Prepared by the Fiscal Affairs Department
In consultation with the other departments–Approved by Vitor Gaspar
April 2024 Fiscal Monitor—**Chapter 1 Online Annexes**

Contents Pages

FIGURES

Online Annex 1.1. Current Fiscal Estimations versus Pre-pandemic Projections for 2023 and 2024 by Structural Characteristics[1]

This annex examines how recent estimates and projections for key fiscal aggregates for 2023-2024 (from April 2024 *World Economic Outlook* database) compared to pre-pandemic projections for the corresponding years (from October 2019 *World Economic Outlook* database) and how these differences are conditioned by pre-pandemic debt levels, tax effort, and commodity exports.

The average global fiscal deficit in 2023 is projected to be higher than pre-pandemic projections by 2 percentage points of GDP, driven by higher-than-expected social benefits. In advanced economies, excluding the *United States*, revenues in 2023 were higher than pre-pandemic projections by about 1.2 percentage points of GDP, on average, as past inflation continued to provide boost to revenues through bracket creep effects. However, buoyant expenditures, including subsidies and transfers (part of "other expenditures"), more than offset revenue gains, leading to the deviation of overall deficit outturns from pre-pandemic projections, i.e., "slippages," of 2.3 percentage points of GDP (Online Annex Figure 1.1.1, panel 1).[2] In emerging economies, excluding *China*, slippages were smaller at about 0.6 percent of GDP, while social benefit spending remained significantly higher than pre-pandemic projections by close to 1.4 percentage points. In contrast to other income groups, fiscal deficits in low-income developing economies in 2023 were in line with pre-pandemic projections, likely reflecting financing constraints. Public investment was particularly lower, by 0.3 percentage point of GDP, than anticipated in 2023, reflecting limited fiscal space. Fiscal slippages were sizeable in the *United States*, amounting to 3.4 percentage points of GDP in 2023 led by lower than anticipated tax revenues and higher-than-expected social benefits. Interest expenses in most countries are also significantly higher than projected before the pandemic, given the surge in nominal interest rates in recent years. In many economies, higher deficits reflected, in part, the effect of automatic stabilizers amid low global growth.

Pre-pandemic debt levels crucially shaped the post-pandemic fiscal outlook. In advanced economies, excluding the *United States*, that entered the pandemic with high debt ratios, slippages in the overall deficit in 2023 was large at about 2.8 percentage points of GDP on average—2.4 percentage points larger than the slippages among advanced economies with low debt levels—partly due to greater-than-anticipated interest expenses (Online Annex Figure 1.1.1, panels 2 and 3).[3] Slippages in high-debt emerging market economies, excluding *China*, were also significant at about 1.6 percentage points of GDP on average in 2023, while slippages were close to zero in emerging market economies with low debt. In low-income developing countries that entered the pandemic with high debt ratios, expenditures in 2023 were lower than pre-pandemic projections, led by lower public investment, reflecting lower-than-projected revenues as well as the other financing sources. Their interest expenses, however, were higher than pre-pandemic projections due to still elevated debt levels. The slippages are projected to remain significant in 2024 and larger among economies with high debt than in economies with low debt.

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[1] Prepared by Hamid Davoodi and Youssouf Kiendrebeogo with assistance from Chenlu Zhang and Victoria Haver.

[2] Fiscal projections are defined as the difference between the April 2024 WEO forecast of a fiscal aggregate (the current post-pandemic projection) and that of the October 2019 WEO forecast of the same aggregate (the pre-pandemic projection). For example, a negative difference for the fiscal balance indicates a higher fiscal deficit than projected or lower fiscal surplus than projected. Note that data beyond 2024 are not shown since pre-pandemic projections made in October 2019 WEO end in 2024.

[3] Public debt to GDP ratio is defined as gross debt of the general government, expressed as a percent of GDP. Data on public debt ratios are retrieved from the October 2023 WEO Database. High-debt countries are those with debt-GDP ratios above the median (48.7 percent of GDP) in 2019. Low-debt countries are those with debt ratios below the median.

