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# Fiscal Sustainability and the Role of Inflation

## Abstract

We examine the relationship between inflation and fiscal sustainability with a two-step approach. In the first step, we estimate to estimate a country-specific time-varying measure of fiscal sustainability using the fiscal reaction function. This function captures the response of the primary balance to changes in the public debt ratio. In the second step, we examine how various measures of inflation such as headline inflation, core inflation, energy inflation, and food inflation affect the estimate of fiscal sustainability found previously. Our findings indicate that higher inflation rates contribute positively to the measure of fiscal sustainability, specifically through core inflation causing an improvement in fiscal sustainability, while the effect of energy inflation is conversely found to be negligible or even negative. These results imply that the initial burst of inflation caused by the energy price shock in 2021 probably did not help improve fiscal sustainability, whereas the subsequent high core inflation had a positive effect.

JEL-Codes: C230, E310, E620, H500, H620.

Keywords: fiscal sustainability, fiscal reaction function, time-varying coefficients, euro area, inflation, core inflation, panel data.

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# 1 Introduction

Whether fiscal policy is sustainable in the long run is a fundamental question in macroeconomic analysis. A country is typically deemed to be fiscally sustainable when government revenues closely align with government expenditures and when the fiscal authorities manage to achieve a primary balance that essentially stabilises the debt-to-GDP ratio. The issue of fiscal sustainability is particularly relevant right now, as the average level of public debt in advanced OECD economies has increased from 37% in 1980 to 76% in 2021, with a significant rise of some 10 percentage points occurring during the Covid-19 crisis. On top of this, inflation has surged in the euro area since mid-2021 to levels reminiscent of the 1970s and the early 1980s, after a decade when it was below the target of 2%. This raises the question of whether higher inflation alleviates or aggravates the challenges associated with fiscal sustainability, but how inflation and its various components affect the indicators of debt sustainability remains insufficiently explored. This paper attempts to find an answer to the question by examining this relationship.

There is no universally accepted measure of fiscal sustainability. This study, like many other papers, uses the framework of Bohn (1998), which describes fiscal sustainability as the positive response of the primary balance in year t to the public debt-to-GDP ratio accumulated by the end of year t-1. There are two ways in which inflation may influence this fiscal response. One is that the expectation of higher inflation in year t increases expected nominal GDP, lowering the level of the public debt-to-GDP ratio expected by the end of year t. Fiscal authorities that expect the debt ratio to decline may in response increase expenditures and reduce tax rates, ultimately weakening the response from the primary balance in year t to the accumulated public debt. The other way inflation may exert an influence is that the fiscal authorities may view higher inflation as giving them an opportunity to strengthen the fiscal policy stance. They may do this by refraining from adjusting certain expenditures in line with the inflation rate, thereby reducing the value of the expenditure in real terms. In the first scenario, the response of the primary balance to the accumulated level of public debt would be expected to worsen, whereas in the second case, that measure of fiscal sustainability should improve.

The analysis in this paper is conducted using a sample of industrialised countries from the OECD and, separately, a more homogenous group of the euro area countries between 1981 and 2021. The study follows Afonso and Jalles (2017a), Afonso and Jalles (2017b) and Afonso and

Coelho (2022) in employing the two-step approach. The first step is that the fiscal reaction function with time-varying coefficients is estimated for each country in the sample following the approach of Schlicht (2021a). The measure of fiscal sustainability that we use is the fiscal response coefficient that relates the primary balance to the lagged debt-to-GDP ratio in the fiscal reaction function. The second step is to analyse how important alternative measures of inflation such as the headline inflation rate, core inflation, energy inflation, and food inflation are for the fiscal response coefficient that was estimated previously. We do this by applying panel regression techniques and estimating the coefficients using the WLS.

The findings of this paper suggest that i) the measure of fiscal sustainability varies across countries and over time, ii) fiscal sustainability deteriorates during economic downturns, iii) higher rates of inflation help raise the level of fiscal sustainability, and iv) core inflation has the largest positive influence on fiscal sustainability. The latter suggests that the positive effect of inflation on fiscal sustainability is probably driven by demand factors.

The remainder of the paper is structured as follows. Section 2 presents a brief literature review. Section 3 explains the empirical strategy and data. Section 4 reports and discusses the empirical results and Section 5 concludes.

## 2 Review of literature

### 2.1 Backward-looking fiscal sustainability tests

There are two types of fiscal sustainability test, as there are backward-looking and forward-looking tests. Backward-looking tests determine whether policies for public debt and the primary balance have historically been consistent with meeting the intertemporal budget constraint (IBC). Forward-looking tests use forecasts for whether the current and future stances of fiscal policy are compatible with the IBC. Each type of test has its shortcomings. The backward-looking analysis does not allow that future fiscal policy may not be the same as the policy observed in the past, while the forward-looking analysis ignores the past and implies that any future behaviour may be consistent with the IBC if the public commitment to it is deemed credible (see Debrun et al. (2019) for a discussion on this).

The academic literature has primarily focused on backward-looking analysis, while also acknowledging its limitations. Earlier backward-looking tests of fiscal sustainability evolved around

examinations of the stationarity of public debt and the budget balance Hamilton and Flavin (1986). Trehan and Walsh (1988) showed that even if both series appear non-stationary, fiscal solvency is satisfied as long as both series are cointegrated, meaning that larger debt is systematically associated with higher primary balances. Various papers such as Hakkio and Rush (1991), Haug (1995) and Quintos (1995) for the United States, Olekalns (2000) for Australia, Hatemi-J (2002) for Sweden, and Afonso and Jalles (2014) for 19 countries have conducted analysis of cointegration between budget revenues and expenditures. Afonso and Jalles (2014) take a longer-term perspective and cover the period 1880–2009. More recent literature has also used panel data techniques to explore panel cointegration relationships (Afonso and Rault (2010), Magazzino et al. (2019)).

Another strand of the literature uses the fiscal reaction function framework proposed by Bohn (1998) to assess the sustainability of fiscal policy. Bohn (1998) demonstrates that the intertemporal budget constraint may be satisfied with neither cointegration nor stationarity of the variables explaining the debt trajectory, and suggests that testing should span a relatively long time period if meaningful conclusions are to be drawn. He finds that the primary balance gives a positive marginal response to changes in public debt in the US. Mendoza and Ostry (2008) use a similar testing procedure and show that the fiscal response varies across countries. They specifically find that the fiscal response is stronger in emerging markets than in industrial ones, indicating that countries with emerging markets tend to converge to lower levels of mean public debt.

Afonso et al. (2021) use a sample of 28 European Union countries and a timespan from 1995 to 2021 and confirm the existence of the Ricardian fiscal regime, which became more prominent after the global financial crisis. In this fiscal regime, improvements in the primary government balance lead to greater reductions in the public debt-to-GDP ratio when there is a positive differential between the long-term real interest rate and the rate of economic growth, but this effect disappears when the differential is negative. Several papers that employ the framework of Bohn (1998) (e.g. Checherita-Westphal and Žďárek (2017), Ostry et al. (2010), Ghosh et al. (2013), or Tran (2018)) conclude that the ability to increase the primary balance in response to rising debt levels cannot last indefinitely. There is a debt limit beyond which there arises fiscal fatigue, which is the inability of the fiscal authorities to keep the primary balance at the necessary level.

