurozone advanced countries, the evidence is particularly stark for the Eurozone: in both core and periphery countries, fiscal policy was more counter-cyyclical during 2020-2021 than before. Furthermore, we show that automatic fiscal stabilisers operate counter-cyclically, but their performance during 2020-2021 was typically more in line with the past than for discretionary fiscal policy. Furthermore, the cyclical behaviour of fiscal policy varies markedly across countries: discretionary fiscal policy is most counter-cyclical in New Zealand, the US and Canada; and leans most towards pro-cyclicality in Estonia, Hungary and Korea. For several advanced countries, the country-by-country regression results confirm that fiscal policy was significantly more counter-cyclical during the Covid-19 crisis. For others, we cannot reject that the cyclical behaviour of fiscal policy matched past performance.

To our best knowledge, this is the first paper to provide estimates on the cyclicality of fiscal policy by considering ex-post data for the Covid-19 crisis years 2020 and 2021 while distinguishing discretionary fiscal policy from automatic stabilisers and addressing endogeneity issues by using IV2SLS. Bökemeier and Wolski (2022) use forecasts of fiscal policy and output gaps for 2020 and 2021 based on AMECO 2020 data and report preliminary results suggesting more counter-cyclicality during the Covid-19 crisis. However, although they only look at the cyclical behaviour of discretionary fiscal policy, they do not address endogeneity issues which are due to the likely positive correlation of the error term with the output gap as exogenous fiscal shocks affect both fiscal policy and economic activity. Tevdovski et al. (2021) use real-time IMF data from October 2020 to assess the impact of real GDP growth on the primary fiscal balance, and they also include an interaction term of their preferred cycle variable (growth) with the Covid crisis year 2020. They report evidence that fiscal policy in 2020 was more counter-cyclical. However, different from our study, neither do they utilise ex-post data, nor do they distinguish between discretionary fiscal policy and automatic fiscal stabilisers. Their preferred estimator is system-GMM.

Numerous studies have stressed that the size of the discretionary fiscal response to Covid-19 – including additional health spending, support measures for keeping businesses and households afloat, foregone tax revenue and social security contributions, fiscal stimulus measures such as additional public investment etc. – was large, although the fiscal effort differs markedly

across countries (e.g. IMF 2021). The results of this paper contribute to the analysis of fiscal policy during the Covid-19 crisis by providing evidence that, on average, the counter-cyclicality of fiscal policy in advanced economies over 2020-2021 was indeed stronger than during other recent episodes – although this does not hold for each and every country individually.

Future research could provide more in-depth analysis on the cyclicality of fiscal policy during the Covid-19 crisis in Eurozone countries – which share common institutions as members of the monetary union – and "stand-alone" OECD countries (with their own central bank), where the latter are less prone to experiencing self-fulfilling market sentiments on bond markets in times of crisis, which has implications for fiscal policy (e.g. Bianchi and Mondragon 2022). One potential avenue for future research is to look more closely at the link between variations in the cyclical behaviour of fiscal policy over time and the impact of fiscal rules (e.g. Larch et al. 2021). The EU's fiscal rules were suspended soon after the pandemic hit to provide European governments with additional fiscal space (e.g. Blanchard et al. 2021). This may have contributed substantially to a more counter-cyclical fiscal stance in some Eurozone countries, while being less important for others. As updated time series on fiscal rules data become available, it might be useful to test for this more explicitly. Conducting case studies for a small set of advanced economies could also improve our understanding of why the cyclicality of fiscal policy during the Covid-19 crisis varied across countries, and why fiscal policy-makers responded differently compared to other recent crisis episodes. Further possible extensions could lie in testing thoroughly whether the cyclicality of fiscal policy during the Covid-19 crisis in real-time (e.g. Beetsma and Guiliodori 2010; Cimadomo 2012) differs from the ex-post outcomes discussed in this paper and how the cyclicality of fiscal policy in emerging market and developing countries compares with advanced countries (e.g. Poghosyan and Tosun 2019). Finally, future research could use new data updates to estimate the cyclicality of tax revenue compared to government spending with particular attention on the impact of the 2020-2021 episode. When new data on bilateral trade between advanced economies become available for the Covid-19 crisis years, it will also be possible to test whether the cyclical response of fiscal policy over 2020-2021 was stronger when growth is used as the preferred cycle variable, instrumented by the trade-partner weighted growth cycle of other advanced economies (e.g. Benetrix and Lane 2013; Dalic 2013).

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Appendix A   Descriptive statistics

The following table shows the descriptive statistics of the full data set. The data sources are explained in section 3.