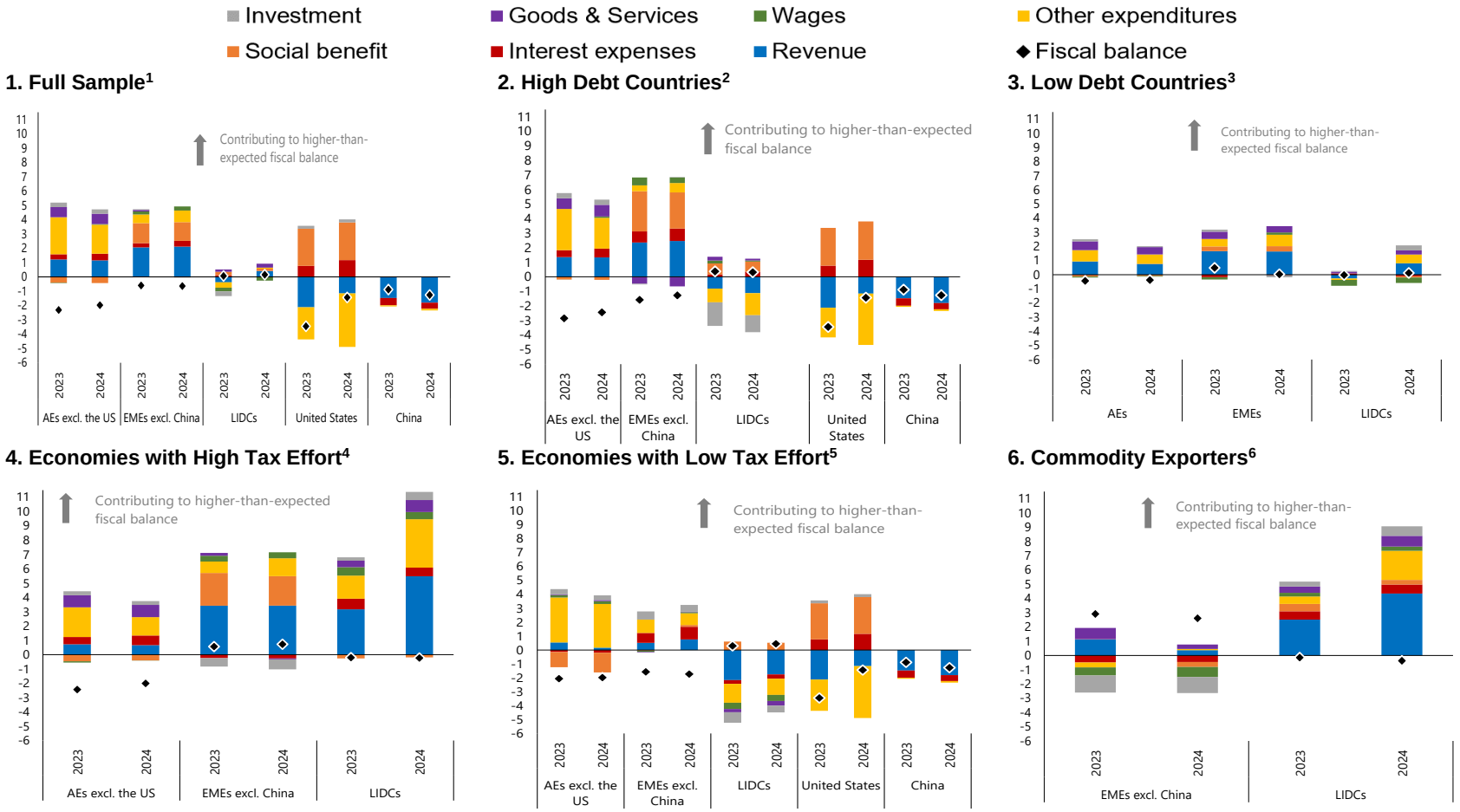
Tax effort is another structural characteristic that impacts fiscal projections. Economies with high tax effort before the pandemic have much lower slippages (0.7 percentage points of GDP) compared to those with low pre-pandemic tax effort (1.5 percentage points of GDP). The revenue outturns in 2023 rose above the level projected in 2019 more steeply in economies with high tax efforts than in economies with low tax efforts, especially among emerging economies and low-income developing countries (Online Annex Figure 1.1.1, panel 4).[4] In low-income developing countries with low tax effort, tax revenue outturns in 2023 were substantially worse than pre-pandemic projections, while post-pandemic revenue gains were significant in low-income developing countries with high tax effort. On the spending side, public investment is particularly squeezed in those low-income economies with low tax effort (Online Annex Figure 1.1.1, panel 5).