Primary balances are influenced by various factors that warrant attention. One crucial factor is the difference between the cost to the government of long-term borrowing (r) and the rate of economic growth (g). Blanchard et al. (2021) explore the relevance of the differential between

interest rates and growth within the framework of fiscal reaction functions. Afonso et al. (2021) similarly emphasise the significance of that differential, and their study reveals that a positive differential following improvements in the primary balance leads to a greater reduction in the debt-to-GDP ratio across a sample of 28 EU countries from 1995Q1 to 2021Q2. Tkačevs and Vilerts (2019) identify that the cost of government borrowing has a positive impact on primary balances. The fiscal policy response to the business cycle also plays a significant role in determining fiscal sustainability, and Aldama and Creel (2019) observe an asymmetric pattern whereby fiscal policy tends to be pro-cyclical during economic downturns but exhibits insensitivity during periods of growth in the economy.

### 2.2 Time-varying fiscal sustainability

The response of the primary balance to changes in the accumulated level of public debt may vary over time under the influence of shifts in the policies of the fiscal authorities. The factors affecting this variation are assessed by Mauro et al. (2015) using an estimation of the non-linear fiscal reaction function that incorporates interactions between the lagged debt ratio, real interest rates, surprises in real GDP growth, and various political variables. Their study notably does not provide an analysis of the inflation effect. Numerous papers, including Afonso and Jalles (2017a), Afonso and Jalles (2017b), Afonso and Coelho (2022), Saadaoui et al. (2022) and Afonso et al. (2023), estimate time-varying coefficients for fiscal sustainability for a range of countries using either the cointegration approach or Bohn's framework. These works examine the evolving nature of fiscal sustainability over time. The Schlicht (2003) estimation procedure is commonly used in these studies to estimate the time-varying coefficients for the fiscal response because it has several advantages over other methods, which are detailed in the next section.

Afonso and Jalles (2017a) focus their analysis on 11 euro area countries between 1999 and 2013, concluding that fiscal policy has been sustainable in Belgium, France, Germany, and the Netherlands. For their investigation they construct time-varying coefficients to examine how the primary government balance responds to the public debt-to-GDP ratio. They find that the global financial crisis had a negative impact on fiscal sustainability, while expenditure-based fiscal rules had a positive effect on it. Afonso and Jalles (2017b) estimate time-varying coefficients for 13 advanced economies, and their findings suggest that the degree of fiscal sustainability increases with the share of foreign currency debt, the share of longer-term debt, the share of debt held by the

central bank, and the share of marketable debt. Afonso and Coelho (2022) provide evidence that economic growth and the presence of fiscal rules positively steer measures of fiscal sustainability, but trade openness, sovereign ratings, and the government effectiveness index have a negative effect on fiscal sustainability. In contrast to previous studies, Afonso et al. (2023) take an expanding window approach to estimate time-varying fiscal sustainability for 22 developed OECD countries. They employ panel data and quantile regression techniques to analyse the heterogeneity in how fiscal sustainability coefficients respond to a set of explanatory variables. However, none of these studies thoroughly examine how inflation and its components impact measures of fiscal sustainability.

### 2.3 Role of inflation

Examining the relationship between inflation and fiscal aggregates reveals several significant effects that inflation has. The well-known Olivera-Tanzi effect posits that high inflation can erode the real value of tax revenues when there is a delay in the collection of taxes (Olivera (1967); Tanzi (1977)). Another effect is that inflation may reduce real expenditure since expenditure is typically planned in nominal terms (Patinkin (1993); Cardoso (1998)).

A recent paper by Staehr et al. (2023) confirms the positive relationship between inflation and the primary balance and finds that the effect arises from both the revenue and expenditure sides. High inflation boosts indirect tax revenues from consumption taxes and VAT as prices rise, while also causing the real value of many government transfers to fall because they are defined in nominal terms. Moreover, wages in the public sector are generally not indexed in most countries, and so although there might be social pressure to maintain the real value of government benefits and wages, that value is usually only partially restored and after some delay. Garcia-Macia (2023) finds that inflation spikes also result in a persistent reduction in debt-to-GDP ratios that is driven both by improvements in the primary balance and by the impact of changes in nominal GDP.

Finally, there is also the Fiscal Theory of the Price Level (FTPL), which argues that inflation might be a consequence of active fiscal policies. In this telling, the government budget constraint plays a key role in determining the price level. Several studies have addressed this topic, notably Sargent and Wallace (1981), Leeper (1991), Sims (1994), Woodford (1995), and Cochrane (2001), and they propose a reverse link between fiscal sustainability or unsustainability and inflation. The study by Afonso and Jalles (2020) for instance observes a significant positive correlation between changes in the fiscal policy stance through year-on-year adjustments in the cyclically adjusted

primary balance and inflation volatility, across a panel of 54 countries from 1980 to 2013. Contrary to this, Cevik and Miryugin (2023) report from a panel of 139 countries spanning from 1970 to 2021 that both headline and core inflation increase in response to expansionary fiscal policies.

As the review of the literature clearly shows, the impact of inflation on the indicators of debt sustainability has not yet been conclusively described. This paper aims to close this gap in the literature.

# 3 Methodology and data

## 3.1 The concept of fiscal sustainability

As explained above, there is no universally acceptable backward-looking measure of fiscal sustainability. Arguably the most parsimonious measure of fiscal sustainability is Bohn's fiscal response coefficient (see Bohn (1998), Bohn (2007)). Bohn (1998) suggested a model-based sustainability framework, in which for a given country, its primary balance is linked to the lagged value of public debt-to-GDP ratio:

$$PB_t = \alpha_t + \beta D_{t-1} + \varepsilon_t \tag{1}$$

According to Bohn (1998), a positive response of primary balance to an increase in government debt in the previous period ($\beta > 0$) is sufficient to satisfy the IBC[1].

Besides signalling the compatibility of fiscal policy with the IBC, the magnitude of the fiscal response coefficient is important as it enters the requirement for public debt dynamics to be stable. Thus, public debt is mean reverting if $\beta > \gamma$, where $\gamma = \frac{r-g}{1+g}$, $r$ is interest rate and $g$ is GDP growth rate (see Debrun et al. (2019) for details on public debt sustainability arithmetic). If this condition is fulfilled, then public debt converges to level $d^*$ defined as $d^* = \frac{-k}{\beta-\gamma^*}$. Higher values of $\beta$ imply a bigger fiscal response to public debt and lead in the longer run to a lower debt-to-GDP ratio.