Table A.1

Statistic	N	Mean	St. Dev.	Min	Max
Primary fiscal deficit	751	0.315	2.826	−7.602	12.430
Cyclically-adjusted primary fiscal deficit	751	1.972	3.125	−6.543	14.287
Cyclical component of the fiscal deficit	751	−0.026	1.611	−6.578	7.726
Output gap	751	−0.482	2.967	−17.070	11.084
Public-debt-to-GDP	754	65.762	41.864	3.765	264.895
Election	756	0.263	0.441	0	1

Appendix B   Weak instrument tests

We instrument the output gap by its own lag and the US output gap. This instrument strategy rests on two assumptions: first, the US output gap does not respond contemporaneously to cyclical developments in other countries, while there is such an impact of US developments on other countries. Second, the correlation between the excluded instruments and the endogenous explanatory variable is strong enough to permit identification. The second assumption can be tested. We consistently find that the instruments are highly correlated with the instrumented variable; the weak instrument tests reject that the instruments are weak.

Here are the weak instrument test results for model (1) in Table 1.

```
Diagnostic tests:

                df1 df2 statistic p-value
Weak instruments   2 712     250.5  <0.000001 ***

---

*** p < 0.01


Residual standard error: 1.793 on Inf degrees of freedom

Multiple R-Squared: 0.6165,Adjusted R-squared: 0.5998

Wald test: 977.7 on 31 DF,  p-value: < 2.2e-16
```

Weak instruments would imply that the instruments have a low correlation with the endogenous explanatory variable. This could result in a larger variance in the coefficient, and severe finite-sample bias. When the relationship between the instruments and the endogenous variable is not sufficiently strong, IV estimators do not correctly identify causal effects. The above test results are based on an F-test on the first stage regression; the null hypothesis is that the instruments are weak. The null is rejected, so we can move forward with the assumption that the instruments are sufficiently strong.

In the models that we run, we consistently find that the hypothesis that the instruments are weak is being rejected.

Appendix C Splitting the Euro sample into core and periphery: panel regressions

The following table shows results for all Eurozone countries (first three columns), Eurozone core countries (fourth, fifth, sixth column) and Eurozone periphery countries (seventh, eight and ninth column). Eurozone core: Austria, Belgium, Germany, Finland, Netherlands); Eurozone periphery: Spain, Greece, Italy, Portugal.

Table C.1: Extension: Euro full sample vs. Euro core vs. Euro periphery

Dep. var. Sample Estimator	(1) PDEF € full IV2SLS	(2) CAPF € full IV2SLS	(3) CC € full OLS	(4) PDEF € core IV2SLS	(5) CAPF € core IV2SLS	(6) CC € core OLS	(7) PDEF € peri IV2SLS	(8) CAPF € peri IV2SLS	(9) CC € peri OLS
PDEF_{t-1}	0.479*** (0.068)			0.513** (0.143)			0.610*** (0.050)		
CAPD_{t-1}		0.594*** (0.087)			0.566*** (0.092)			0.816*** (0.069)	
CD_{t-1}			0.219*** (0.060)			0.104** (0.045)			0.025 (0.120)
ogap	−0.427*** (0.059)	0.020 (0.068)	−0.365*** (0.035)	−0.707** (0.174)	−0.209 (0.141)	−0.413*** (0.029)	−0.146 (0.074)	0.319*** (0.044)	−0.506*** (0.032)
PDebt_{t-1}	−0.089*** (0.020)	−0.030 (0.021)	0.004 (0.003)	−0.085 (0.083)	0.035 (0.093)	−0.008 (0.008)	−0.030** (0.007)	0.041 (0.018)	0.006 (0.009)
election	0.721 (4.235)	−0.712 (2.816)	−0.097 (0.063)	1.080 (0.702)	−0.499 (0.867)	−0.066 (0.087)	−1.632 (1.096)	−0.150 (1.195)	−0.084 (0.058)
FinancialCrisis	1.158** (0.454)	0.965*** (0.327)	0.594*** (0.110)	0.524 (0.897)	0.943 (1.155)	0.067 (0.109)	4.041** (1.066)	3.585** (0.960)	0.706*** (0.268)
EuroCrisis	0.265 (0.557)	−0.235 (0.483)	0.144* (0.084)	0.899 (0.544)	0.073 (0.566)	0.136 (0.118)	−1.061* (0.417)	−0.973 (1.213)	0.427*** (0.073)
Covid	0.985 (0.949)	−0.123 (0.771)	0.318 (0.272)	−0.144 (0.759)	−0.491 (1.019)	0.224 (0.250)	−2.724 (1.353)	−4.455* (1.519)	0.947** (0.401)
ogap*FinancialCrisis	−0.080 (0.202)	−0.069 (0.168)	−0.006 (0.040)	−0.075 (0.276)	−0.001 (0.169)	−0.073** (0.029)	−0.470 (0.344)	−0.430 (0.242)	0.081** (0.032)
ogap*EuroCrisis	0.075 (0.200)	−0.081 (0.231)	−0.052** (0.022)	0.395 (0.397)	0.244 (0.316)	−0.048 (0.076)	−0.207** (0.041)	−0.133 (0.123)	0.044*** (0.014)
ogap*Covid	−0.821*** (0.275)	−0.571** (0.203)	−0.151 (0.105)	−0.864** (0.283)	−0.535 (0.394)	−0.222*** (0.069)	−1.007** (0.184)	−0.916** (0.163)	0.090 (0.118)
Observations	426	426	426	134	134	134	107	107	107
R^2	0.568	0.643	0.888	0.676	0.585	0.859	0.698	0.647	0.943
Adjusted R^2	0.541	0.621	0.881	0.638	0.536	0.842	0.656	0.597	0.935

