DYNAMICS OF GOVERNMENT SPENDING CYCLICALITY

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Abstract

Government spending policy has an important macroeconomic stabilization role. We empirically revisit the computation of fiscal cyclicality measures by employing a novel time-varying approach while explicitly dealing with endogeneity concerns. Analyzing a sample of 36 advanced economies from 1970 to 2015, the focus of the paper is on the spending side of the budget and its components. The average government spending cyclicality is -0.9, pointing to sample counter-cyclicality. However, there is considerable cross-country heterogeneity: in less than 50 percent of the sample cyclicality coefficients are negative and statistically significant. We also uncover that government spending has become increasingly more countercyclical between 1970 and mid-1990s. Several factors drive the degree of spending cyclicality. More developed economies (more open to trade) tend to have a smaller (higher) degree of spending procyclicality. Countries with larger governments and those with better institutions are able to provide more fiscal stabilization.

Keywords: government expenditure; budgetary components; time-varying coefficients; weighted least squares; panel data; executive constraints

JEL codes: E62, H50, H60

1. Introduction

From a policymaking point of view, it is important to understand how fiscal policy behaves over the business cycle. Today´s need for government´s greater (fiscal) accountability, discipline and effectiveness, has led many practioneers and academics to revive the debate around the best policy options at a time a budget is designed. In normal times, fiscal discussions are centered around which taxes and/or spending items to decrease and/or decrease (e.g. Jha et al., 2014; Hur et al., 2014).[1] Such discussions should be carried out mindful of the need to have a fiscal policy that does not destabilize the economy. Most tend to argue in favor of governments implementing countercyclical fiscal policies (e.g. Lane, 2003) since this is associated with higher macroeconomic stabilization (e.g. Fatas and Mihov, 2013; Furceri and Jalles, 2018). Empirical papers looking at this issue are of two types: i) those that document the cyclical properties of fiscal policy and/or its components; ii) those that empirically assess the drivers of fiscal cyclicality.

The cyclical properties of fiscal policy can be analyzed at the aggregate budget level or, more granularly, by splitting the budget into its revenue and expenditure components. In this paper, we take the latter approach; that is, we focus on the expenditure side of the budget to add new insights on the fiscal cyclicality debate. Expenditure patterns can change as a result of decision markers´ discretion or as the result of the operation of the so-called automatic stabilizers (Granado et al., 2013). Expenditure policy can stabilize a given economy if one of its components rises increases when output falls and decreases when output rises (Furceri, 2010). The more countercyclical government spending is, the higher its stabilizing effect. Most empirical studies looking at the cyclical properties of government expenditure normally find: i) an acyclical or countercyclical pattern in advanced economies (Hallerberg and Strauch, 2002); ii) a procyclical behavior in developing countries (Gavin et al., 1996; Kaminsky et al, 2004; Alesina and Tabellini, 2005).

This paper answers two research questions. First, we ask whether government expenditure policy has been procyclical or countercyclical in advanced economies and how has its degree evolved over time. Second, we shed new light on the key drivers of the government spending cyclicality. We answer these questions using a novel empirical strategy that involves the estimation of country-specific time-varying government spending cyclicality measures. For this purpose, we

[1] We thank the editor for this comment.

use an unbalanced panel of 36 advanced countries between 1970 and 2015. To the best of our knowledge, this is the first paper estimating time-varying cyclicality measures of different categories of government spending. Aware of potential reverse causation issues, we take an endogeneity-robust approach prior to the estimation of time-varying cyclicality coefficients. This is something also not dealt with in a consistent manner in previous studies doing cross-country analyses. Moreover, the use of such time-varying cyclicality measures in a panel regression setting, overcomes the major limitation of previous papers that rely on cross-country regressions and are not able to account for country-specific as well as global factors. Relative to Lane's (2003) contribution, this paper not only extends the sample from 22 to 36 countries but, more importantly, it explores the dynamic aspect of fiscal cyclicality.

We find that, on average, an increase in output growth by 1 percentage point reduces government spending by 0.9 percentage points. However, there is considerable cross-country heterogeneity. For the different spending categories, both spending on wages and goods and services show an average cyclicality coefficient that is negative, suggesting a counter-cyclical behavior. In contrast, public investment comes out procyclical with a coefficient of 1.3. we also uncover that government spending has become increasingly more countercyclical between 1970 and mid-1990s. In terms of key determinants of fiscal cyclicality, economies more open to trade seem to be conduct a more procyclical fiscal (spending) policy. In contrast, government spending cyclicality is robustly and negatively associated with the level of financial development and financial openness. Finally, the better the institutional quality and the larger the government, the lower the degree of government spending procyclicality.

The remainder of the paper is organized as follows. Section 2 reviews the related literature. Section 3 describes the methodology and identifies the data used in the empirical analysis. Section 4 presents key stylized facts and discusses the empirical results. Section 5 concludes.

2. Literature Review

In order to stabilize the economy, policymakers should increase public spending during an economic downturn and reduce it during a boom. This is a desirable budgetary feature and a characteristic that is present in most advanced countries (Lane, 2003; Talvi and Vegh, 2005;

Staehr, 2008; Egert, 2010).[2] In contrast, Gavin et al. (1996) highlighted that the reality in the developing world was of expenditure policy procyclicality - a behaviour that reinforces cycles (Kaminsky et al., 2004; Talvi and Vegh, 2005; Ilzetzki and Vegh, 2008; Diallo, 2009; Abdih et al., 2010). This "desirability" feature is justified with the fact that fiscally pro-cyclical countries have witnesses lower rates of economic growth, higher rates of output volatility and higher rates of inflation (McManus and Ozkan, 2015). The procyclical behaviour of fiscal policy has been especially evident during times of financial distress (Real and Vicente, 2008; Vegh and Vuletin, 2012). Frankel et al. (2013) showed that about one third of developing countries are on good track to escape what he calls the procyclicality trap. In fact, according to Alberola et al. (2016) in Latin America, for instance, fiscal policies became countercyclical during the crisis but returned to procyclical patterns in more recent years.

Several explanations have been developed to justify the cyclical patterns that characterize different groups of countries. To explain the procyclicality behaviour present in most developing countries, many advance the presence of inadequate access to international credit markets and/or the lack of financial depth (Gavin et al., 1996; Gavin and Perotti, 1997; Calderon and Schmidt-Hebbel, 2008) as key reasons. However, Alberola et al. (2016) show that financing conditions while important have seen their relevance diminished recently. In fact, the reduction of procyclicality in developing countries may also have been the result of export diversification and adoption of fiscal butters, as argued by Ouedraogo and Sourouema (2018).Some other authors have highlighted the role of political distortions and/or weak institutions in affecting the degree of fiscal cyclicality (Tornell and Lane, 1999; Alesina et al., 2008; Talvi and Vegh, 2005; Fatas and Mihov 2013; Abbott et al., 2015; Acemoglu et al. 2019). Recently, Attinasi et al. (2019) showed that more efficient national institutions helped mitigating pro-cyclical fiscal behaviours in good times. Relatedly, some have advocated the importance of fiscal rules in curbing the procyclical behaviour, particularly in high-debt contexts (Combes et al., 2017; Bergman and Hutchison, 2018). Some of these are aspects will be explored in detail in the second part of the empirical analysis.

[2] Note however that Gali and Perotti (2003) provided earlier evidence of pro-cyclicality of government spending in the euro area countries, particularly in the period preceding the Maastricht Treaty. Implementation lags and inconsistent incentives are among the possible explanations underlying the observed pro-cyclical behavior of expenditure policies in these countries.

3. Empirical Methodology and Data

3.1 How to measure Fiscal Cyclicality?

The first step in our empirical analysis consists in estimating the degree of government spending cyclicality in each country *i*. We do so by obtaining the response of changes in a given government spending category to changes in economic activity. We follow Lane (1998, 2003) and Woo (2009) and estimate the following reduced-form equation:

$$\Delta \ln(s_i) = \alpha_i + \beta_i \Delta \ln(y_i) + \varepsilon_i \quad (1)$$

where *s* denotes government spending (or one of its categories), expressed in real terms using the GDP deflator (since we do not want to erase any growth in government expenditure stemming from an increase in relative prices of public sector outputs – Lane, 2003). y_i denotes a measure of economic activity—proxied by real GDP growth.[3] Δ denotes the first difference operator and $\ln(\bullet)$ the natural logarithm. Our main coefficient of interest is β_i which measures the degree of fiscal cyclicality in country *i*: if $\beta_i > 0$ we have a procyclical behavior; if $\beta_i < 0$ we have a counter-cyclical behavior.[4] The following public spending categories are considered: total expenditure (*exp*), spending on wages and salaries (*wage*), public investment (*capital*), spending on goods and services (*gs*), non-interest current government expenditure or primary spending (*nonint*), and debt interest payments (*interest*).[5] Equation (1) is first estimated with Ordinary Least Squares, with a correction for first-order serial correlation in the error term. Data come from the International Monetary Fund´s World Economic Outlook and Government Financial Statistics databases.

We then generalize equation (1) by assuming its coefficients can vary over time:

$$\Delta \ln(s_{it}) = \alpha_{it} + \beta_{it} \Delta \ln(y_{it}) + \varepsilon_{it} \quad (2)$$

[3] Using the output gap - computed using the HP filter - instead yields similar results (available upon request).
[4] Similarly to Lane (2003), we prefer the regression-based measure of cyclicality instead of the alternative pairwise correlation of HP-filtered series employed by e.g. Agenor et al. (1999) or Talvi and Vegh (2000).For our own purposes - with a new time-varying approach -, this alternative method would not work.
[5] For some countries, some categories of government spending are available for only a more limited time interval.

β is assumed to change slowly and unsystematically over time and its conditional expected value today equals its yesterday value. The change in β is denoted by $v_{i,t}$, which is assumed to be normally distributed with expectation zero and variance σ_i^2:

$$\beta_{it} = \beta_{it-1} + v_{it} \tag{3}$$

The Varying-Coefficient model proposed by Schlicht (1985) is employed to jointly estimate equations (2) and (3). Variances σ_i^2 are calculated by a method-of-moments estimator that coincides with the maximum-likelihood estimator in large samples (see Schlicht, 1985; Schlicht, 2003; Schlicht and Ludsteck, 2006 for more details).[6] Equations (2) and (3) generalize equation (1) that is obtained as a special case when the variance of the disturbances approaches zero.