## 3.2 Response of the primary balance to public debt

In the first step, we estimate the fiscal reaction function for each country in our sample. To account for the cyclical component of the primary balance, we also add the output gap as an explanatory

[1]The problem with Bohn (1998) test of fiscal sustainability is that it does not rule out rising public debt ratios for a long period of time which by itself can trigger investors' concerns.

factor:

$$PB_t = \alpha_t + \beta D_{t-1} + \gamma \hat{Y}_{t-1} + \varepsilon_t \tag{2}$$

where $PB_t$ is the primary balance-to-GDP ratio in year $t$, $D_{t-1}$ is the public debt-to-GDP ratio lagged by one year, $\hat{Y}_{t-1}$ is the output gap lagged by one year and $\varepsilon_t$ is a standard i.i.d. disturbance term in year $t$. The fiscal response coefficient $\beta$ is thus estimated for each country and each year.

If estimated using OLS, this regression yields a single, time-invariant fiscal response coefficient. We are rather interested in a fiscal sustainability measure that is country-specific, but also changes over time. For this purpose, we estimate $\beta$ as a time-varying coefficient using the Schlicht (2021a) method, which relies on the assumption that $\beta$ changes "slowly and unsystematically over time":

$$\beta_t = \beta_{t-1} + v_t, \tag{3}$$

where $v_t \sim N(0; r^2)$.

According to Schlicht (2021a) and Schlicht (2021b), equations 2 and 3 should be estimated jointly. This approach is a generalization of the standard linear model where the independent variables can (slowly) change over time (as opposed to remaining constant, as assumed in the linear model). As it is assumed that the fiscal response coefficient follows the random walk process, the expected value of this coefficient in time $t$ is equal to its value in time $t-1$. The change of the coefficients is denoted by $v_t$, which is assumed to be normally distributed with zero mean and variance $r^2$. The variances $r^2$ are computed using a method of moments estimator, which coincides with the maximum-likelihood estimator for large samples, although it is statistically more efficient and numerically more transparent and straightforward to interpret in small samples. Thus, the standard regression model is a special case when $r^2$ tends to zero, which in turn translates into $\beta_t = \beta_{t-1}$. By departing from this assumption and allowing $r^2$ to be small but different from zero, we allow the coefficients to move slowly through time, departing from the previous year's coefficients but reflecting changes or departures from the stance that occurred in that year.

Schlicht's (2021a,b) approach has several advantages over other methods such as the rolling or expanding window estimation in estimating the time-varying fiscal reaction coefficient. One is that it allows all the observations in the sample to be used. Individual country regressions estimated over rolling or expanding windows of predetermined length[2] provide a much shorter series for the

[2] Mauro et al. (2015) suggest that the shortest time span should be at least 25 years if meaningful estimates of the

fiscal reaction coefficient. A second advantage is that changes in the magnitude of the time-varying coefficients estimated for a given year come from innovations in the same year rather than from shocks that occur in other years. A third point is that it reflects how changes in policy are slow and depend on the immediate past.

### 3.3 Relationship between inflation and fiscal sustainability measure

In the second step, we use the time- and country-specific fiscal response coefficient $\beta_{it}$ obtained previously as the dependent variable and regress it on a measure of inflation $\pi_{it}$. We also include the difference between the ten-year sovereign bond yield and the growth rate of the economy $(r-g)_{it}$ as a control factor, and the country fixed effects $\gamma_i$ to account for time-invariant, country-specific, unobservable effects:

$$\beta_{it} = \theta_0 + \theta_1 \pi_{it} + \theta_2 (r-g)_{it} + \gamma_i + u_{it} \tag{4}$$

where $u_{it}$ is the error term, $\theta_1$ is the coefficient that captures the effect of inflation on fiscal responsiveness. If $\theta_1 > 0$, inflation improves the reaction of the primary balance to government debt. Since inflation is included as the main variable, we use the real GDP growth rate to calculate $r-g$.

The dependent variable is the coefficient estimated previously, i.e. this is a measure and not a precise data point. Therefore, it is important to account for the fact that this measure is estimated more precisely for some observations than for others. In view of this, we use the weighted least squares (WLS), where each observation in the second step is weighted by the inverse of the standard error of the fiscal response coefficient obtained in the first step.

Fiscal response coefficients can differ from one country to another for a number of reasons, such as political and social pressures, country-specific laws and fiscal rules, election cycles, and so forth. Therefore we treat each country separately in the first step, and we do not exploit the panel nature of the data. Moreover, we do not use any control variables other than the output gap in that regression, since we are interested in a parsimonious and unconditional measure of fiscal sustainability. We do the opposite in the second step, because we aim to study how inflation impacts fiscal sustainability in developed OECD countries in general and in groups of countries such as the euro area, its core and its periphery in particular.

We use the headline CPI inflation rate as the key explanatory variable in the baseline estimation. To look more deeply into the source of the impact that inflation has on fiscal responsiveness, we also

fiscal response coefficient are to be obtained. Afonso et al. (2023) use an expanding window that starts with 20 years.

check whether the effect varies for different inflation components, and run several more regressions that replace headline inflation with core inflation, energy inflation, and food inflation.

### 3.4 Data

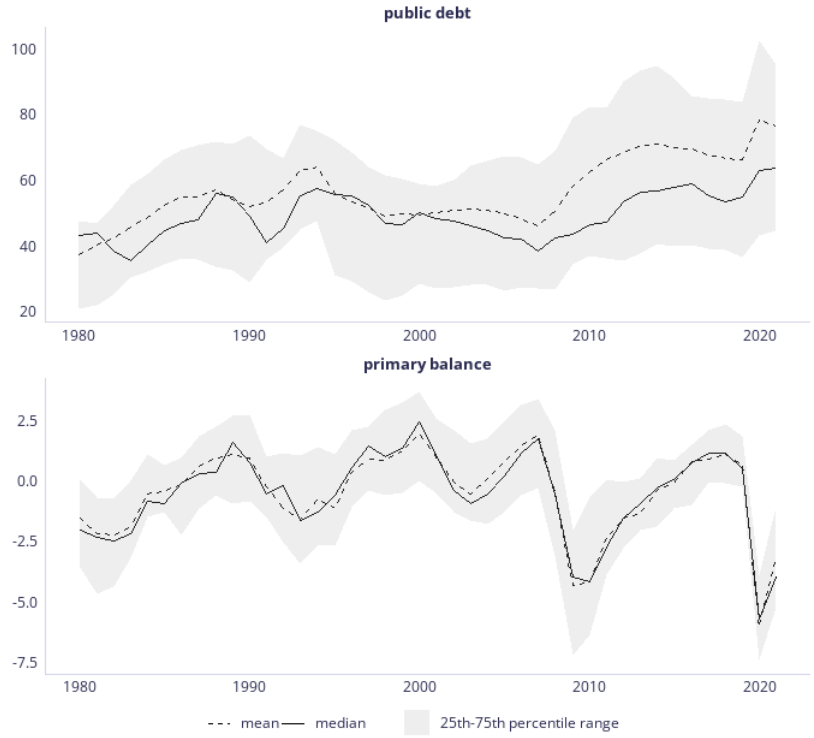
This study uses the annual panel dataset of 35 current member countries of the Organization for Economic Cooperation and Development (OECD). Three countries, namely Costa Rica, Columbia and Estonia, are excluded because data are unavailable for certain series, as there are no data available on the ten-year sovereign bond yield for Estonia for instance. Our estimations are conducted both for the entire sample and for a more homogeneous subgroup of countries within the euro area. The estimations cover the period from 1980 to 2021, but the starting year for each country depends on the availability of data, as indicated in Table A.1 in the Appendix. The data used in our analysis are sourced from the databases of the OECD and the International Monetary Fund (IMF). Table A.2 in Appendix A presents the variables employed in our analysis along with their sources, while Table A.3 presents the corresponding descriptive statistics.