Finally, large swings in commodity prices in recent years, prompted by supply disruptions related to the COVID-19 pandemic and Russia's invasion in Ukraine, led to strong revenue windfalls for commodity exporters. In commodity-exporting emerging economies, this resulted in significantly lower deficit levels in 2023 compared to pre-pandemic projections by 2.9 percentage points on average (Online Annex Figure 1.1.1, panel 6).[5] In commodity-exporting low-income economies, however, revenue windfalls were fully spent on higher spending, including subsidies and public investment.

[4] Tax effort is defined as the ratio of actual revenue collection to tax potential. Data on tax efforts are from the latest update (July 2023) of the Collecting-Taxes-Database by the US Agency for International Development (USAID) with a wide cross-country coverage and a similar methodology as in Benitez and others (2023). High- and low-tax effort countries are defined based on the level of tax effort in 2019. The effort value is further kindred between USAID database and Benitez and others (2023).

[5] Commodity (both fuel and non-fuel) exporters are those reported in Table D of the 2023 October WEO Statistical Appendix.

Online Annex Figure 1.1.1. Fiscal Overall Balance and its Components: Current versus Pre-pandemic Projections *(Percent of GDP)*



Source: IMF, World Economic Outlook database; IMF staff calculations.
Notes: For China, social benefits spending is not separately reported in the WEO. Current=April 2024; Pre-pandemic=October 2019. [1] The full sample include 35 advanced economies, 40 emerging economies, and 40 low-income and developing countries. [2] The threshold (median) for public debt to GDP ratio is 48.7 percent of GDP in 2019. High debt countries are those with a debt ratio above the median and include 19 AEs, 23 EMs and 16 LIDCs. [3] Low-debt countries are those with a debt ratio below the median and include 16 AEs, 17 EMs and 24 LIDCs. [4] Tax effort is defined as the ratio of actual to potential revenue collection, where the median tax effort is 81.3 percent. High tax effort countries include 35 AEs, 25 EMs, and 15 LIDCs. [5] Low tax effort countries include 15 EMs and 25 LIDCs. [6] Commodity exporters are defined as countries with fuel or nonfuel primary products as the main source of export earnings (Table D of the October 2023 Statistical Appendix). Commodity exporters include 18 EMs and 15 LIDCs.

Online Annex 1.2. Econometric Analyses of Spillovers from Loose Fiscal Policy in the *United States*[1]

This online annex presents the estimation of the effect of fiscal policy in the *United States* on its nominal term premia (Figure 1.7 in the main text), and the estimation of spillover effects of the US long-term interest rate on other economies' long-term interest rate (Figure 1.8, panels 1 and 2 of the main text).