According to Aghion and Marinescu (2008), this method has multiple advantages compared to alternative approaches to compute time-varying coefficients. First, changes in the degree of government spending cyclicality in a given year come from innovations in the same year, rather than from shocks occurring in neighboring years. Second, this approach allows using all observations in the sample to estimate the degree of government spending cyclicality in each year—which, for instance, by construction is not possible in the rolling windows approach. Third, it reflects that policy changes are slow moving and depend on the immediate past. Fourth, reverse causality is reduced particularly when the measure of cyclicality is used as regressor as it depends on its own past (see next sub-section).

3.2 Which factors explain cross-country differences in cyclicality?

In our second step, we empirically evaluate the importance of various factors determining the degree of (the time-varying) government spending cyclicality. There is only one other study that – to the best of our knowledge - assessed the determinants of fiscal cyclicality at the general level (but not looking at budgetary components) using time-varying measures. This work is by

[6] Schlicht´s (2003) approach is very similar to the one used by Aghion and Marinescu (2008). The main difference is in the computation of the variances σ_i^2. Aghion and Marinescu (2008) use the Markov Chain Monte Carlo method to approximate these variances, while Schlicht (2003) uses a method-of-moments.

Aghion and Marinescu (2008) but they focused on a relatively smaller sample of 19 advanced economies. We estimate the following regression on a larger panel of 36 advanced economies for which we have time-varying estimates of government spending cyclicality for at least 20 continuous years[7]:

$$\hat{\beta}_{it} = \delta_i + \gamma_t + \boldsymbol{\theta}'\boldsymbol{X}_{\boldsymbol{it-1}} + \epsilon_{it} \quad (4)$$

where $\hat{\beta}_{it}$ denote the time-varying estimates obtained earlier, δ_i are country-fixed effects to capture cross-country unobserved heterogeneity and time-unvarying factors; γ_t are time-fixed effects to control for global shocks; and $\boldsymbol{X}_{\boldsymbol{it}}$ is a vector of time-varying macroeconomic, financial and institutional variables.[8] To minimize reverse causality problems, all regressors enter with one lag.

As far as macroeconomic variables are concerned, we include real GDP per capita as a proxy of economic development in line with Lane (2003). Government size has been found to be one of the most important drivers of fiscal cyclicality (Gali, 1994; Debrun et al., 2008; Debrun and Kapoor, 2011; Woo, 2009; Furceri, 2010; Afonso and Jalles, 2013; Fatas and Mihov, 2013; Furceri and Jalles, 2018). For this reason, we include the share of public sector employees in total employment (from the OECD database) to capture the potential power of (typically highly unionized) public workers in affecting government's policy. Several variables have been used as proxies of the stringency of financial constraints. One is the degree of trade openness (defined as the sum of exports and imports over GDP) (Rodrik, 1998). Another variable is the Chinn-Ito Index of capital account openness which has been found to affect fiscal cyclicality as foreign capital tends to flow in (out) during expansions (recessions), therefore increasing the cost of financing counter-cyclical fiscal policies (Aghion and Marinescu, 2008). We also include a measure of financial deepening, namely the private credit-to-GDP ratio.[9] The institutional variable we use comes from Henisz (2000); specifically we focus on constrains on the executive which captures

[7] The full list of countries is provided in the Appendix. Note that not all countries considered have been labelled "advanced" all the time (e.g. Hong Kong, Iceland, Israel, Singapore). Given our long time horizon, we also re-did the second stage analysis dropping such less mature countries and results remained qualitatively unchanged.

[8] See the Appendix Tables A1 and A2 for sources, definitions and summary statistics.

[9] Other financial variables that have been employed include credit ratings and the spread of sovereign debt over the US debt (Alesina et al., 2008). We are not using these since they would further reduce the sample size.

potential veto points on the decisions of the executive.[10] Finally, output volatility is measured as the 5-year rolling standard deviation of real GDP growth.[11]

The dependent variable in equation (4) is based on estimates meaning that the residuals from that regression can be thought of having two components. The first, is sampling error; the second, is the random shock that would have been obtained even if the dependent variable was observed directly. Consequently, equation (4) is also estimated using Weighted Least Squares (WLS) to account for the presence of this un-measurable error term. The WLS estimator assumes that the errors ϵ_{it} are distributed as $\epsilon_{it} \sim N(0, \sigma^2/s_i)$, where s_{it} are the estimated standard deviations of the cyclicality coefficient for each country i, and σ^2 is an unknown parameter estimated in the second-stage regression.

4. Stylized Facts

4.1 Static Cyclicality Estimates

Figure 1 plots the histograms for the estimated β coefficients for total government spending and its different spending categories. The average total government spending cyclicality coefficient is -0.9 – this means that an increase in output growth by 1 percentage point reduces government spending by 0.9 percentage points. However, there is considerable heterogeneity; the standard deviation of the estimated β coefficients is 0.79. For the different spending categories, both spending on wages and goods and services show an average cyclicality coefficient that is negative and around 0.9, suggesting a counter-cyclical behavior. In contrast, public investment comes out procyclical with a coefficient of 1.3 and an even higher dispersion than overall government expenditure. Both primary expenditure and interest payments behave countercyclically.

[insert Figure 1]

Table 1 shows the country-specific static β coefficients for each country in our sample. Looking at specification 1 for total government spending we can observe that most coefficient

[10] Other studies have employed variants of this proxy (e.g. Acemoglu et al., 2019).
[11] Replacing real GDP growth by the output gap does not change the main thrust of our results.

estimates are negative, suggesting fiscal counter-cyclicality. However, only 14 out of 36 (roughly 39 percent of the sample) are statistically significant at usual levels. In four countries (Switzerland, Latvia, Hong Kong and Italy) coefficient estimates are positive but insignificant. Looking at spending components it is clear there is a great deal of cross-country heterogeneity on coefficients´ magnitudes and degree of statistical significance.

[insert Table 1]

As a first robustness exercise we get inspiration by the fact that Sorensen et al. (2001) explored the same relationship based on first differences in levels, rather than in logs. Following Lane's (2003) invitation in his footnote 11 - "*it would be interesting to explore this alternative hypothesis in future work*" – we estimate the following alternative equation for total government expenditures:

$$\Delta(RGEXP_i) = \alpha_i + \beta_i \Delta\,(\mathrm{RGDP}_i) + \varepsilon_i \qquad (5)$$

where $RGEXP$ and RGDP denote real government expenditure and real GDP, respectively.

Figure 2 plots the baseline cyclicality coefficients of government spending against the new estimates computed using first differences in levels (equation 5). The correlation between the two is 40 percent and the obtained cyclicality estimates tend to be larger in absolute value in the baseline case (blue bars).

[insert Figure 2]

As a second robustness check, we also pursued an instrumental-variable estimation (similarly to Lane, 2003).. The model described by equation (1) is a reduced-form one and it does not legitimize causal statements or even immediate quantification of the effect of output on government spending (or one of its categories). Since causality can run in both directions, the key right-hand-side regressor – output growth – may be correlated with the error term. The weighted-average output growth rate of a country's trading partners and the lag of domestic output growth are employed as instruments for the domestic output growth rate in a two-stage least square (TSLS)

regression.[12] For the case of total government expenditure, the comparison between the country-specific OLS cyclicality coefficients and those stemming from the alternative IV approach, are displayed in Figure A1 in the Appendix. In general, IV cyclicality estimates are larger in absolute value than OLS ones, suggesting that some endogeneity might be present (but depends on the country under scrutiny).

While useful, a focus only on averages (that is, taking a static approach) misses the substantial heterogeneity illustrated earlier as well as the temporal dynamics. Understanding some of the sources of this heterogeneity requires a closer look. We turn to these aspects in the following (sub-)sections.

4.2 Dynamic Cyclicality Estimates

We now allow β to be time-varying and jointly estimate equations (2) and (3). In Figure 3, we plot the interquartile range of the time-varying cyclicality coefficients estimated using the IV approach. That is, we run for each country a first stage regression of domestic real GDP growth on its lag and the contemporaneous weighted-average output growth rate of a country's trading partners and then retrieve the country-specific fitted values. In a second stage, we estimate a time-varying regression of each spending category on the fitted growth variable.[13]

[insert Figure 3]

As a first observation, the median government spending cyclicality has increased in absolute value between 1970 and mid 1990s (that is, it has become more negative or countercyclical). Our finding is consistent with the literature emphasizing strong counter-cyclical fiscal policy in advanced economies (Gavin and Perotti, 1997; Talvi and Vegh, 2005; Aghion and Marinescu, 2008). It then reverted a bit in the 1990s and resumed its countercyclical path in the 2000s (Figure 3 for total government expenditures). The (EU) debt crisis in 2011/12 led to some procyclical correction. Spending on wages and salaries is the most countercyclical government spending

[12] First stage regressions (not shown) have good explanatory power. In particular, the Kleibergen-Paap test generally confirms the validity of the set of instruments.
[13] The starting date for each chart is dictated by data availability.

component. To a lesser extent, public investment showed an increase in the degree of its countercyclicality in the 1990s which partially corrected afterwards. As far as other spending items are concerned, there were some movements over the 1980-2015 period, but they remained relatively stable and countercyclical.

The second observation concerns the country heterogeneity hidden by the time profile previously covered. Figure 4 plots the individual country charts. While each country has its own pattern, government spending countercyclicality increased over time in about 15 out of 36 countries (e.g. Australia, Austria, Israel, Korea, UK or US). In contrast, fiscal policy has become more procyclical in Denmark, Iceland, Ireland, Germany, Japan, Portugal and the Netherlands. In the remainder set of countries time profiles are more varied. The Global Financial Crisis had an impact on the cyclicality pattern in most countries, either accentuating it, or reverting it.

[insert Figure 4]

Country specific time-varying charts for each of the remaining spending categories are available in Figure A2 in the Appendix. A few comments are worth making without being exhaustive. The degree of wages and salaries´ spending countercyclicality has increased over time in most countries until the Global Financial Crisis, time when we observe a kink upwards towards a less countercyclical behavior. Concerning goods and services, in several countries spending countercyclicality increased over time (e.g. Finland, Korea, New Zealand, Switzerland, UK, US). In others, this spending category has become more procyclical over time (e.g. Ireland, Italy, Japan, Portugal, Spain, Sweden). In the case of capital spending cyclicality, in most countries the Global Financial Crisis made this spending category more procyclical in the recent years. When it comes to primary spending cyclicality, we also have a heterogeneous picture: countries such as Austria, Denmark, Iceland, Ireland, Italy, Sweden, have seen their degree of countercyclicality declining over time; in contrast, in countries such as Hong Kong, Korea, Singapore, Taiwan, UK and US, saw the opposite movement.