Across the entire sample of OECD countries, the average primary balance stands at -0.37% of GDP, with the public debt-to-GDP ratio averaging 59.2%. The average value for the output gap is negative at -0.5% of potential GDP. The mean inflation rate is heavily influenced by outliers[3], while the median value hovers around 3%. Core inflation remains below this value, but energy inflation exceeds it. Norway, which is a commodity-producing country, has the highest values for the primary balance, while Japan, Italy and Belgium have high debt-to-GDP ratios. The highest mean inflation rates have historically been seen in Turkey and several Central and Eastern European countries such as Hungary and Slovakia.

Figure 1 depicts the primary balance and the debt-to-GDP ratio for the full sample of countries. It presents the simple averages and medians for these variables for each year in the sample, with the shaded areas representing the range between the 25th and 75th percentiles. Sharp declines in primary balances are observed during periods of crisis, including the recession in the 1990s, the dot-com crisis in the early 2000s, the Great Recession from 2008 to 2011, and the Covid-19 crisis from 2020 to 2021. Although the primary balances managed to recover following these events, it took several years for the fiscal stance to be restored after the Great Recession. Consequently, the trajectory of the public debt-to-GDP ratio was gradually rising during the second decade of the

[3]Those outliers are not part of the estimation sample (see Table A.4)

Figure 1: Primary balance and public debt in OECD countries, 1980-2021




Source: IMF, OECD

2000s.

# 4 Results

## 4.1 Estimates of fiscal responsiveness

As outlined in the Methodology section, we use the method of Schlicht (2003, 2021a,b) to gauge the time-varying coefficients that link the primary balance to the lagged public debt-to-GDP ratio for each OECD country. There is a clear and direct interpretation of these coefficients, as a coefficient value of 0.05 for instance implies that an increase of 10 percentage points in the public debt ratio corresponds to an improvement in the next year of 0.5 percentage point in the primary balance expressed as a ratio to the country's GDP, assuming that the output gap remains constant.

Figure 2 displays the evolution of the median value of the estimated mean of the fiscal response coefficient, alongside its interquartile range, for the set of OECD countries.[4] The median value

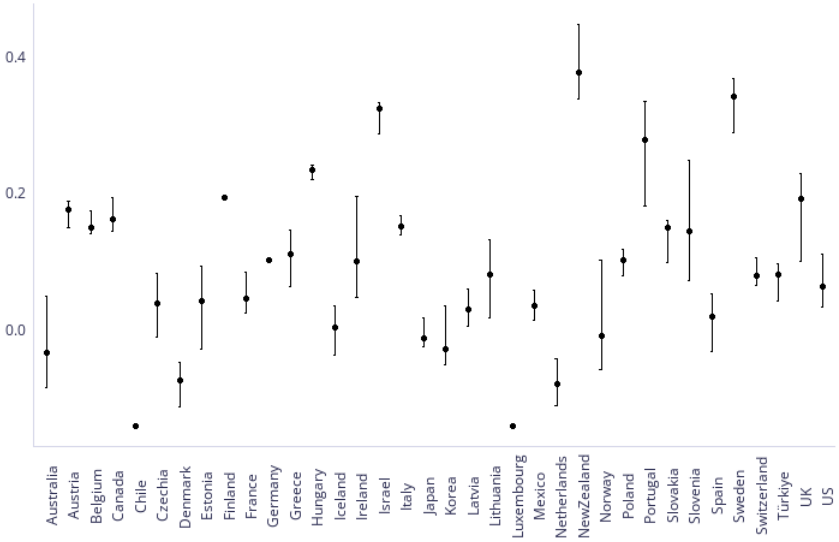
[4]The interquartile range should not be confused with the confidence band around the mean value of the coefficient. This is the interquartile range of the mean coefficients for all countries in every year. The coefficient for each individual country may be statistically significant or insignificant in any given year irrespective of whether the range of the estimated means of the coefficient across countries includes zero.

Figure 2: Developments of the fiscal response coefficient, 1980-2021


Source: Authors' estimation

increases gradually, starting at 0.05 in 1980, reaching 0.1 around 2007, dipping just below zero in 2009, and subsequently stabilising at approximately 0.04 during the latter half of the 2010s, after which it notably falls substantially below zero in 2020. This pattern is observed in numerous individual countries as well.

Figure 3: Fiscal response coefficient by country




Source: Authors' estimation

Figure 3 illustrates the fiscal response coefficients for individual OECD countries. Each point denotes the average value throughout the period when data are available, and the whiskers surrounding each point indicate the entire range encompassed by this coefficient. Whether the range includes or excludes zero says nothing about the statistical significance of the coefficient. Table C1 in the Appendix shows for each decade of the time sample the share of countries where the coefficient is above zero and statistically significant, meaning the countries that were following a sustainable fiscal policy in that decade. There is considerable variation across countries in the cross-time median and the range of values of the fiscal response coefficient. New Zealand, Sweden, Israel, Portugal, Hungary, and Finland have the highest median values for the fiscal response coefficient among the countries examined, while Chile, Finland, Germany, and Luxembourg have a very narrow range for the coefficient estimate.

### 4.2 Impact of inflation on fiscal responsiveness

We next use the fiscal response coefficient estimated previously as the dependent variable, and regress it on HICP inflation while controlling for the differential labelled r-g between the interest rate from the ten-year sovereign bond yield and output growth. Following the approach described in Section 3, we first test whether the fiscal response coefficient is cointegrated with each measure of inflation. Most test results signal that there is cointegration (see Table B.1 in the Appendix), hence the regression is well-specified in levels.

The estimation results for HICP headline inflation are presented in Table 1. The columns in the table correspond to the different specifications of the regression, including one with r-g as a control and one without it. The first two columns display the results estimated for the entire OECD sample, while the last two columns focus on the estimation results for the euro area countries. It is important to note that all the panel regressions use country-fixed effects but do not incorporate time-fixed effects.

The findings for the impact of inflation indicate that fiscal policy makers tend to tighten the fiscal stance more forcefully as inflation increases in response to a given rise in public debt. This outcome is aligned with those found by the earlier studies conducted by Afonso and Jalles (2017b) and Afonso and Coelho (2022)), which considered headline inflation as a control variable. That inflation has a positive impact may suggest that the fiscal authorities are using inflation strategically as a tool to tighten the fiscal stance, perhaps by not fully adjusting expenditure.