Effect of the US Fiscal Policy on Its Nominal Term Premia

Data, Estimated Sample, and Variables Included in the Estimation

All data are retrieved from the Fred data system from Federal Reserve St. Louis (stlouisfed.org). The sample employed to assess the consequences of fiscal deficits on the US' nominal term premia ranges from 1963q1 to 2023q3. The variables used in the estimations are: (i) real GDP; (ii) primary balances and/or real government spending (excluding interest) (as percent of GDP); (iii) nominal short term interest rates (Fed Funds and shadow fed funds rates for the period of the zero lower bound (i.e., 2009q1-2022q1); and (iv) 10-year maturity Treasury bonds nominal interest rates.

Methodology

A Bayesian Vector Auto Regressive (BVAR) Model with 4 lags is estimated using different specifications: (i) rates of change of GDP and government spending; (ii) log levels of the fiscal variables, and (iii) using only one of the two fiscal variables (real spending and fiscal primary balances). Additionally, two models are run: (i) one with both nominal long-term rates and short-term rates entering separately; and (ii) another that includes the nominal short-term rate and the nominal term premium.

Impulse responses of those different specifications are identified via two different strategies: (a) a simple Cholesky decomposition and (b) sign restrictions.

The sign restrictions are described below. Importantly, they are imposed only at t=0 (i.e., contemporaneously to the fiscal shock).

- Impact of a positive shock on the fiscal balance is assumed to have a contemporaneously negative impact on either (a) the term premium or (b) the 10-year maturity Treasury bonds nominal rate [2]. The fiscal policy shock on the nominal short-term interest rate (Fed Funds) is not restricted in the estimations (i.e., it is agnostic).

- Impact of a positive shock on government spending is assumed to exert a positive impact on either (a) the term premium or (b) the 10-year maturity Treasury bonds nominal rate, in addition to boosting real GDP.

- Importantly, the fiscal shock is not mis-identified or indistinguishable from a GDP shock. This is because whereas the sign restrictions dictate that the former lead to a *deterioration* in fiscal balances, it also imposes that the latter cause an *improvement* in fiscal balances.

[1] Prepared by Carlos Goncalves.

[2] Or risk premium, depending on the model being run.

The BVAR uses standard hierarchical Minnesota priors.

Results

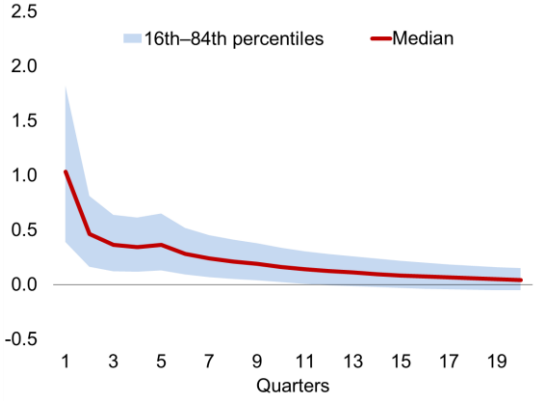
Online Figure 1.2.1 displays the econometric findings underlying the result report in Figure 1.7 in the main text. It shows the impulse responses of the Treasury's nominal term premiums to spikes in US primary balance. Here, term premiums are estimated using the methodology introduced by Adrian, Crump, and Moench (2013). Online Annex Figure 1.2.1, panel 1, shows the underlying response of the primary balance to its own shock. Online Annex Figure 1.2.1, panel 2, reports the impulse response of the nominal term premiums to the shock on the US primary balance using the sign restriction identification strategy. Hence, that panel is the inverted impulse response to the one portrayed in Figure 1.7 from the main text.