5. Empirical Results

We begin our analysis of the determinants of fiscal cyclicality by estimating equation (4). Table 2 shows the results for government spending cyclicality and includes one regressor at the time in specifications 1-7 and then a baseline multivariate regression (specification 8) and two additional variants (specifications 9-10).

Starting with the set of macroeconomic and financial variables, we find that government spending cyclicality is robustly and negatively associated with the level of financial development. A higher credit-to-GDP ratio positively influences the ability of the government to borrow (particularly during downturns) and, therefore, it is expected to decrease the degree of fiscal procyclicality. In our estimations an increase of 10 percentage points in the credit-to-GDP ratio lowers the degree procyclicality by about 0.6 (i.e. by 1.3 standard deviations). A similar effect comes from financial openness. We also find that more developed economies tend to have a smaller degree of procyclicality. The rationale behind this result being that the capacity to implement fiscal control procedures (and have more fiscal discipline) tends to be positively correlated with the level of development. This is in accordance with the so-called Talvi-Vegh (2005) hypothesis (which relates to Kraay and Ventura's (1999) finding) which states that volatility and output per capita are inversely correlated and not including the latter would likely result in omitted variable bias. In contrast, advanced economies more open to trade seem to be conduct a more procyclical fiscal (spending) policy. This is in line with the literature since economies that are more open to trade tend to be more exposed to external shocks and may use more actively fiscal policies (Rodrik, 1998; Lane, 2003; Woo, 2009). Countries with larger governments are also able to provide more stabilization: an increase of 10 percent in the share of public sector employment reduces procyclicality by about 0.1 (i.e., 0.25 standard deviations). As Lane (2003) puts it, another reason to explicitly consider the size of public sector is that this variable is negatively correlated with output volatility (Gali,1994; Fatas and Mihov, 2001) so it is necessary to control for it. Looking at the institutional variables, we find that constraints on the executive are robustly negatively and significantly associated with procyclicality. The results are consistent with evidence provided in Lane (2003) and Fatas and Mihov (2013). As argued by Fatas and Mihov (2013), (political) constraints – meaning a larger number of veto points (less power dispersion) – are likely to reduce government spending volatility and positively influence fiscal

stabilization and economic growth.[14] Finally, the larger business cycle fluctuations, the more procyclical fiscal policy will be.

[insert Table 2]

In Table 3 we repeat the exercise for remainder categories of spending (including the baseline result for total expenditures that corresponds to specification 6 in table 2).[15] The key differences worth mentioning are as follows. First, with the exception of interest payments, the level of development robustly comes out as a significant determinant negatively affecting the degree of cyclicality in the case of spending on wages and salaries (in line with Lane (2003) – relative public wages are more countercyclical the richer nations are) and in the case of public investment.

Second, also in line with Lane (2003), the more open an economy is, the more procyclical its public investment will be.[16] The opposite is true for interest payments´ cyclicality.

As far as institutional variables are concerned, increased volatility rises the degree of cyclicality of most expenditure categories except wages and salaries. Political constraints come out positive (negative) and significant in affecting the degree of public investment (interest payments) cyclicality. Talvi and Vegh (2005) wrote a model in which political economy factors generated a procyclical fiscal bias. Specifically, they stated that lobbying pressures (which proxy political distortions) for higher public (investment) spending were particularly acute during booms. All in all, institutional factors are relatively more important in explaining procyclicality in the case of public investment and interest payments.

Finally, the relative size of the government generates countercyclicality in all spending categories, except interest payments. As a larger share of the annual budget is used to pay public sector employees' wages and salaries, there will be less scope (that is, less fiscal space) for the government to conduct procyclical fiscal policy (at least from the expenditure side of the budget).

[insert Table 3]

[14] Note that some of the empirical evidence in Lane (2003) did not find the "correct" (expected) sign for the coefficient on political constraints as he himself notices. He does not offer any explanation for that fact though.
[15] We get similar results using contemporaneous regressors (see Table A3 in the Appendix).
[16] According to this author the coefficient obtained for trade openness in his cross-sectional analysis was found to be ten times larger than its contribution to the other spending categories.

Table 4 takes into account the time-varying coefficient estimates' uncertainty and re-estimates the panel version of equation (4) via WLS. In general, the previous set of results are kept with a few differences. Political constraints come out now positive and significant in affecting goods and services' procyclicality, but this variable loses statistical significance in the case of interest payments. Also trade openness no longer significantly affects interest payments' procyclicality as it did in the the case of OLS estimation. Finally, government size turns out negative and significant in the case of interest payments (it was already negative but insignificant before).[17]

[insert Table 4]

Interestingly, we also explored how the different determinants' importance altered over time by splitting the time span before and after 2000 (Table 5).[18] The most noticeable findings are the following. First, economic volatility and trade openness seem to positively affect spending cyclicality more strongly in the recent period than in earlier years. This is a feature of the upward trend in globalization we have witnessed in recent times. Sincetrade openness increases economic volatility, governments respond to trade-induced changes in relative incomes by engaging into redistributive policies (Rodrik, 1998). Second, government size (political constraints) negatively (positively) affects spending cyclicality more strongly in earlier years than in the most recent period. On the one hand, recall that the most dramatic institutional changes in advanced economies (regime changes, democratization, etc.) took place in the 1970´s and 1980´s. On the other, the power of unionized public sector has been on a declining trend in recent years. This is the result of a shift in paradigm calling for more labor market reforms aimed at deregulating, liberalizing and creating greater flexibility in many rules and procedures, so as to increase competitiveness, efficiency and productivity (see e.g. Duval et al., 2019).

[insert Table 5]

[17] We further conducted some sensitivity by re-estimating equation (4) first with country effects and then with country and time effects. Results are shown in Tables A4 and A5 in the Appendix.

[18] The split is arbitrary but done so as to allow a relatively similar number of observations in both sub-periods and avoid compromising too many degrees of freedom.

Finally, we checked whether outliers significantly drove our results. Sample sensitivity of some cross-country empirical studies is well known. We employed one robust estimator, the Least Absolute Deviation (LAD) which minimizes the sum of the absolute deviations. We then excluded any observations for which the LAD residual was more than two standard deviations from the mean residual, before re-estimating the model given by equation (4) by OLS. When the two sets of estimates are very different, then it may be that the observations are drawn from several different regimes, and/or the OLS estimates are driven by a few outliers. This procedure is not perfect, but helps excluding the worst outliers, including some that would not be identified by more conventional OLS diagnostics. Results presented in Table 6 suggest that outliers are not playing a critical role since coefficient estimates are qualitatively similar to those reported in Table 3.

[insert Table 6]

6. Conclusion

Fiscal policy can influence medium-term growth through its support to macroeconomic stability. Most research on the cyclicality of fiscal policy has either focused on small set of countries or looked at aggregate government variables. In this paper, we focused on a large sample of 36 advanced countries and focused on the spending side of the budget and its components to revisit the debate on fiscal cyclicality. Using time-varying estimates of government spending cyclicality, we provided a novel characterization of its behavior across countries and over time and then empirically analyzed its main macroeconomic, financial and institutional determinants. Aware of potential reverse causation issues, we take an endogeneity-robust approach prior to the estimation of time-varying cyclicality coefficients. Then, the use of time-varying cyclicality measures in a panel regression setting, overcame the major limitation of previous papers that relied solely on cross-country regressions and were not able to account for country-specific as well as global factors.

The average total government spending cyclicality coefficient is -0.9, meaning that an increase in output growth by 1 percentage point reduces government spending by 0.9 percentage points. However, there is considerable cross-country heterogeneity. Only 14 out of 36 cyclicality coefficients are negative and statistically significant (roughly 39 percent of the sample). For the different spending categories, both spending on wages and goods and services show an average

cyclicality coefficient that is negative and around 0.9, suggesting a counter-cyclical behavior. In contrast, public investment comes out procyclical with a coefficient of 1.3. Both primary expenditure and interest payments behave countercyclically. In terms of temporal dynamics, government spending has become increasingly more countercyclical between 1970 and mid-1990s. It then reverted a bit in the 1990s and resumed its countercyclical path in the 2000s. While each country has its own pattern, government spending countercyclicality increased over time in about 15 out of 36 countries. We also found that more developed economies tend to have a smaller degree of procyclicality. Moreover, government spending cyclicality is robustly and negatively associated with the level of financial development and financial openness. In contrast, economies more open to trade seem to be conduct a more procyclical fiscal (spending) policy. Countries with larger governments are also able to provide more stabilization. Finally, the better the institutional quality, the lower the degree of government spending procyclicality. Our empirical results are robust to several sensitivity checks.

In terms of policy implications, efforts to have fiscal policies behaving more countercyclicality need to consider policy reforms that seek to strengthen the ability of countries to save in good times to generate fiscal buffers that could be used in bad times. Going forward, initiatives such as the establishment of fiscal councils and the adoption of fiscal rules, the development of sound debt management strategies that reinforce fiscal discipline, and the strengthening of macro (and micro) prudential regulations are all important ingredients to be seriously considered.

Future research could consider an assessment of the key determinants of the duration of countercyclical/procyclical fiscal spells and/or inspect the cyclicality consequences (for macroeconomic stability and long-term growth) within this time-varying panel environment. Other avenues of research could consider using infra-annual (e.g. quarterly) fiscal and macroeconomic variables to look at the shorter-run dynamics of cyclicality.