Table 1: The effect of headline inflation on fiscal responsiveness

| Variable | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| HICP inflation | 0.0026** | 0.0067*** | 0.0063*** | 0.0094*** |
| | (0.0012) | (0.0019) | (0.0014) | (0.0024) |
| R-G | | -0.0025*** | | -0.0025*** |
| | | (0.0006) | | (0.0009) |
| Constant | 0.0741*** | 0.0731*** | 0.0734*** | 0.0749*** |
| | (0.0036) | (0.0043) | (0.0042) | (0.0053) |
| Country group | OECD | OECD | EA | EA |
| Observations | 1,085 | 1,006 | 523 | 484 |
| R-squared | 0.026 | 0.066 | 0.142 | 0.181 |
| # of countries | 36 | 35 | 17 | 16 |

Notes: The dependent variable is the response of the primary government balance to a unit change in public debt lagged by one period, where both variables are a percentage of GDP. The sample consists of annual panel data for the OECD countries (columns 1-2) and the euro area countries (column 3-4) over the time period 1980-2021. The estimation is performed using WLS (weighted least square). Country fixed effect is included. *, **, and *** denote significance at the level of 0.1, 0.05, and 0.01 respectively.

For the sample of OECD countries, an increase of one percentage point in the inflation rate is associated with an increase in the fiscal response coefficient of 0.0026 if the control variable is not considered, and of 0.0067 if the negative impact of r-g is taken into consideration; the difference arises because inflation and the interest rate-growth differential are positively correlated. This indicates that the primary balance improves by an additional 0.007 percentage point on average with each additional percentage point of inflation. For a country with a fiscal response coefficient of, say, 0.05, which corresponds to the median of the OECD sample, this represents a substantial 14% increase in fiscal responsiveness when inflation rises by one percentage point. The magnitude of this effect is somewhat larger for the sample of euro area countries, where each additional percentage point of inflation leads to an increase of 0.0063-0.0094 in the fiscal response coefficient depending on whether the impact of $r - g$ is accounted for.

We next investigate whether the extent of fiscal policy tightening varies for different types of inflation. Core inflation is often regarded as a measure of demand-driven inflation, while food and energy inflation are understood to indicate cost-push inflation. Unfortunately, the OECD database does not offer a breakdown of food inflation into its components of processed food, which is driven by both demand and supply, and unprocessed food, which is mostly supply-driven. We consequently use energy inflation as the most appropriate proxy for cost-push inflation, but we also provide separate results from food inflation.

Table 2: The effect of core inflation on fiscal responsiveness

| Variable | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| HICP core inflation | 0.0035*** | 0.0079*** | 0.0059*** | 0.0102*** |
| | (0.0011) | (0.0020) | (0.0013) | (0.0025) |
| R-G | | -0.0029*** | | -0.0032*** |
| | | (0.0007) | | (0.0010) |
| Constant | 0.0731*** | 0.0721*** | 0.0817*** | 0.0835*** |
| | (0.0031) | (0.0042) | (0.0038) | (0.0047) |
| Country group | OECD | OECD | EA | EA |
| Observations | 1,067 | 1,006 | 516 | 481 |
| R-squared | 0.041 | 0.084 | 0.139 | 0.222 |
| # of countries | 36 | 35 | 17 | 16 |

Notes: The dependent variable is the response of the primary government balance to a unit change in public debt lagged by one period, where both variables are a percentage of GDP. The sample consists of annual panel data for the OECD countries (columns 1-2) and the euro area countries (column 3-4) over the time period 1980-2021. The estimation is performed using WLS (weighted least square). Country fixed effect is included. *, **, and *** denote significance at the level of 0.1, 0.05, and 0.01 respectively.

Tables 2 to 4 present the estimation results from Equation 4 for three different inflation measures: core inflation, energy inflation, and food inflation. Core inflation emerges as the primary driver behind the increase in the fiscal response coefficient, as an increase of one percentage point in the core inflation rate is associated with growth in the fiscal response coefficient of 0.0082 in the OECD sample, or 0.0097 in the euro area, which slightly exceeds the point estimate for the headline inflation coefficient.

Table 3: The effect of energy inflation on fiscal responsiveness

| Variable | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| HICP energy inflation | 0.0007*** | 0.0006** | 0.0006* | 0.0004 |
| | (0.0002) | (0.0002) | (0.0003) | (0.0002) |
| R-G | | -0.0011 | | -0.0009 |
| | | (0.0007) | | (0.0009) |
| Constant | 0.0805*** | 0.0837*** | 0.0972*** | 0.101*** |
| | (0.0008) | (0.0022) | (0.0013) | (0.0032) |
| Country group | OECD | OECD | EA | EA |
| Observations | 1,071 | 1,006 | 520 | 481 |
| R-squared | 0.009 | 0.011 | 0.009 | 0.011 |
| # of countries | 36 | 35 | 17 | 16 |

Notes: The dependent variable is the response of the primary government balance to a unit change in public debt lagged by one period, where both variables are a percentage of GDP. The sample consists of annual panel data for the OECD countries (columns 1-2) and the euro area countries (column 3-4) over the time period 1980-2021. The estimation is performed using WLS (weighted least square). Country fixed effect is included. *, **, and *** denote significance at the level of 0.1, 0.05, and 0.01 respectively.

In contrast, energy inflation appears to have a negligible effect and is found to be insignificant

in the euro area. The effect of food inflation lies somewhere in between.

Table 4: The effect of food inflation on fiscal responsiveness

| Variable | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| HICP food inflation | 0.0019* | 0.0035*** | 0.0046*** | 0.0059*** |
| | (0.0010) | (0.0012) | (0.0010) | (0.0019) |
| R-G | | -0.0016** | | -0.0016** |
| | | (0.0007) | | (0.0007) |
| Constant | 0.0764*** | 0.0777*** | 0.0864*** | 0.0889*** |
| | (0.0030) | (0.0033) | (0.0027) | (0.0040) |
| Country group | OECD | OECD | EA | EA |
| Observations | 1,068 | 996 | 510 | 471 |
| R-squared | 0.016 | 0.034 | 0.097 | 0.114 |
| # of countries | 36 | 35 | 17 | 16 |

Notes: The dependent variable is the response of the primary government balance to a unit change in public debt lagged by one period, where both variables are a percentage of GDP. The sample consists of annual panel data for the OECD countries (columns 1-2) and the euro area countries (column 3-4) over the time period 1980-2021. The estimation is performed using WLS (weighted least square). Country fixed effect is included. *, **, and *** denote significance at the level of 0.1, 0.05, and 0.01 respectively.

The finding that core inflation has a stronger effect and energy inflation[5] has limited significance probably arises because higher cost-push inflation leads to considerable political and social pressure to offset rising living costs, and this then compels the fiscal authorities to take the necessary measures to compensate.