A second exercise to check the robustness of the result reported in Figure 1.7 in the main text explores the impact of an improvement in fiscal balance in the *United States* on the spread between the Treasury 10 and Effective FedFunds (Online Annex Figure 1.2.2). After the initial drop following an improvement in fiscal balances, it takes relatively long for the impulse response of term premia to return to zero. This lends credence to the sign restrictions identification, given the constraint is only imposed for t = 0

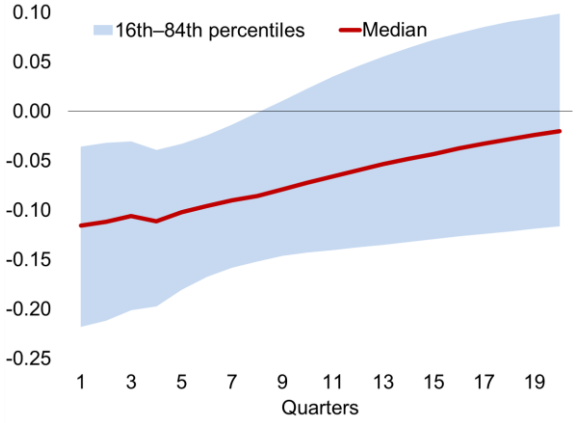
Online Annex Figure 1.2.1. Impulse Responses of the Treasury's Nominal Term Premiums to the US Primary Balance Spikes

(Percent; unless stated otherwise)

1. Response of the Primary Balance (Percent points of GDP)



2. Response of the Nominal Term Premium (Sign Restrictions)

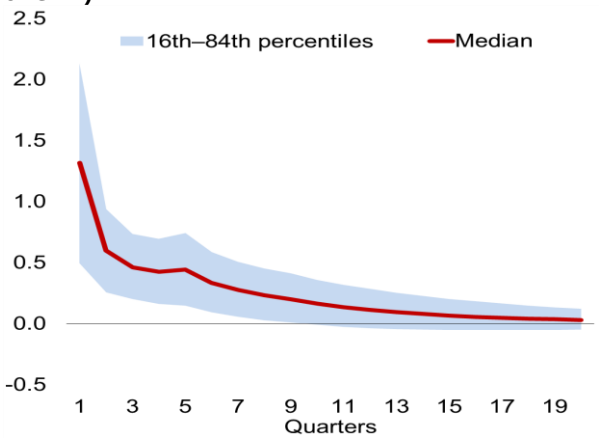


Sources: Federal Reserve St. Louis, Fred data system (stlouisfed.org); and IMF staff calculations.
Note: x-axes measured in months. The impulse response presented identifies the fiscal shock via sign restrictions. Shaded area represents the 95 percent confidence interval, whereas solid lines indicate the average response.

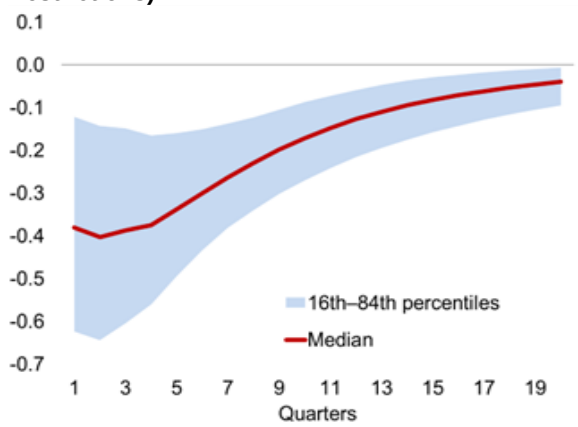
Online Annex Figure 1.2.2. Impulse Responses of the Treasury's Nominal Risk Premium to the US Primary Balance Spikes

(Percent; unless stated otherwise)

1. Response of the Primary Balance (Percent points of GDP)



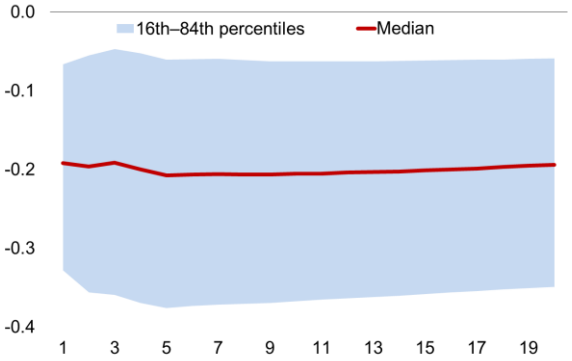
2. Response of the Nominal Risk Premium (Sign Restrictions)



Sources: OECD database; and IMF staff calculations.
Note: x-axes measured in months. The impulse response presented identifies the fiscal shock via sign restrictions. Shaded area represents the 95 percent confidence interval, whereas solid lines indicate the average response.