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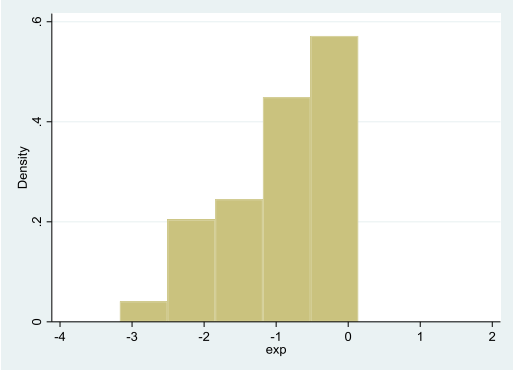
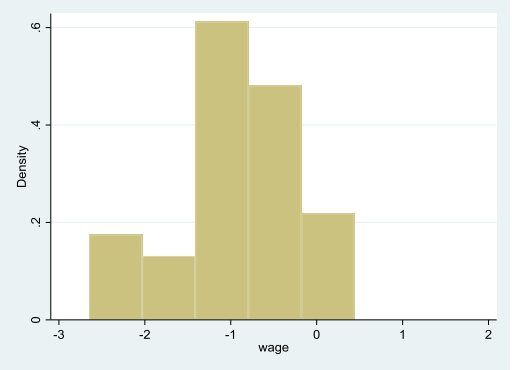
Figure 1. Histogram of Static Cyclicality Coefficient Estimates

Government Total Expenditures



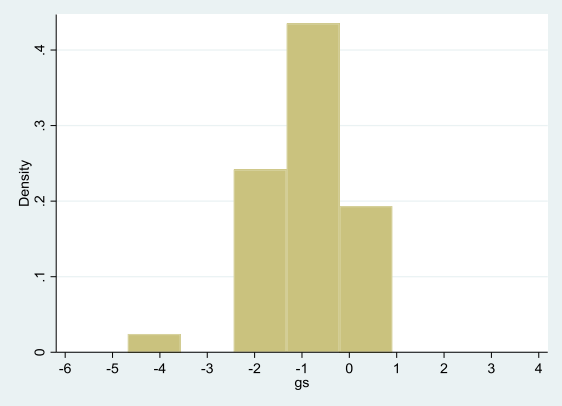
Mean: -0.92 standard deviation: 0.79

Spending on wages and salaries



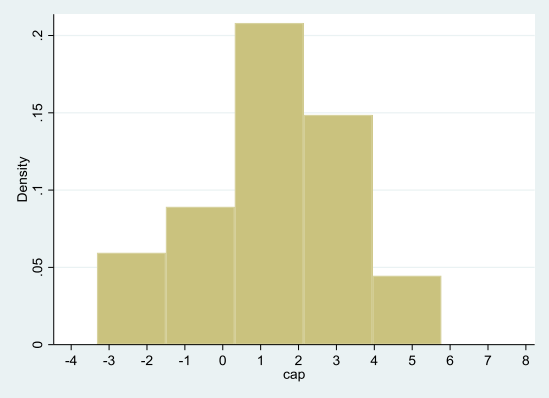
Mean: -0.92 standard deviation: 0.74

Spending on goods and services



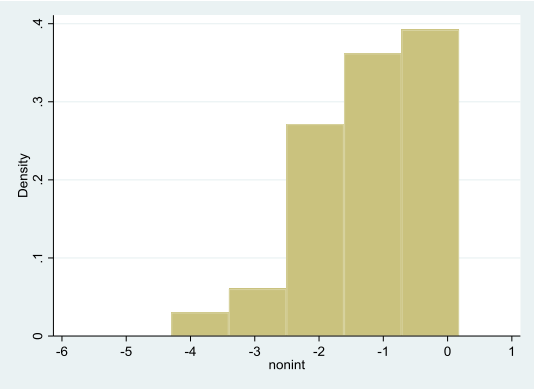
Mean: -0.93 standard deviation: 0.99

Public investment



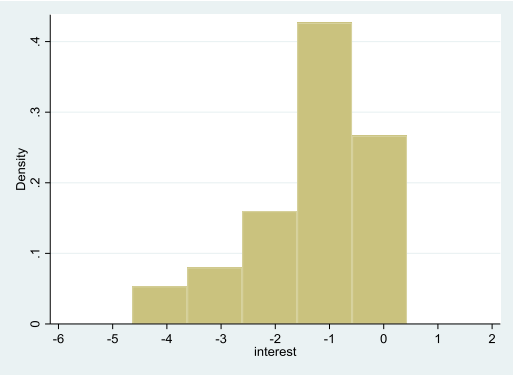
Mean: 1.34 standard deviation: 2.06

Non-interest government expenditure



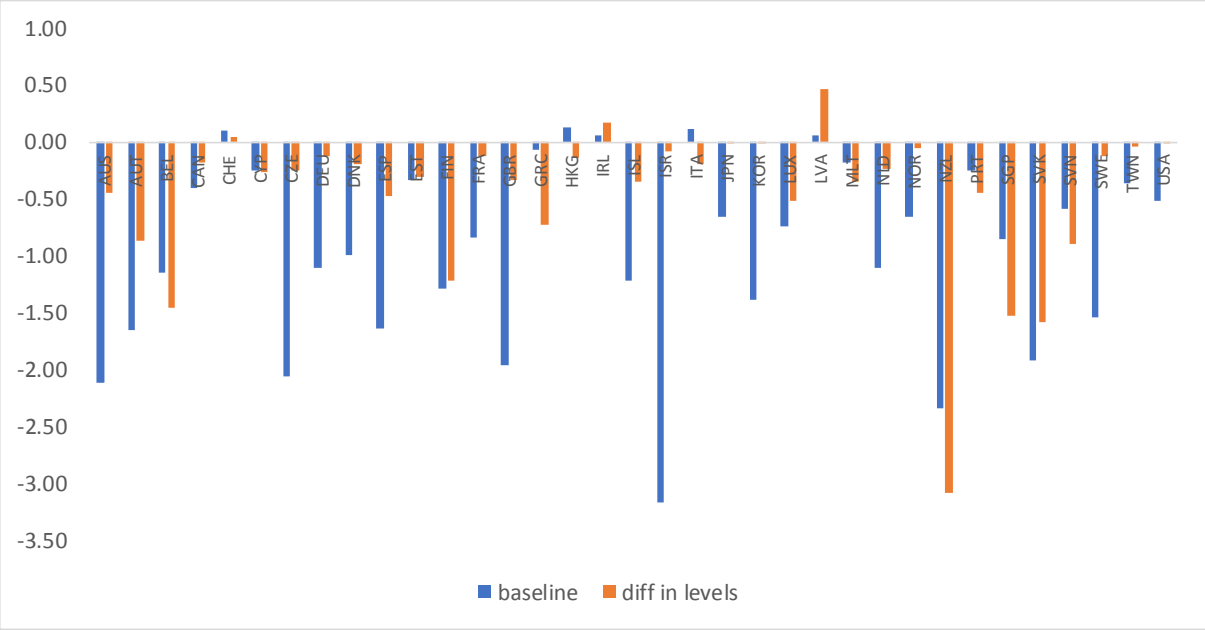
Mean: -1.22 standard deviation: 0.93

Debt interest payments



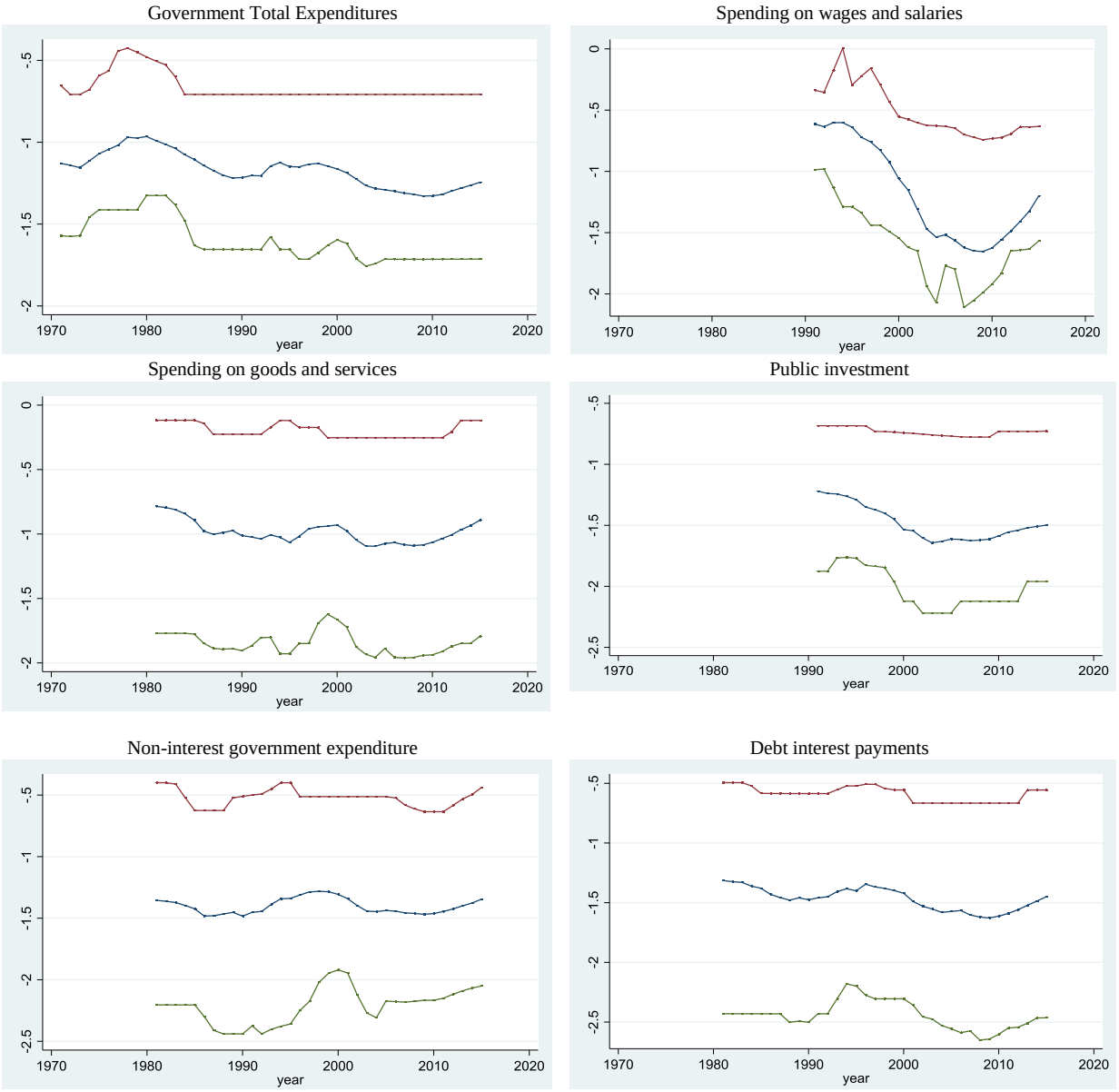
Mean: -1.34 standard deviation: 1.15

Figure 2: Government Expenditure Static Cyclicality Estimates: baseline vs difference in levels