It is likely that the impact of inflation is not linear and may depend on the inflation rate itself, meaning the inflation effect is non-linear. To investigate this hypothesis, we conduct additional analysis and present the estimation results in Table 5.

Our first observation is that the effect of inflation diminishes as inflation itself increases. In other words, inflation cannot continually improve the fiscal response, as there is a threshold beyond which real expenditure cannot decrease further, and real revenue cannot rise any higher, because adjustments are needed to nominal revenue and expenditures to ensure the public sector keeps functioning properly and to preserve a certain pattern of income distribution within society.

We next examine the differential impact of inflation on fiscal sustainability for the core and periphery countries of the euro area. The euro area periphery for this purpose is taken as Portugal, Italy, Ireland, Greece and Spain.[6] To perform this analysis we introduce an interaction term to account for periphery countries within the euro area. The findings reported in Table 6 reveal that

[5]We also tested whether the difference between the effects of these two inflation components is statistically significant. We included both inflation measures in single regressions (1) to (6) and conducted a t-test of the H0 that the two estimated coefficients are equal. The test results allow us to reject H0 for all six regressions.

[6]See Afonso et al. (2014) for the split between core and periphery euro area countries.

Table 5: The effect of headline inflation with a quadratic term on fiscal responsiveness

| Variable | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| HICP inflation | 0.00472** | 0.0132*** | 0.0142*** | 0.0166*** |
| | (0.0019) | (0.0027) | (0.0039) | (0.0045) |
| HICP inflation squared | 0.000 | -0.0006*** | -0.0006** | -0.0007** |
| | (0.000) | (0.0002) | (0.0002) | (0.0003) |
| R-G | | -0.0023*** | | -0.0022** |
| | | (0.0006) | | (0.0008) |
| Constant | 0.0699*** | 0.0646*** | 0.0612*** | 0.0647*** |
| | (0.0047) | (0.0051) | (0.0076) | (0.0075) |
| Country group | OECD | OECD | EA | EA |
| Observations | 1,085 | 1,006 | 523 | 484 |
| R-squared | 0.037 | 0.089 | 0.192 | 0.212 |
| # of countries | 36 | 35 | 17 | 16 |

Notes: The dependent variable is the response of the primary government balance to a unit change in public debt lagged by one period, where both variables are a percentage of GDP. The sample consists of annual panel data for the OECD countries (columns 1-2) and the euro area countries (column 3-4) over the time period 1980-2021. The estimation is performed using WLS (weighted least square). Country fixed effect is included. *, **, and *** denote significance at the level of 0.1, 0.05, and 0.01 respectively.

Table 6: The effect of headline inflation on fiscal responsiveness in the euro area's core and periphery countries

| Variable | (1) | (2) |
|---|---|---|
| HICP inflation | 0.0048 | 0.0056* |
| | (0.0030) | (0.0030) |
| HICP inflation # EA Periphery dummy | 0.0022 | 0.0082* |
| | (0.0035) | (0.0039) |
| R-G | | -0.0025** |
| | | (0.0009) |
| Constant | 0.0747*** | 0.0765*** |
| | (0.0054) | (0.0053) |
| Country group | EA | EA |
| Observations | 523 | 484 |
| R-squared | 0.146 | 0.222 |
| # of countries | 17 | 16 |

Notes: The dependent variable is the response of the primary government balance to a unit change in public debt lagged by one period, where both variables are a percentage of GDP. The sample consists of annual panel data for the euro area countries over the time period 1980-2021. The periphery is Portugal, Italy, Ireland, Greece and Spain. The estimation is performed using WLS (weighted least square). Country fixed effect is included. *, **, and *** denote significance at the level of 0.1, 0.05, and 0.01 respectively.

the effect observed in the core countries of the euro area is slightly smaller than that of the overall euro area, and there is a marginal loss of significance. However, fiscal sustainability displays a significantly stronger response to higher inflation in the periphery countries than it does in the core countries. It is essential to emphasise here that inflation having a relatively more substantial impact on the fiscal response coefficient in the periphery should not automatically be interpreted

as indicating that fiscal policy there is more sustainable. Drawing from Mendoza and Ostry (2008), these results may suggest that fiscal behaviour in these countries comes with greater risk in budget revenues and more volatility in expenditures. Consequently, a more robust response from the primary balance is required to an increase of similar magnitude in public debt, and inflation may simply serve as a tool for achieving this objective.

### 4.3 Robustness

This section reports the results of the robustness analysis. It initially focuses on the importance of the time period chosen, as the estimation results may be influenced by two significant events during this period, the Great Recession in 2008-2011 and the Covid-19 crisis in 2020-2021. To ensure that our results are not driven by those events we exclude these years and re-estimate the regressions. We then focus on the period of euro adoption for the euro area, and we re-estimate the regressions for the time between 2000 and 2021.

Table 7: The reduced effect of headline inflation on fiscal responsiveness in 2008-2011 and 2020-2021

| Variable | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| HICP inflation | 0.0016 | 0.0065*** | 0.0045*** | 0.0076*** |
| | (0.0017) | (0.0016) | (0.0011) | (0.0022) |
| R-G | | -0.0030*** | | -0.0024** |
| | | (0.000824) | | (0.0009) |
| Constant | 0.0847*** | 0.0824*** | 0.0874*** | 0.0875*** |
| | (0.0034) | (0.0039) | (0.0035) | (0.0046) |
| Country group | OECD | OECD | EA | EA |
| Observations | 905 | 831 | 438 | 404 |
| R-squared | 0.015 | 0.063 | 0.118 | 0.146 |
| # of countries | 36 | 35 | 17 | 16 |

Notes: The dependent variable is the response of the primary government balance to a unit change in public debt lagged by one period, where both variables are a percentage of GDP. The sample consists of annual panel data for the OECD countries (columns 1-2) and the euro area countries (column 3-4) over the time period 1980-2021. The estimation is performed using WLS (weighted least square). Country fixed effect is included. *, **, and *** denote significance at the level of 0.1, 0.05, and 0.01 respectively.

The estimation results when the two recessions are excluded from the sample are reported in Table 7. The impact of inflation on the measure of fiscal sustainability remains comparable to that in the baseline shown in Table 1. Focusing on the shorter sample for the euro area does not markedly affect this result, as the inflation coefficient loses some of its significance, but its magnitude increases a little (see Table 8).

Table 8: The effect of headline inflation on fiscal responsiveness estimated for the euro area countries in 2000-2021

| Variable | (1) | (2) |
|---|---|---|
| HICP inflation | 0.0109** | 0.0108** |
| | (0.0043) | (0.0050) |
| R-G | | -0.0025*** |
| | | (0.0008) |
| Constant | 0.0559*** | 0.0627*** |
| | (0.0081) | (0.0085) |
| Country group | EA | EA |
| Observations | 371 | 346 |
| R-squared | 0.116 | 0.170 |
| # of countries | 17 | 16 |

Notes: The dependent variable is the response of the primary government balance to a unit change in public debt lagged by one period, where both variables are a percentage of GDP. The sample consists of annual panel data for the euro area countries over the time period 2000-2021. The estimation is performed using WLS (weighted least square). Country fixed effect is included. *, **, and *** denote significance at the level of 0.1, 0.05, and 0.01 respectively.