When analyzing the effect of an improvement in fiscal balance on the long-term interest rate following a similar BVAR estimation, results are statistically significant only under sign restrictions (Online Annex Figure 1.2.3). However, the impact remains negative over many quarters following the fiscal balance shock lends credence to the argument that improvements in fiscal balances lead to lower long-term rates.

Online Annex Figure 1.2.3. Effect of US Primary Balance Spikes on Nominal Long-Term Interest Rates *(Percentage points)*



Source: Federal Reserve St. Louis, Fred data system (stlouisfed.org); and IMF staff calculations.
Note: The impulse response presented here identifies the fiscal shock via sign restrictions. Shaded area represents the 16th and 84th percentiles, whereas solid lines indicate the median response.

Spillover Effects of the US Long-Term Interest Rate on Other Economies' Long-Term Interest Rate

In this section, potential spillovers from the US nominal long-term rates to other economies' financing conditions (also proxied by the nominal interest rates on their long-term securities) are assessed. The analysis is based on a standard Panel Vector Auto Regressive model, assuming that interest rates in the *United States* are mostly determined by domestic factors.

Data and Methodology

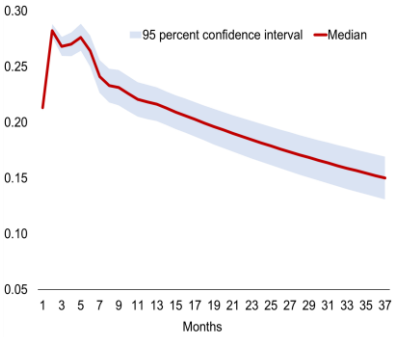
A Panel VAR is estimated for a group of 27 advanced economies, other than the *United States*, and separately for a group of 14 emerging market economies.[3] Both models include 8 lags of nominal long-term interest rates.

Long term interest rate data are monthly. The period sample ranges from 1985m1 till 2023m12 for advanced economies; and 1995m1 to 2023m12 for emerging market economies. The panels are unbalanced, in particular for the group of emerging market economies.

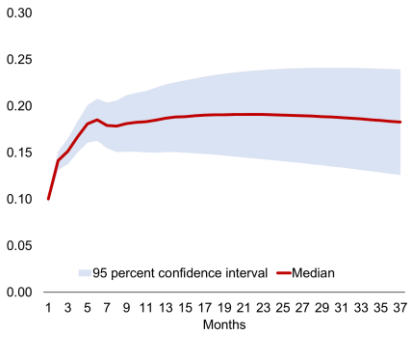
Online Annex Figure 1.2.4. Impulse Response of Other Economies Long-Term Nominal Interest Rates to Spikes in the US Long-Term Nominal Interest Rate

(Percentage points; unless stated otherwise)

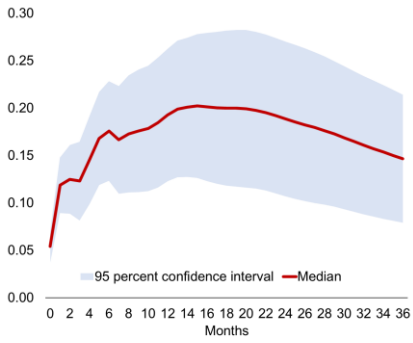
1. Response of the Primary Balance in the United States
(Percent points of GDP)



2. Advanced Economies



3. Emerging Market Economies



Sources: OECD database; and IMF staff calculations.
Note: x-axes measured in months. The impulse response presented identifies the fiscal shock via sign restrictions. Shaded area represents the 95 percent confidence interval, whereas solid lines indicate the average response.