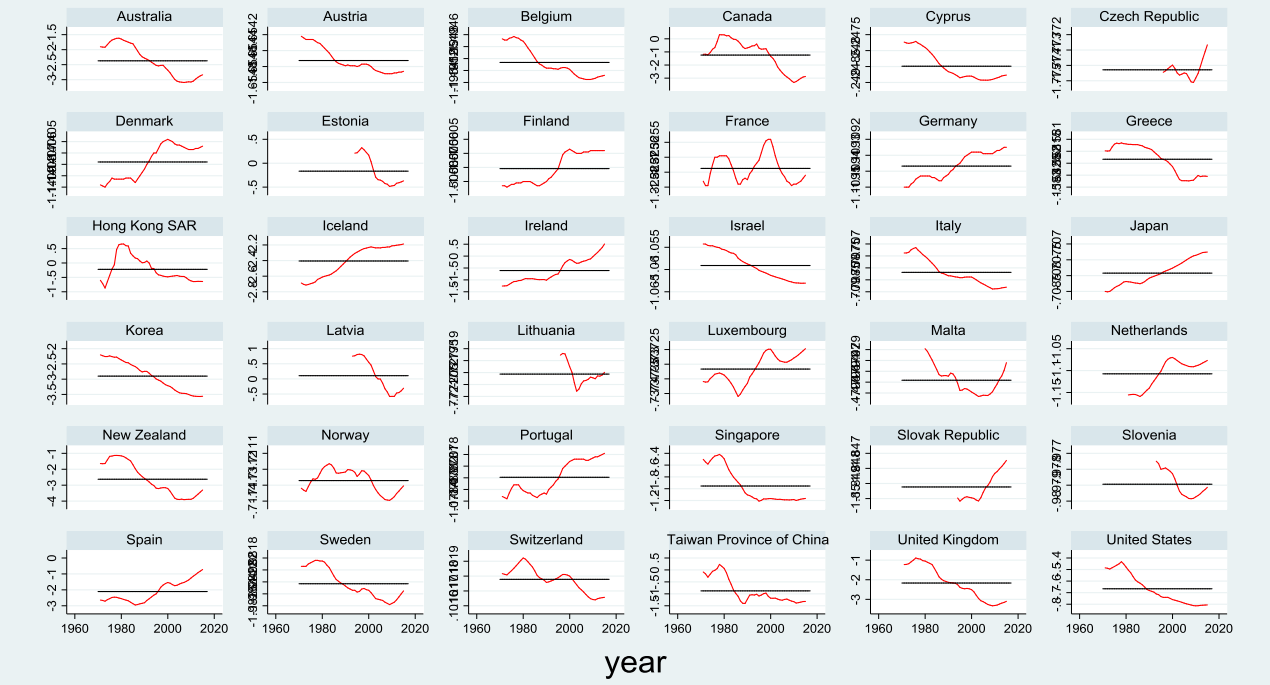
Note: baseline cyclicality coefficients based on equation (1) estimated for each country individually (blue bars). Alternative estimation of cyclicality coefficients based on equation (5) that uses differences in levels rather than in logs. See main text for details.

Figure 3: Time-Varying Government Expenditure Cyclicality: Cross-country Interquartile Range



Note: The figure displays median (blue) and first (green) and third (red) quartiles of the distribution of estimated time-varying cyclicality coefficients for the entire sample of 36 countries (with at least 20 continuous observations of each relevant fiscal variable). Starting date dictated by data availability.

Figure 4: Time-Varying Government Expenditure Cyclicality: Country Profiles over time



Note: red line denotes the time-varying coefficients (TVC) estimates; red line is the average TVC.

Table 1. Country-Specific Fiscal Cyclicality Coefficient Estimates – static approach

Specification	(1)	(2)	(3)	(4)	(5)	(6)
Countries / Dependent Variable	**exp**	**wages**	**gs**	**capital**	**nonint**	**interest**
AUS	-2.119**	-1.291	-0.785	2.544	-1.271	-0.916
AUT	-1.654***	-1.395*	-2.221**	3.695*	-2.517**	-3.154**
BEL	-1.149	-1.229	-2.126	2.562	-2.891**	-4.434**
CAN	-0.398	-1.310	-0.428	2.387	-0.812	-0.459
CHE	0.102	-1.049	0.911	-2.471	-0.625	-0.927
CYP	-0.246	-0.528	-0.452	1.854***	-0.609	-0.475
CZE	-2.064***	-2.104***	-1.687**	-0.589	-1.908***	-1.959***
DEU	-1.109*	-0.487	-0.884	1.984	-1.526*	-2.147**
DNK	-0.998	-0.428	-0.434	3.661**	-0.956	-0.642
ESP	-1.639***	-0.806	-1.948**	3.038**	-2.147**	-2.880**
EST	-0.336	-0.432*	-0.0599	0.579	-0.317	-0.533**
FIN	-1.280***	-0.981**	-0.752	1.168	-1.138**	-0.933*
FRA	-0.842	-1.280	-0.886	4.797**	-1.949*	-2.693**
GBR	-1.966***	-2.653***	-2.000**	0.461	-2.487***	-2.035
GRC	-0.0638	-0.465	-0.436	1.385*	-0.444	-0.893
HKG	0.136	-0.593*	0.210	-0.551	-0.00531	0.142
IRL	0.0602	0.444	0.276	1.571*	0.179	-0.166
ISL	-1.222	-1.474	-1.843*	-3.317**	-2.070**	-2.406*
ISR	-3.166*	-1.062	-4.675	-1.841*	-4.304	-4.635
ITA	0.118	-0.862	-0.836	3.946***	-1.471*	-1.465
JPN	-0.649	0.00439	0.262	2.754	-0.315	0.432
KOR	-1.381**	-2.178**	-1.624**	-1.853**	-1.636**	-1.228
LTU	-0.881***	-0.901***	-0.845***	0.443	-0.935***	-1.096***
LUX	-0.737	-0.195	-0.506	2.245**	-0.895	-1.295
LVA	0.0572	-0.216	0.0583	-0.531	-0.219	-0.523***
MLT	-0.182	0.338	-1.014	1.935	-0.339	-0.577
NLD	-1.104	-0.0226	-0.855	4.396***	-1.304	-2.180*
NOR	-0.654	-0.392	-0.189	5.767***	-0.194	0.172
NZL	-2.347***	-2.548**	-1.794	0.707	-2.009**	-1.554
PRT	-0.240	-0.165	-0.668	3.584***	-0.959	-1.492
SGP	-0.856***	-1.127***	-0.727***	0.747	-0.896***	-0.655
SVK	-1.923***	-1.529**	-1.996***	0.230	-1.769***	-1.784***
SVN	-0.588	-0.447	-0.585	-0.0610	-0.540	-0.910*
SWE	-1.544**	-1.858**	-1.361	0.551	-1.772**	-1.564
TWN	-0.364	-1.148***	-0.937***	0.355	-1.005***	-0.990***
USA	-0.518	-1.086**	-0.0620	1.997	-0.645***	-0.0302

Note: Table presents the government spending cyclicality coefficient estimates country-by-country. Dependent variable identified in the second row. Estimation of equation (1) – see main text for further details. If a coefficient $\beta>0$ we have a procyclical behavior; if the coefficient $\beta<0$ we have a counter-cyclical behavior.. Robust standard errors not shown. *, **, *** denote statistical significance at the 10, 5 and 1 percent levels, respectively.

Table 2. Determinants of Government Expenditure Cyclicality– dynamic approach

Specification	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**
Regressors \ Dependent Variable	**exp**	**exp**	**exp**	**exp**	**exp**	**exp**	**exp**	**exp**	**exp**	**exp**
Output volatility	0.0204*							0.0193*	0.0009	0.0155*
	(0.010)							(0.011)	(0.010)	(0.010)
Political Constraints		-0.3320***						-0.1101	-0.1823***	-0.2634***
		(0.070)						(0.121)	(0.086)	(0.078)
Real GDP per capita			-0.0663***					-0.0821***	0.0667***	-0.0863***
			(0.007)					(0.008)	(0.013)	(0.007)
Trade Openness				0.0372*				0.0499*		
				(0.021)				(0.029)		
Government Size					-0.0053***			-0.0071***	-0.0130***	-0.0039**
					(0.002)			(0.002)	(0.002)	(0.002)
Private Credit						-0.0605***			-0.0770***	
						(0.004)			(0.010)	
Financial Openness							-0.0719***			-0.0362***
							(0.010)			(0.010)
Observations	945	996	1,031	944	802	949	925	709	749	734
R-squared	0.0041	0.0220	0.0837	0.0034	0.0124	0.1764	0.0538	0.1757	0.2423	0.2108

Note: Results obtained by estimating equation (4) using time-varying estimates of the cyclicality coefficients. Estimation by Ordinary Least Squares. All regressors enter with one lag. Robust standard errors clustered at the country level in parentheses. The constant term was omitted for reasons of parsimony. ***, **, * denote significance at 1, 5 and 10 percent level, respectively.

Table 3. Determinants of Fiscal Cyclicality– dynamic approach

Specification	(1)	(2)	(3)	(4)	(5)	(6)
Regressors \ Dependent Variable	**exp (memory)**	**wages**	**gs**	**capital**	**nonint**	**interest**
Output volatility	0.0063	0.0639	0.0723*	0.1198***	0.1259***	0.1313***
	(0.011)	(0.041)	(0.039)	(0.036)	(0.037)	(0.040)
Political Constraints	-0.1101	0.5926	0.6313	1.2716***	-0.2222	-1.2997***
	(0.121)	(0.508)	(0.421)	(0.444)	(0.401)	(0.439)
Real GDP per capita	-0.0821***	-0.1757***	0.0029	-0.1112***	0.0266	0.0607**
	(0.008)	(0.029)	(0.026)	(0.026)	(0.025)	(0.028)
Trade Openness	0.0499*	0.0290	0.0249	0.2301**	0.0768	-0.2542**
	(0.029)	(0.114)	(0.102)	(0.100)	(0.097)	(0.107)
Government Size	-0.0071***	-0.0162**	-0.0206***	-0.0188***	-0.0254***	-0.0097
	(0.002)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)
Observations	709	507	709	507	709	709
R-squared	0.1757	0.0893	0.0235	0.1084	0.0547	0.0456

Note: Results obtained by estimating equation (4) using time-varying estimates of the cyclicality coefficients. Estimation by Ordinary Least Squares. All regressors enter with one lag. Robust standard errors clustered at the country level in parentheses. The constant term was omitted for reasons of parsimony. ***, **, * denote significance at 1, 5 and 10 percent level, respectively.