To scrutinise further the robustness of our results for the specification of the fiscal reaction function used in the initial step, we estimate the fiscal reaction function while excluding the output gap from the set of control variables, which gives an alternative series for the fiscal response coefficient. After this we re-estimate the second-step regressions. The findings, detailed in Table 9, confirm that inflation has a positive and statistically significant impact, though the magnitude of the effect is somewhat reduced.

Table 9: The effect of headline inflation on fiscal responsiveness defined without the output gap

| Variable | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| HICP inflation | 0.0022** | 0.0048*** | 0.0035** | 0.0058** |
| | (0.0011) | (0.0017) | (0.0016) | (0.0023) |
| R-G | | -0.0034*** | | -0.0038*** |
| | | (0.0008) | | (0.0011) |
| Constant | 0.0430*** | 0.0450*** | 0.0532*** | 0.0561*** |
| | (0.0039) | (0.0047) | (0.0049) | (0.0063) |
| Country group | OECD | OECD | EA | EA |
| Observations | 1,085 | 1,006 | 520 | 481 |
| R-squared | 0.017 | 0.066 | 0.042 | 0.141 |
| # of countries | 36 | 35 | 17 | 16 |

Notes: The dependent variable is the response of the primary government balance to a unit change in public debt lagged by one period, where both variables are a percentage of GDP. The sample consists of annual panel data for the OECD countries (columns 1-2) and the euro area countries (column 3-4) over the time period 1980-2021. The estimation is performed using WLS (weighted least square). Country fixed effect is included. *, **, and *** denote significance at the level of 0.1, 0.05, and 0.01 respectively.

Table 10: The effect of headline inflation on fiscal responsiveness with r-g calculated using the nominal GDP growth rate

| Variable | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| HICP inflation | 0.0026** | 0.0045** | 0.0057*** | 0.0062*** |
| | (0.0012) | (0.00172) | (0.0014) | (0.0021) |
| R-G | | -0.0068*** | | -0.0026** |
| | | (0.0007) | | (0.0009) |
| Constant | 0.0741*** | 0.0723*** | 0.0828*** | 0.0846*** |
| | (0.0036) | (0.0043) | (0.0042) | (0.0052) |
| Country group | OECD | OECD | EA | EA |
| Observations | 1,085 | 1,006 | 520 | 481 |
| R-squared | 0.026 | 0.078 | 0.124 | 0.176 |
| # of countries | 36 | 35 | 17 | 16 |

Notes: The dependent variable is the response of the primary government balance to a unit change in public debt lagged by one period, where both variables are a percentage of GDP. The sample consists of annual panel data for the OECD countries (columns 1-2) and the euro area countries (column 3-4) over the time period 1980-2021. The estimation is performed using WLS (weighted least square). Country fixed effect is included. *, **, and *** denote significance at the level of 0.1, 0.05, and 0.01 respectively.

Additionally, we explore whether the results remain consistent when the r-g variable is calculated as the difference between the nominal interest rate from the ten-year sovereign bond yield and the nominal rate of GDP growth. Once again, the estimated impact of inflation is negative and statistically significant, as presented in Table 10, though it is slightly smaller in magnitude.

Finally, we calculate r-g using an average, or effective, interest rate[7] instead of the sovereign bond yield. The estimated coefficients are very similar to those obtained above.[8]

[7] As a ratio of government budget interest payments in year $t$ and the public debt stock in year $t-1$.

[8] The estimation results are not reported for the sake of brevity and are available upon request.

# 5 Conclusions

This study adopts a two-step approach to investigate the relevance of inflation for fiscal sustainability. We first estimate a time-varying fiscal response coefficient, which serves as a measure of fiscal sustainability, and we establish the relationship between the primary balance and the lagged public debt-to-GDP ratio in the fiscal reaction function. We then analyse how various inflation measures impact the fiscal response coefficients derived previously, considering headline inflation, core inflation, energy inflation, and food inflation.

We establish in the first step that there is significant volatility in the measure of fiscal sustainability across countries and over different time periods, and it has a tendency to deteriorate during economic downturns. These dynamics are expected, as they correspond to a countercyclical fiscal policy whereby governments support businesses and households with more spending in an economic slowdown, even though the higher debt-to-GDP ratio then requires improvements in the primary balance.

The key finding of this study is that higher inflation rates have a positive impact on the measure of fiscal sustainability. The results show that the primary balance improves on average when the public debt is larger, and this relationship strengthens when inflation is rising. The magnitude of the improvement in fiscal sustainability in response to inflation depends on the type of inflation considered, as the largest positive effect is observed for core inflation, which is mostly demand-driven, while energy inflation tends to have an insignificant effect. Moreover, we find that fiscal sustainability exhibits a significantly stronger response to higher inflation in the euro area periphery countries than it does in the core countries. The impact of inflation on the measure of fiscal sustainability remains consistent with the baseline findings even after numerous robustness checks, for which we exclude the Great Recession of 2008-2011 and the Covid-19 crisis of 2020-2021 as two major events that might have influenced the estimation results, redefine fiscal sustainability by disregarding the output gap in the first step, and use different definitions of r-g.

This study is the first to analyse thoroughly the positive impact that inflation has on fiscal sustainability. Understanding this relationship is more important today as two factors are currently coinciding, since the level of public debt is historically high in many countries around the world, and inflation is also high. The findings imply that the ongoing burst of higher inflation might help ameliorate fiscal sustainability problems. This is likely to be the case because high inflation makes it

easier for governments to readjust the real value of certain revenue and expenditure items by deciding whether and by how much to readjust their value in nominal terms. At the same time, the results indicate that the effects vary over various inflation measures and with the underlying source of the inflation shock, since only demand-driven inflation seems to improve fiscal sustainability, whereas inflation caused by an energy price shock is not associated with improved fiscal responsiveness.