Notes: All regressions include country-fixed effects, where results are not reported for brevity. Standard errors (clustered at the country level) are given in parentheses. PDEF... primary fiscal deficit (overall fiscal policy); CAPD... cyclically-adjusted primary deficit (discretionary fiscal policy); CD... cyclical component of the fiscal deficit (automatic stabilisers); ogap... output gap; PDebt_{t-1}... lagged public-debt-to-GDP; election: dummy for federal elections; Covid... dummy variable for Covid-19 crisis (2020-2021); FinancialCrisis... dummy for financial crisis (2008-2009); EuroCrisis... dummy for Euro Crisis (2011-2012). *p<0.1; **p<0.05; ***p<0.01

Appendix D Panel regressions: robustness checks with regard to the instrumental variable approach

The following table shows the regression findings based on an alternative IV2SLS approach, where the output gap is instrumented by the country's own lagged output gap and the US output gap interacted with the tax-revenue-to-GDP ratio. With this alternative instrument set, weak instrument tests again reject that the instrumental variables are weakly correlated with the instrumented variable.

Table D.1: Robustness check: IV2SLS (own output gap and interaction of US output gap with tax-revenue-to-GDP as instruments for the output gap)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dep. var.	PDEF	CAPF	CC	PDEF	CAPF	CC	PDEF	CAPF	CC
Sample	full	full	full	Euro	Euro	Euro	OECD	OECD	OECD
Estimator	IV2SLS	IV2SLS	OLS	IV2SLS	IV2SLS	OLS	IV2SLS	IV2SLS	OLS
$PDEF_{t-1}$	0.570***			0.492***			0.652***		
	(0.039)			(0.054)			(0.044)		
$CAPD_{t-1}$		0.660***			0.601***			0.670***	
		(0.039)			(0.048)			(0.069)	
CD_{t-1}			0.186***			0.178***			0.182***
			(0.043)			(0.053)			(0.059)
ogap	−0.169***	0.006	−0.394***	−0.251***	0.009	−0.393***	−0.119*	−0.079*	−0.386***
	(0.047)	(0.048)	(0.024)	(0.061)	(0.055)	(0.030)	(0.060)	(0.038)	(0.028)
$PDebt_{t-1}$	−0.024***	−0.022***	0.001	−0.040***	−0.034***	0.004	−0.013**	−0.015**	−0.001
	(0.005)	(0.006)	(0.003)	(0.007)	(0.007)	(0.003)	(0.005)	(0.005)	(0.001)
election	0.287**	0.387***	−0.062	0.466***	0.590***	−0.079	0.0004	0.091	−0.042
	(0.119)	(0.131)	(0.044)	(0.147)	(0.149)	(0.066)	(0.164)	(0.201)	(0.051)
Covid	−0.425	−0.037	0.283	0.178	−0.017	0.339	−0.336	−0.505	0.211
	(0.698)	(0.581)	(0.209)	(0.671)	(0.421)	(0.241)	(2.139)	(1.471)	(0.307)
ogap*Covid	−0.953***	−0.558***	−0.130**	−0.940***	−0.564***	−0.116	−0.701	−0.660	−0.152***
	(0.184)	(0.150)	(0.063)	(0.158)	(0.095)	(0.090)	(0.640)	(0.416)	(0.036)
Observations	745	745	745	426	426	426	319	319	318
R^2	0.700	0.727	0.848	0.664	0.675	0.880	0.766	0.760	0.772
Adjusted R^2	0.686	0.715	0.841	0.646	0.658	0.873	0.753	0.747	0.759