Table 4. Determinants of Fiscal Cyclicality– dynamic approach

Specification	(1)	(2)	(3)	(4)	(5)	(6)
Regressors \ Dependent Variable	**exp**	**wages**	**gs**	**capital**	**nonint**	**interest**
Output volatility	0.0026	0.0529*	0.0602**	0.1011***	0.1178***	0.1711***
	(0.010)	(0.027)	(0.030)	(0.026)	(0.028)	(0.025)
Political Constraints	-0.0487	0.4735	0.7177**	1.7770***	-0.2442	-0.5717
	(0.105)	(0.405)	(0.363)	(0.415)	(0.345)	(0.365)
Real GDP per capita	-0.0818***	-0.2021***	-0.1456***	-0.1731***	-0.1157***	0.2275***
	(0.007)	(0.026)	(0.023)	(0.025)	(0.022)	(0.029)
Trade Openness	0.0589**	0.0179	0.0259	0.4121***	-0.0700	-0.0952
	(0.025)	(0.090)	(0.083)	(0.091)	(0.078)	(0.081)
Government Size	-0.0071***	-0.0134**	-0.0229***	-0.0183***	-0.0278***	-0.0331***
	(0.002)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)
Observations	709	507	709	507	709	679
R-squared	0.2032	0.1421	0.0844	0.2260	0.0966	0.1657

Note: Results obtained by estimating equation (4) using time-varying estimates of the cyclicality coefficients. Estimation by Weighted Least Squares. Weights are given by the inverse of the standard deviation of the estimated cyclicality coefficients. All regressors enter with one lag. Robust standard errors clustered at the country level in parentheses. The constant term was omitted for reasons of parsimony. ***, **, * denote significance at 1, 5 and 10 percent level, respectively.

Table 5. Determinants of Fiscal Cyclicality in different periods– dynamic approach

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Regressors \ Dependent Variable	**exp**	**wages**	**gs**	**capital**	**nonint**	**interest**	**exp**	**wages**	**gs**	**capital**	**nonint**	**interest**
Time period	Before 2000						After 2000					
Output volatility	0.0221	-0.0989	-0.0735	0.0812	-0.0396	-0.0073	0.0030	0.1395***	0.1481***	0.1319***	0.2056***	0.1780***
	(0.019)	(0.064)	(0.070)	(0.066)	(0.064)	(0.070)	(0.014)	(0.047)	(0.044)	(0.044)	(0.045)	(0.048)
Political Constraints	0.0797	2.4953***	1.7100***	1.5680*	0.2168	-0.2286	-0.3228*	-0.1627	-0.2281	1.1615**	-0.5689	-1.6595***
	(0.177)	(0.819)	(0.650)	(0.845)	(0.594)	(0.650)	(0.176)	(0.598)	(0.559)	(0.551)	(0.569)	(0.608)
Real GDP per capita	-0.0740***	-0.0847***	0.0815**	-0.0392	0.1051***	0.1736***	-0.0855***	-0.1831***	-0.0677*	-0.1428***	-0.0544	-0.0556
	(0.010)	(0.032)	(0.037)	(0.033)	(0.034)	(0.037)	(0.011)	(0.039)	(0.036)	(0.036)	(0.037)	(0.040)
Trade Openness	0.1916***	0.8481***	0.1185	0.4561**	0.2531	-0.3429	0.0238	0.0655	-0.1179	0.3177**	-0.0349	-0.2146
	(0.059)	(0.181)	(0.216)	(0.186)	(0.197)	(0.216)	(0.041)	(0.139)	(0.130)	(0.128)	(0.132)	(0.141)
Government Size	-0.0126***	-0.0425***	-0.0237***	-0.0385***	-0.0284***	-0.0198**	-0.0014	-0.0027	-0.0194**	-0.0064	-0.0257***	0.0024
	(0.002)	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)	(0.003)	(0.009)	(0.008)	(0.008)	(0.009)	(0.009)
Observations	410	208	410	208	410	410	299	299	299	299	299	299
R-squared	0.1997	0.2912	0.0430	0.1698	0.0611	0.0946	0.1973	0.1265	0.0685	0.1417	0.1196	0.0773

Note: Results obtained by estimating equation (4) using time-varying estimates of the cyclicality coefficients. Estimation by Ordinary Least Squares. All regressors enter with one lag. Robust standard errors clustered at the country level in parentheses. The constant term was omitted for reasons of parsimony. ***, **, * denote significance at 1, 5 and 10 percent level, respectively.

Table 6. Robustness: Outlier-robust estimation

Specification	(1)	(2)	(3)	(4)	(5)	(6)
Regressors \ Dependent Variable	**exp**	**wages**	**gs**	**capital**	**nonint**	**interest**
Output volatility	0.0145	0.0610	0.0333	0.0940	0.1288**	0.1195*
	(0.018)	(0.070)	(0.062)	(0.061)	(0.059)	(0.065)
Political Constraints	-0.1068	0.5848	0.6115	1.2553***	-0.2504	-1.3507***
	(0.124)	(0.523)	(0.425)	(0.453)	(0.405)	(0.443)
Real GDP per capita	-0.0829***	-0.1645***	0.0250	-0.0945***	0.0431*	0.0781***
	(0.008)	(0.031)	(0.027)	(0.027)	(0.026)	(0.028)
Trade Openness	0.0478	0.0223	0.0018	0.2271**	0.0361	-0.3007***
	(0.031)	(0.120)	(0.105)	(0.104)	(0.100)	(0.109)
Government Size	-0.0069***	-0.0172**	-0.0226***	-0.0199***	-0.0270***	-0.0114*
	(0.002)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)
Observations	680	482	680	482	680	680
R-squared	0.1704	0.0733	0.0239	0.0753	0.0519	0.0503

Note: Results obtained by estimating equation (4) using time-varying estimates of the cyclicality coefficients. Least Absolute Deviation was used to exclude worst outliers – see main text for details. All regressors enter with one lag. Robust standard errors clustered at the country level in parentheses. The constant term was omitted for reasons of parsimony. ***, **, * denote significance at 1, 5 and 10 percent level, respectively.

APPENDIX

List of countries

Australia, Austria, Belgium, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Taiwan, UK, USA.

Table A1. Variables, definitions and sources

Variables	Definition	Source
Credit to GDP	Domestic credit to private sector refers to financial resources provided to the private sector by financial institutions (in percent of GDP)	World Bank, World Development Indicators
GDP per capita	Real gross domestic product divided by population	World Bank, World Development Indicators
Trade openness	Exports plus imports over GDP	IMF, International Financial Statistics
Capital account openness	KAOPEN is an index measuring a country's degree of capital account openness	Chinn-Ito Index of Financial Openness
Government expenditure to GDP	Total government expenditure to GDP ratio	IMF, International Financial Statistics
Executive constraints	This variable refers to the extent of institutionalized constraints on the decision-making powers of chief executives, whether individuals or collectivities.	Polity IV Project
Political constraints	POLCON index takes into account the number of veto points faced by the executive power, as well as the distribution of political preferences across different branches of government.	Political Constraint Dataset, Henisz (2000)
Population	Total population	World Bank, World Development Indicators

Table A2. Summary Statistics

Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
Health spending (%GDP)	1823	3.93	2.21	0.20	10.38
Social protection spending (%GDP)	1598	8.51	7.02	0.002	28.31
Pensions spending (%GDP)	1826	4.94	4.31	0.001	17.79
Education spending (% GDP)	1614	4.18	1.87	0.40	15.98
Credit to GDP (log)	2017	12.12	3.91	-13.35	21.66
GDP per capita (log)	2109	10.70	2.16	6.39	16.91
Trade openness	1856	0.675	0.471	0.108	4.38
Capital account openness	1924	0.39	1.59	-1.85	2.45
Government expenditure to GDP	2109	15.57	6.02	0.86	40.4
Regime Durability	2044	33.15	38.30	0	203
Executive constraints	2011	5.26	2.03	1	7

Table A3. Determinants of Fiscal Cyclicality Coefficients using contemporaneous regressors– dynamic approach

Specification	(1)	(2)	(3)	(4)	(5)	(6)
Regressors \ Dependent Variable	**exp**	**wages**	**gs**	**capital**	**nonint**	**interest**
Output volatility	0.0059	0.0452	0.0723*	0.1119***	0.1349***	0.1365***
	(0.011)	(0.041)	(0.039)	(0.036)	(0.037)	(0.041)
Political Constraints	-0.0923	0.7968	0.5109	1.3269***	-0.3207	-1.3634***
	(0.121)	(0.517)	(0.425)	(0.455)	(0.403)	(0.442)
Real GDP per capita	-0.0811***	-0.1705***	0.0023	-0.1077***	0.0259	0.0658**
	(0.008)	(0.030)	(0.027)	(0.026)	(0.025)	(0.028)
Trade Openness	0.0554*	0.0795	0.0086	0.2477**	0.0600	-0.2576**
	(0.029)	(0.116)	(0.103)	(0.102)	(0.098)	(0.107)
Government Size	-0.0073***	-0.0176***	-0.0207***	-0.0186***	-0.0257***	-0.0114*
	(0.002)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)
Observations	709	485	692	485	692	692
R-squared	0.1761	0.0904	0.0230	0.1079	0.0588	0.0509

Note: Results obtained by estimating equation (4) using time-varying estimates of the cyclicality coefficients. Estimation by Ordinary Least Squares. All regressors enter contemporaneously. Robust standard errors clustered at the country level in parentheses. The constant term was omitted for reasons of parsimony. ***, **, * denote significance at 1, 5 and 10 percent level, respectively.

Table A4. Determinants of Fiscal Cyclicality Coefficients with country effects– dynamic approach

Specification	(1)	(2)	(3)	(4)	(5)	(6)
Regressors \ Dependent Variable	**exp**	**wages**	**gs**	**capital**	**nonint**	**interest**
Output volatility	-0.0094	0.1368***	0.0031	0.0875***	-0.0127	0.0318*
	(0.007)	(0.029)	(0.021)	(0.021)	(0.022)	(0.019)
Political Constraints	0.0494	-0.1664	-0.4014	0.9809**	-0.5943	-1.0973***
	(0.137)	(0.592)	(0.396)	(0.423)	(0.420)	(0.374)
Real GDP per capita	0.0190	-4.0377***	-0.5013***	-2.3149***	-0.4623***	-1.4256***
	(0.052)	(0.350)	(0.150)	(0.250)	(0.159)	(0.142)
Trade Openness	-0.2094***	1.0390***	0.5904***	0.8121***	0.5147**	0.6586***
	(0.077)	(0.343)	(0.222)	(0.245)	(0.236)	(0.210)
Government Size	-0.0084	-0.0436	-0.0135	-0.1098***	-0.0171	-0.0949***
	(0.009)	(0.046)	(0.025)	(0.033)	(0.027)	(0.024)
Country Effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Observations	709	507	709	507	709	709
R-squared	0.7673	0.7426	0.8093	0.8316	0.7715	0.8474