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# Appendices

## A Data

Table A.1: Data samples

| Country | Time sample | Country | Time sample |
|---|---|---|---|
| Australia | 1991-2021 | Latvia | 2001-2021 |
| Austria | 1989-2021 | Lithuania | 2004-2021 |
| Belgium | 1981-2021 | Luxembourg | 1996-2021 |
| Canada | 1981-2021 | Mexico | 2001-2021 |
| Chile | 2004-2021 | Netherlands | 1996-2021 |
| Czechia | 2000-2021 | New Zealand | 1996-2021 |
| Denmark | 1993-2021 | Norway | 1981-2021 |
| Finland | 1981-2021 | Poland | 2000-2021 |
| France | 1981-2021 | Portugal | 1991-2021 |
| Germany | 1992-2021 | Slovakia | 1996-2021 |
| Greece | 1996-2021 | Slovenia | 2002-2017 |
| Hungary | 1999-2021 | Spain | 1981-2021 |
| Iceland | 1992-2021 | Sweden | 1994-2021 |
| Ireland | 1996-2021 | Switzerland | 1991-2021 |
| Israel | 2000-2021 | Türkiye | 2005-2021 |
| Italy | 1989-2021 | United Kingdom | 1981-2021 |
| Japan | 1981-2021 | United States | 2002-2021 |
| Korea | 1996-2021 | | |

Table A.2: List of variables used in the study, their definition and source

| Variable | Data source | Definition |
|---|---|---|
| Primary balance | OECD | General government net borrowing, excluding interest payable, % of GDP |
| Output gap | OECD | Gap between actual and potential GDP, % of potential GDP |
| Public debt | OECD | General government consolidated gross debt, % of GDP |
| CPI inflation | OECD | Annual average rate of change in CPI, % |
| CPI core inflation | OECD | Annual average rate of change in CPI (all items non-food non-energy), % |
| CPI energy inflation | OECD | Annual average rate of change in CPI (energy), % |
| CPI food inflation | OECD | Annual average rate of change in CPI (food and non-alcoholic beverages), % |
| Interest rate | OECD | Nominal long-term interest rate (10-year sovereign bond yield), % |
| GDP growth | OECD | Change in GDP at constant prices, % |
| Current account balance | OECD | Current account balance, % of GDP |

Table A.3: Descriptive statistics – whole sample

| Variable | Mean | Median | Standard Deviation | Min | Max |
|---|---|---|---|---|---|
| Primary balance | -0.371 | -0.243 | 3.597 | -29.896 | 15.826 |
| Output gap | -0.5 | -0.346 | 3.103 | -17.07 | 17.145 |
| Public debt | 59.186 | 50.902 | 38.7 | 3.765 | 259.433 |
| CPI inflation | 11.41 | 2.925 | 58.912 | -4.478 | 1281.444 |
| CPI core inflation | 5.787 | 2.4 | 17.31 | -4.304 | 371.939 |
| CPI energy inflation | 7.176 | 4.491 | 19.942 | -23.027 | 376.594 |
| CPI food inflation | 7.118 | 2.807 | 27.622 | -13.846 | 773.987 |
| Interest rate | 6.03 | 5.042 | 4.447 | -0.524 | 29.742 |
| GDP growth | 2.751 | 2.781 | 3.275 | -14.839 | 25.383 |
| Current account balance | -0.977 | -0.729 | 11.785 | -172.09 | 78.82 |

Table A.4: Descriptive statistics – estimation sample

| Variable | Mean | Median | Standard Deviation | Min | Max |
|---|---|---|---|---|---|
| Primary balance | -0.391 | -0.346 | 3.732 | -29.896 | 15.826 |
| Output gap | -0.582 | -0.396 | 2.993 | -17.07 | 17.145 |
| Public debt | 63.971 | 55.993 | 39.111 | 3.902 | 259.433 |
| CPI inflation | 2.584 | 2.14 | 2.381 | -4.478 | 15.402 |
| CPI core inflation | 2.459 | 1.921 | 2.345 | -4.304 | 14.748 |
| CPI energy inflation | 3.756 | 3.548 | 7.069 | -20.27 | 44.519 |
| CPI food inflation | 2.525 | 2.047 | 3.011 | -7.914 | 18.263 |
| Interest rate | 5.017 | 4.553 | 3.613 | -0.524 | 22.498 |
| GDP growth | 2.294 | 2.405 | 3.026 | -14.839 | 25.383 |
| Current account balance | -0.597 | 0.082 | 13.479 | -172.09 | 78.82 |

# B Cointegration

Table B.1: Cointegration between fiscal responsiveness and inflation

| Test \Inflation | Headline | Core | Energy | Food |
|---|---|---|---|---|
| Westerlund | | | | |
| 1. All panels | -3.7712 | -4.3020 | -3.0428 | -3.5699 |
| | (0.0001) | (0.0000) | (0.0012) | (0.0002) |
| 2. Some panels | -4.1790 | -4.0284 | -2.0800 | -2.7405 |
| | (0.0000) | (0.0000) | (0.0188) | (0.0031) |
| Pedroni | | | | |
| 1. Modified Phillips-Perron t | -0.6394 | -0.7244 | 0.2564 | -0.2019 |
| | (0.2613) | (0.2344) | (0.3988) | (0.4200) |
| 2. Phillips-Perron t | 1.7511 | 1.7457 | 2.7307 | 1.9064 |
| | (0.0400) | (0.0404) | (0.0032) | (0.0283) |
| 3. Adjusted Phillips-Perron t | 2.7847 | 2.7527 | 3.7425 | 2.0374 |
| | (0.0027) | (0.0030) | (0.0001) | (0.0208) |
| Kao | | | | |
| 1. Modified Dickey-Fuller t | 0.8966 | 0.5976 | -1.6198 | 2.2383 |
| | (0.1850) | (0.2750) | (0.0526) | (0.0126) |
| 2. Dickey-Fuller t | 0.7313 | 0.4938 | -1.0176 | 2.1543 |
| | (0.2323) | (0.3093) | (0.1544) | (0.0156) |
| 3. Augmented Dickey-Fuller t | -1.8472 | -2.0107 | -3.6420 | -0.0254 |
| | (0.0324) | (0.0222) | (0.0001) | (0.4899) |
| 4. Unadjusted modified | -2.4982 | -2.5244 | -1.8976 | -2.5076 |
| Dickey-Fuller t | (0.0062) | (0.0058) | (0.0289) | (0.0061) |
| 5. Unadjusted Dickey-Fuller t | -1.7146 | -1.6867 | -1.1794 | -1.7382 |
| | (0.0432) | (0.0458) | (0.1191) | (0.0411) |

Notes: Results of cointegration tests between dependent variable $\beta_{it}$ and independent variable $\pi_{it}$ in Equation 5. For the inflation measure, the headline, core, energy and food inflation rates are used in turn. Westerlund Test 1. H0: No cointegration. Ha: Some panels are cointegrated. Westerlund Test 2. H0: No cointegration. Ha: All panels are cointegrated. Pedroni. H0: No cointegration. Ha: All panels are cointegrated. Kao. H0: No cointegration. Ha: All panels are cointegrated.

# C Fiscal responsiveness

Table C.1: The share of countries with a responsive fiscal policy

| Decade | OECD | Euro Area |
|---|---|---|
| 1980s | 37.5% | 40.9% |
| 1990s | 42.2% | 55.0% |
| 2000s | 38.6% | 42.0% |
| 2010s | 34.4% | 39.4% |
| 2020-2021 | 18.1% | 23.5% |

Notes: The percentage shows the average share of countries in each decade that conduct a sustainable fiscal policy that is sufficiently responsive to the debt-to-GDP ratio, where the $\beta_t$ coefficient in Equation 2 is statistically significantly above zero at the 95% confidence level.