Notes: All regressions include country-fixed effects, where results are not reported for brevity. Standard errors (clustered at the country level) are given in parentheses. PDEF... primary fiscal deficit (overall fiscal policy); CAPD... cyclically-adjusted primary deficit (discretionary fiscal policy); CD... cyclical component of the fiscal deficit (automatic stabilisers); ogap... output gap; $PDebt_{t-1}$... lagged public-debt-to-GDP; election: dummy for federal elections; Covid... dummy variable for Covid-19 crisis (2020-2021). *p<0.1; **p<0.05; ***p<0.01

The following table presents the one-step system-GMM results discussed at the end of section 4, where we use the t-2 and t-3 lags of the fiscal policy variable and the output gap as instruments.

Table D.2: GMM estimation results

Fiscal policy var.	(1) overall	(2) discr.	(3) autom.	(4) overall	(5) discr.	(6) autom.	(7) overall	(8) discr.	(9) autom.
Sample	full	full	full	Euro	Euro	Euro	OECD	OECD	OECD
Estimator	GMM	GMM	OLS	GMM	GMM	OLS	GMM	GMM	OLS
PDEF_{t-1}	0.663***			0.571***			0.745***		
	(0.054)			(0.053)			(0.033)		
CAPD_{t-1}		0.787***			0.769***			0.862***	
		(0.026)			(0.031)			(0.019)	
CD_{t-1}			0.186***			0.178***			0.182***
			(0.043)			(0.053)			(0.059)
ogap	−0.154***	0.072*	−0.394***	−0.165***	0.108***	−0.393***	−0.206***	−0.020	−0.386***
	(0.050)	(0.041)	(0.024)	(0.056)	(0.041)	(0.030)	(0.075)	(0.049)	(0.028)
PDebt_{t-1}	−0.003	0.003**	0.001	−0.007***	0.003***	0.004	0.002	0.001	−0.001
	(0.002)	(0.001)	(0.003)	(0.001)	(0.001)	(0.003)	(0.002)	(0.001)	(0.001)
election	0.373**	0.397**	−0.062	0.721***	0.668***	−0.079	−0.113	0.089	−0.042
	(0.159)	(0.179)	(0.044)	(0.202)	(0.206)	(0.066)	(0.172)	(0.254)	(0.051)
Covid	−0.551	−0.109	0.283	0.436	−0.044	0.339	−1.626**	−0.363	0.211
	(0.498)	(0.258)	(0.209)	(0.466)	(0.263)	(0.241)	(0.659)	(0.603)	(0.307)
ogap*Covid	−0.841***	−0.508***	−0.130**	−0.764***	−0.515***	−0.116	−0.864***	−0.543***	−0.152***
	(0.097)	(0.089)	(0.063)	(0.097)	(0.099)	(0.090)	(0.165)	(0.184)	(0.036)
Observations	745	745	745	426	426	426	319	319	318

Notes: All regressions include country-fixed effects, where results are not reported for brevity. Standard errors (clustered at the country level) are given in parentheses. PDEF... primary fiscal deficit (overall fiscal policy); CAPD... cyclically-adjusted primary deficit (discretionary fiscal policy); CD... cyclical component of the fiscal deficit (automatic stabilisers); ogap... output gap; PDebt_{t-1}... lagged public-debt-to-GDP; election: dummy for federal elections; Covid... dummy variable for Covid-19 crisis (2020-2021). *p<0.1; **p<0.05; ***p<0.01

Appendix E Country-by-country-regressions with standard errors

The following table presents detailed results on the fiscal cyclicality coefficients reported in Figure 2 by including information on the standard errors.