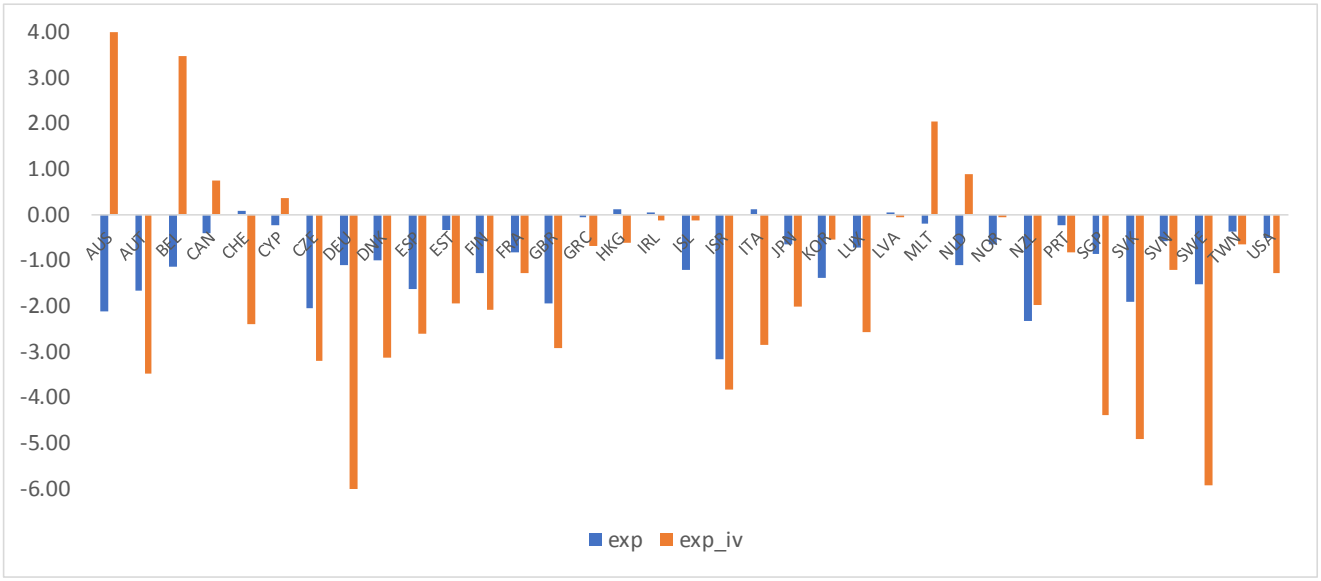
Note: Results obtained by estimating equation (4) using time-varying estimates of the cyclicality coefficients. Estimation by Ordinary Least Squares. All regressors enter with one lag. Robust standard errors clustered at the country level in parentheses. The constant term and country effects were omitted for reasons of parsimony. ***, **, * denote significance at 1, 5 and 10 percent level, respectively.

Table A5. Determinants of Fiscal Cyclicality Coefficients with country and time effects– dynamic approach (OLS)

Specification	(1)	(2)	(3)	(4)	(5)	(6)
Regressors \ Dep.Var.	**exp**	**wages**	**gs**	**capital**	**nonint**	**interest**
Output volatility	-0.0001	0.1872***	-0.0092	0.1050***	-0.0210	0.0766***
	(0.009)	(0.035)	(0.026)	(0.027)	(0.027)	(0.024)
Political Constraints	0.0122	-0.6516	-0.7693*	0.8994**	-0.9546**	-0.9656**
	(0.142)	(0.590)	(0.416)	(0.453)	(0.442)	(0.387)
Real GDP per capita	0.0034	-2.2405***	0.1253	-2.4606***	0.0236	-2.1463***
	(0.086)	(0.503)	(0.261)	(0.386)	(0.277)	(0.243)
Trade Openness	-0.1231	2.0348***	0.7655***	1.3536***	0.7547***	0.9696***
	(0.087)	(0.351)	(0.255)	(0.269)	(0.271)	(0.237)
Government Size	-0.0120	-0.1064**	-0.0187	-0.1623***	-0.0315	-0.1346***
	(0.009)	(0.051)	(0.026)	(0.039)	(0.028)	(0.025)
Country Effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Time Effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Observations	709	485	692	485	692	692
R-squared	0.7807	0.7830	0.8215	0.8377	0.7850	0.8617

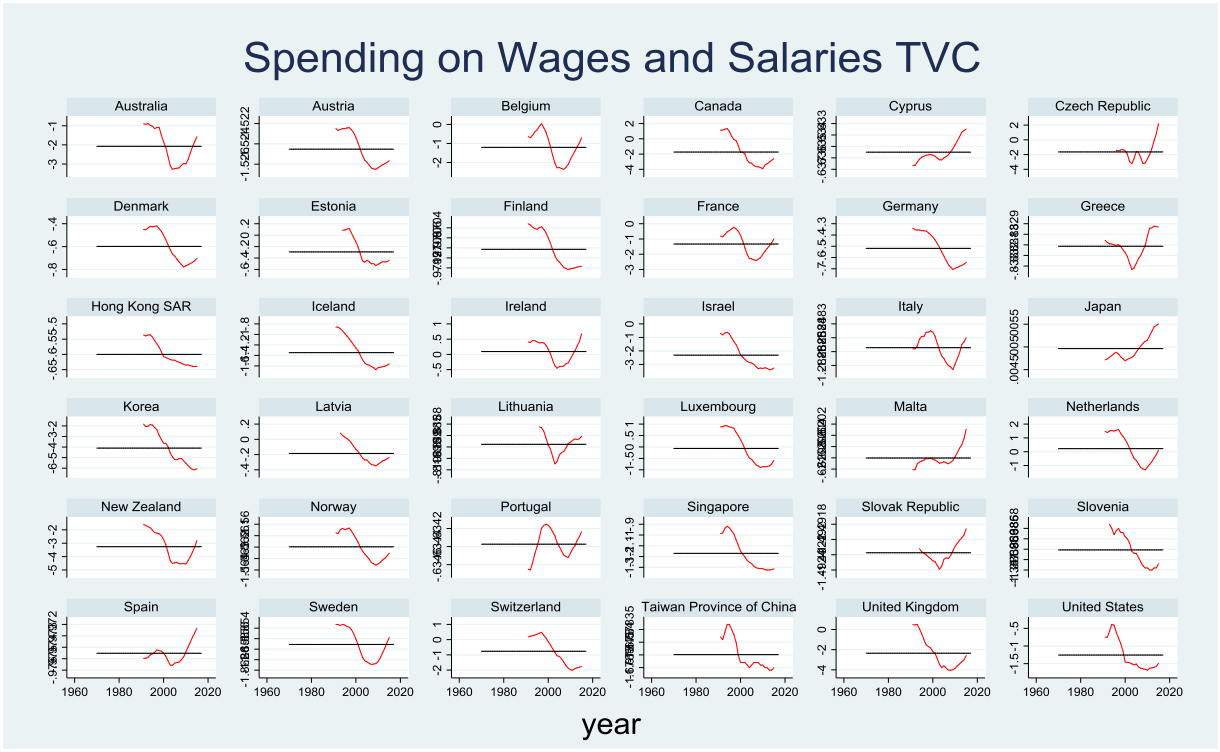
Note: Results obtained by estimating equation (4) using time-varying estimates of the cyclicality coefficients. All regressors enter with one lag. Robust standard errors clustered at the country level in parentheses. The constant term, country and time effects were omitted for reasons of parsimony. ***, **, * denote significance at 1, 5 and 10 percent level, respectively.

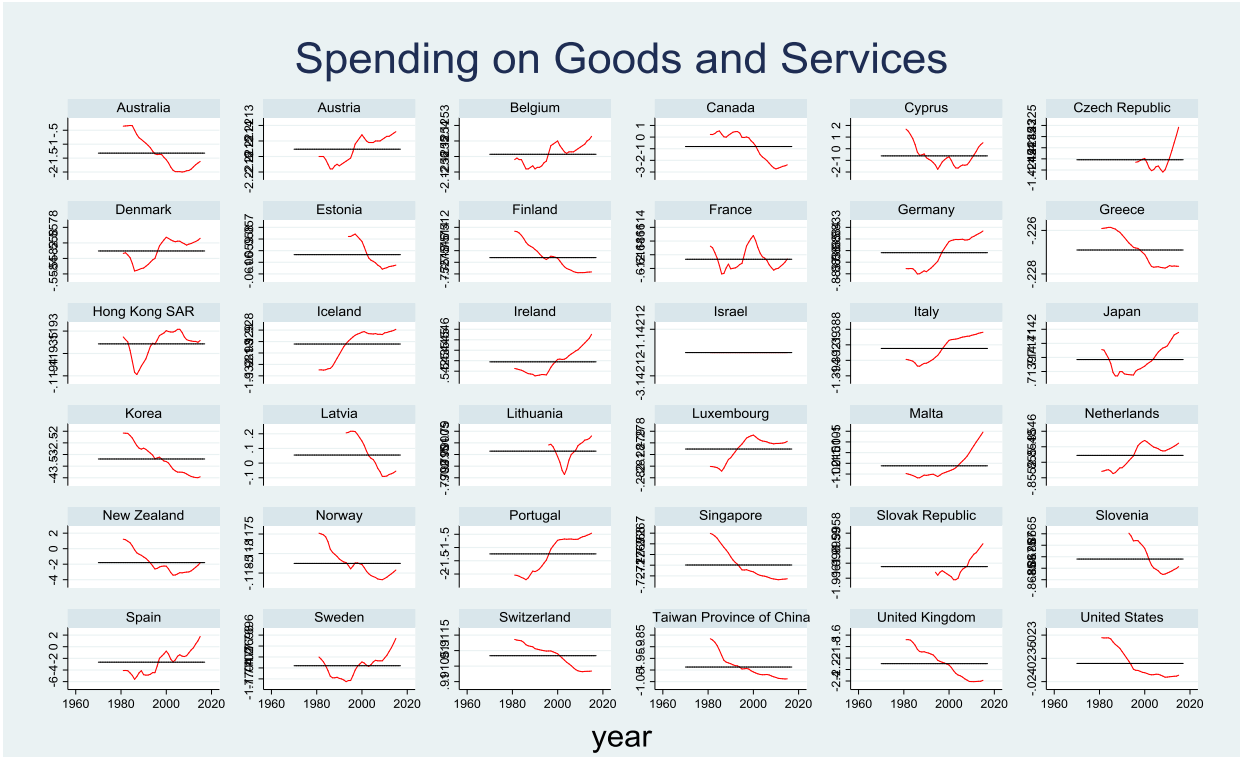
Figure A1: Government Expenditure Static Cyclicality Estimates: baseline vs IV