Results

For advanced economies, Granger causality tests suggest,[4] albeit inconclusively, that movements in US interest rates indeed precede shifts in rates in other advanced economies. For emerging market economies, however, the evidence shows more strongly that changes in interest rates in the *United Stated* granger cause changes in rates in emerging market economies.

Figure 1.8 in the main text and Online Annex Figure 1.2.4 convey that the overall passthrough from US long-term nominal interest rates to advanced economies is only slightly smaller than for emerging market economies.

[3] The emerging economies are: *Bulgaria*, *Brazil*, *Chile*, *China*, *Colombia*, *Costa Rica*, *Croatia*, *Hungary*, *Indonesia*, *India*, *Mexico*, *Poland*, *Russia*, *South Africa*. For the sample of advanced economies, the countries included are: *Australia*, *Austria*, *Belgium*, *Canada*, *Switzerland*, *Czech Republic*, *Germany*, *Denmark*, *Finland*, *France*, *Greece*, *Ireland*, *Israel*, *Italy*, *Japan*, *Korea*, *Latvia*, *Luxembourg*, *Netherlands*, *New Zealand*, *Norway*, *Portugal*, *Slovakia*, *Slovenia*, *Spain*, *Sweden*, *United Kingdom*.

[4] The results for the Granger causality tests are not shown here, but available upon request.

Online Annex 1.3. Election-Year Swings in Fiscal Policy[1]

This online annex describes the methodology used in Chapter 1 for the estimation of the political budget cycle and presents some of the drivers behind election-year deficit increases.

The Global Political Budget Cycle: Updated Evidence

A large literature on political budget cycles—the movement in fiscal aggregates in connection to the electoral cycle—documents that incumbents' reelection concerns often translate into higher budget deficits in the run-up to elections. These effects have been found to be particularly large in developing economies (Shi and Svensson 2006), in younger democracies (Brander and Drazen 2005), and in political regimes where the incentives and opportunities for fiscal manipulation are strongest (Shmuel 2020).

An updated analysis for the 1990-2020 period across 173 advanced, emerging, and developing economies confirms that, on average, election years are marked with a deterioration in fiscal outcomes, the full extent of which is often revealed after elections take place.[2] Detailed information on the national elections that determine the highest executive positions is drawn from the National Elections under Democracy and Autocracy database and is used to select minimally competitive elections as defined in Hyde and Marinov (2012).[3] Data on fiscal outcomes is collected from the IMF World Economic Outlook database. Information for the control variables is obtained from IMF and World Bank data sources. The analysis rests on estimating equations of the following form:

$$y_{c,t} = \alpha \cdot y_{c,t-1} + \beta \cdot ELE_{c,t} + \gamma \cdot X_{c,t} + \delta_c + \zeta_t + \varepsilon_{c,t}, \qquad (1)$$

where y represents a fiscal outcome in country c and year t, dummy variable ELE records the occurrence of an election during the year, δ_c and ζ_t are country and year fixed effects, respectively, and X includes a list of contemporaneous or lagged controls. The inclusion of the outcome lag helps control for path dependence in fiscal aggregates, but also suggests the need to correct for the correlation between the lagged outcome and the error term (Nickell, 1981). For this reason, Equation (1) is estimated with a system Generalized Method of Moments (GMM) estimator following the approach in de Haan, Ohnsorge, and Yu (2023), using two outcome lags as GMM-type instruments. The resulting estimates of

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[1] Prepared by Enrico Di Gregorio. The author wishes to acknowledge the help of Franziska Ohnsorge.