Table E.1: Fiscal cyclicality coefficients and standard errors in Figure 2 of the paper

Country	Discretionary fiscal policy		Automatic stabilisers	
	Coefficient ogap	Standard error ogap	Coefficient ogap	Standard error ogap
AUT	-0.47	0.18	-0.61	0.04
BEL	-0.84	0.21	-0.59	0.05
CYP	-0.09	0.17	-0.44	0.02
DEU	-0.67	0.24	-0.50	0.03
ESP	-0.31	0.12	-0.51	0.02
EST	0.41	0.12	-0.42	0.02
FIN	-0.68	0.21	-0.46	0.05
FRA	-0.33	0.17	-0.55	0.01
GRC	-0.16	0.23	-0.43	0.03
ITA	-0.03	0.22	-0.47	0.04
LTU	-0.24	0.17	-0.31	0.03
LUX	-0.49	0.24	-0.36	0.05
MLT	-0.06	0.33	-0.48	0.07
NLD	-0.57	0.20	-0.57	0.03
PRT	-0.81	0.33	-0.51	0.03
SVK	-0.11	0.25	-0.31	0.08
CAN	-1.13	0.13	-0.60	0.01
CZE	-0.22	0.18	-0.38	0.03
DNK	-0.27	0.11	-0.50	0.02
HUN	0.17	0.19	-0.40	0.08
JPN	-0.93	0.31	-0.38	0.01
POL	-0.16	0.26	-0.39	0.05
KOR	-0.03	0.28	-0.33	0.01
CHE	-0.15	0.20	-0.40	0.01
SWE	-0.35	0.15	-0.45	0.03
GBR	-0.84	0.28	-0.56	0.01
USA	-1.72	0.36	-0.44	0.01
NZL	-1.71	0.36	-0.51	0.01

Notes: All regressions include the lagged public-debt-to-GDP ratio and the election dummy, where results are not reported for brevity. ogap... output gap.

Appendix F   Automatic stabilisers and government size

This figure reports the correlation between automatic stabilisers (as reported in Figure 2 in the main paper) and government size, where the latter is proxied by using the tax-revenue-to-GDP ratio.

Figure F.1: Automatic fiscal stabilisers and government size
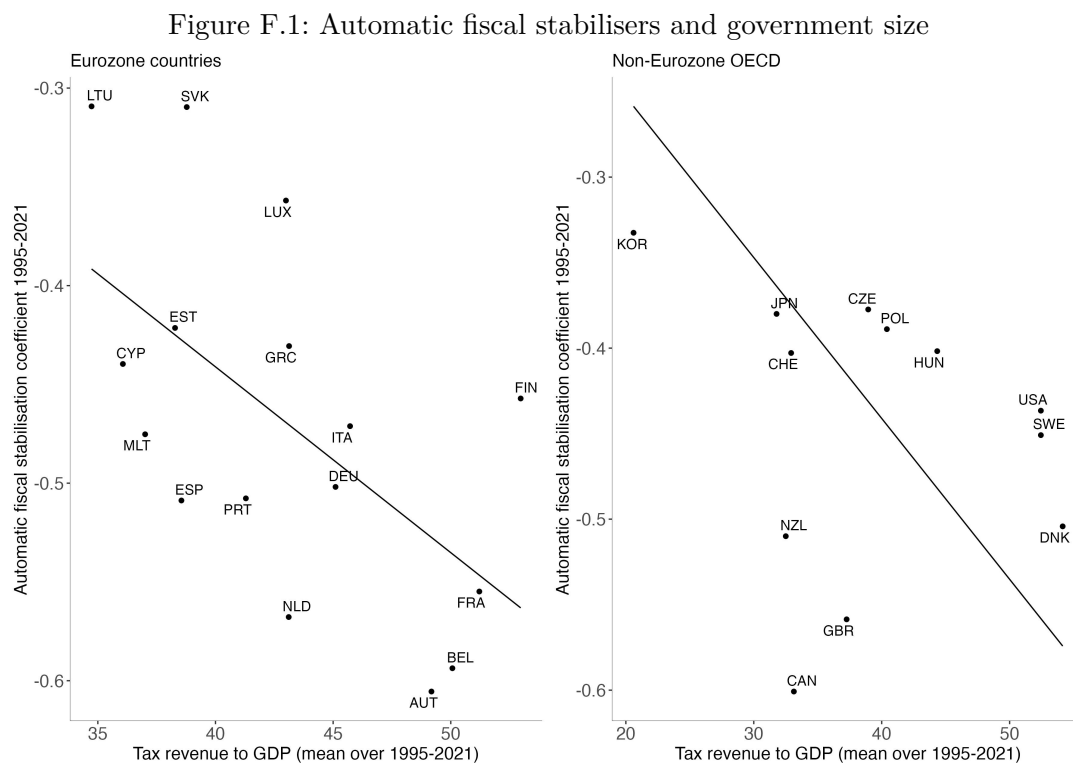
Notes: Own illustration. The estimates on the cyclicality of automatic stabilisers on the vertical axis are based on figure 2; data on tax-revenue-to-GDP on the horizontal axis were obtained from the AMECO database (Spring 2022) and the OECD's Economic Outlook (June 2022).