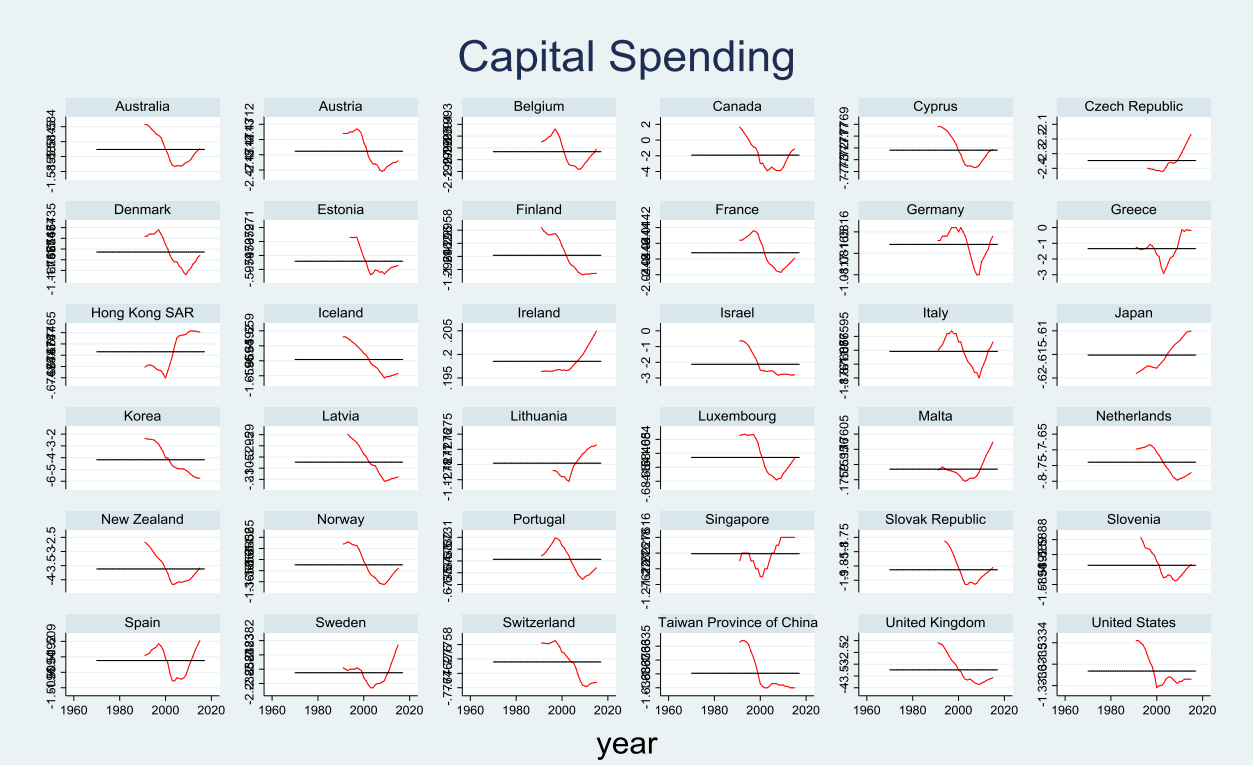


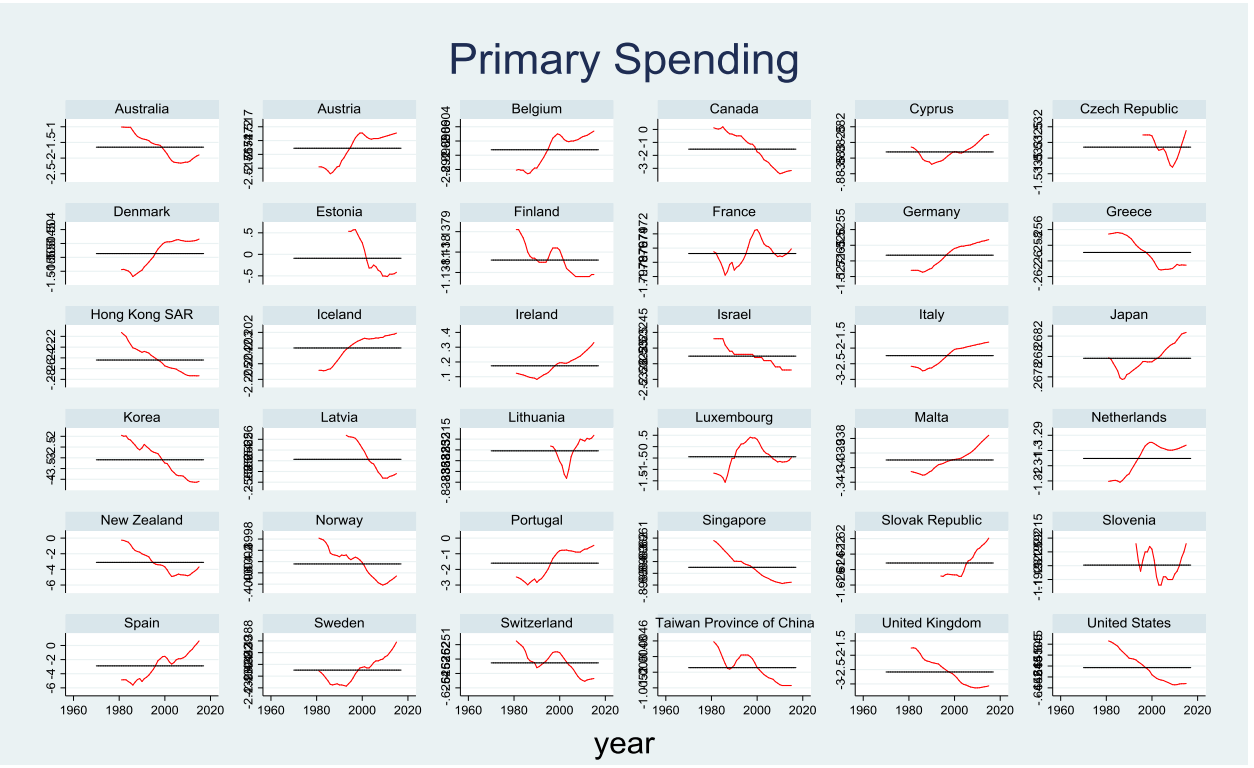
Note: baseline cyclicality coefficients based on equation (1) estimated for each country individually (blue bars). IV-based estimates of cyclicality coefficients use lagged domestic growth and the weighted-average growth in trading partners as instruments for domestic growth (orange bars). See main text for details.

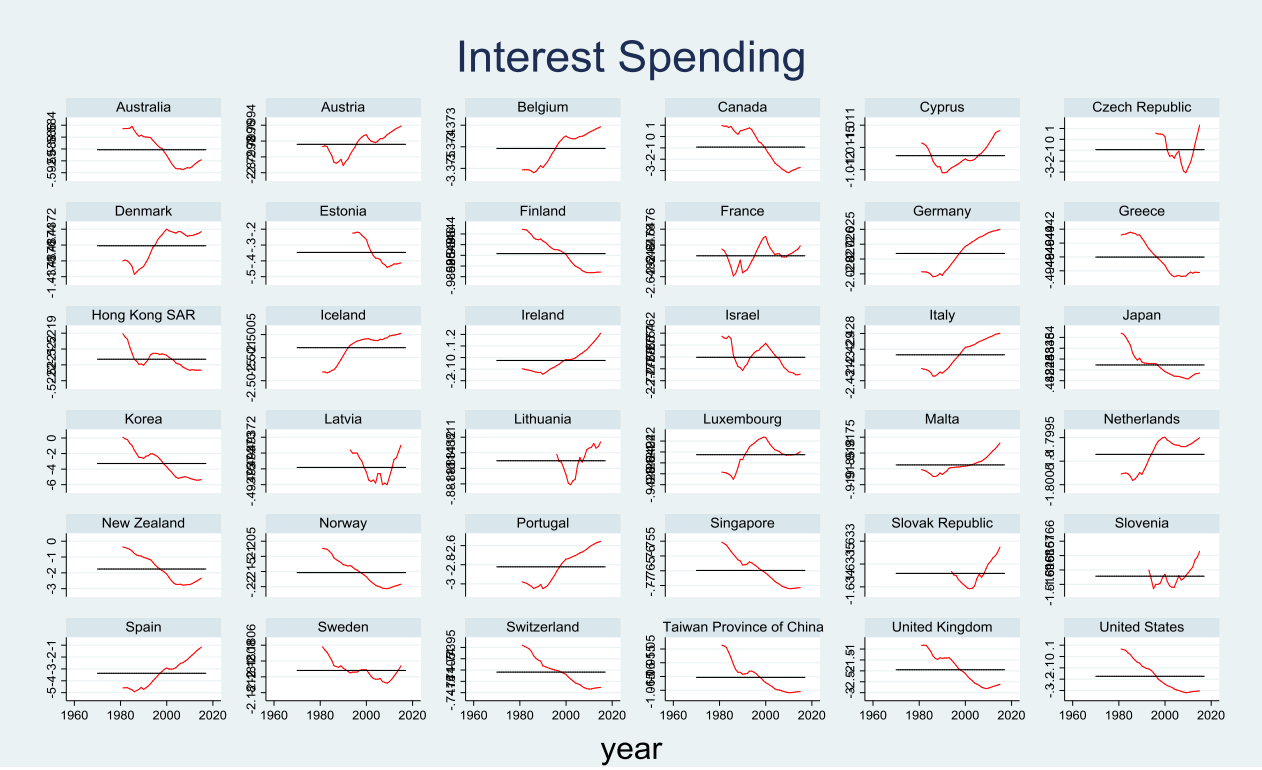
Figure A2: Time-Varying Expenditure Categories' Cyclicality: Country Profiles over time






Capital Spending
Australia
Austria
Belgium
Canada
Cyprus
Czech Republic
Denmark
Estonia
Finland
France
Germany
Greece
Hong Kong SAR
Iceland
Ireland
Israel
Italy
Japan
Korea
Latvia
Lithuania
Luxembourg
Malta
Netherlands
New Zealand
Norway
Portugal
Singapore
Slovak Republic
Slovenia
Spain
Sweden
Switzerland
Taiwan Province of China
United Kingdom
United States
1960
1980
2000
2020
year


Primary Spending
Australia
Austria
Belgium
Canada
Cyprus
Czech Republic
Denmark
Estonia
Finland
France
Germany
Greece
Hong Kong SAR
Iceland
Ireland
Israel
Italy
Japan
Korea
Latvia
Lithuania
Luxembourg
Malta
Netherlands
New Zealand
Norway
Portugal
Singapore
Slovak Republic
Slovenia
Spain
Sweden
Switzerland
Taiwan Province of China
United Kingdom
United States
1960
1980
2000
2020
year



Note: red line denotes the time-varying coefficients (TVC) estimates; black line is the average TVC.