[2] The final sample consists of 173 economies in the full sample, including both countries holding and not holding competitive elections during the sample period (1990–2020). Among advanced economies, these are: *Austria*, *Belgium*, *Cyprus*, *Czech Republic*, *Estonia, Finland, Germany, Greece, Hong Kong SAR, Iceland, Ireland, Israel, Italy, Korea, Latvia, Lithuania, Macao SAR, Malta, Netherlands, Norway, Portugal, Slovakia, Slovenia, Spain, Taiwan*, and the *United States*. Among emerging markets, these are: *Albania, Algeria, Angola, Antigua and Barbuda, Argentina, Armenia, Aruba, Azerbaijan, Bahamas, Bahrain, Barbados, Belarus, Belize, Bolivia, Bosnia-Herzegovina, Botswana, Brazil, Bulgaria, Cape Verde, Chile, China, Colombia, Costa Rica, Croatia, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eswatini, Fiji, Gabon, Georgia, Grenada, Guatemala, Guyana, Hungary, India, Indonesia, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Lebanon, Malaysia, Maldives, Marshall Islands, Mauritius, Mexico, Micronesia, Mongolia, Montenegro, Morocco, Namibia, Nauru, North Macedonia, Oman, Pakistan, Palau, Panama, Paraguay, Peru, Philippines, Poland, Qatar, Romania, Russia, Saint Lucia, Saint Vincent and the Grenadines, Samoa, Saudi Arabia, Serbia, Seychelles, South Africa, Sri Lanka, Suriname, Syria, Thailand, Trinidad and Tobago, Tunisia, Türkiye, Turkmenistan, Ukraine, United Arab Emirates, Uruguay, Vanuatu*, and *Venezuela*. Among low-income and developing countries, these are: *Afghanistan, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, Cameroon, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Democratic Republic of Congo, Djibouti, Eritrea, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Haiti, Honduras, Kenya, Kiribati, Kyrgyz Republic, Lao P.D.R., Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Moldova, Mozambique, Myanmar, Nepal, Nicaragua, Niger, Nigeria, Papua New Guinea, Rwanda, São Tomé and Príncipe, Senegal, Sierra Leone, Solomon Islands, Somalia, Sudan, Tajikistan, Tanzania, Timor-Leste, Togo, Uganda, Uzbekistan, Vietnam, Yemen, Zambia*, and *Zimbabwe*.

[3] In presidential systems, only executive elections are considered, while only legislative elections are considered for parliamentary regimes. Minimally competitive elections are defined as electoral episodes where opposition to the incumbent government or political majority is allowed, more than one party is legal, and there is a choice of candidates on the ballot. Due to the country-year nature of the final dataset, only information about the first round is considered.

β capture the mean difference in fiscal outcomes in election years relative to all other years, although the electoral cycle could have longer lasting consequences in practice.

Figure 1.16 in Chapter 1 presents the results of our analysis. On its panel 1, fiscal outcomes are of two types: the deficit outturn and the deficit "surprise", or the difference between the outturn reported in the October 2023 World Economic Outlook and its predicted value for year t reported in the World Economic Outlook April edition of year $t-1$.[4] On its panel 2, outcomes include the outturn of the primary deficit, public consumption, and tax revenues. For both panels, we perform our estimation with the following details. Outcomes are expressed in GDP terms and winsorized at the 1st and 99th percentile of their distribution to reduce the role of outliers. Controls include the lag of the dependent variable, real GDP per capita growth, net official development assistance and aid received in GDP terms, external debt to GDP, trade openness, the log of 100 plus the inflation rate, the lag of a fiscal rule dummy, the log of the real GDP per capita in US dollars, and country and year fixed effects. In the tax revenue regression, the log of the population and natural resource rents to GDP are added, following the approach in Ebeke and Ölçer (2017). Robust standard errors determine the shown confidence intervals.

In Figure 1.16, panel 1, we find that elections are associated with higher deficit outturns (by more than 0.3 percent of GDP) or surprises (by around 0.4 percent of GDP), with coefficients being significant at the 95 percent level. In Figure 1.16, panel 2, we shed light on the composition of the election-year deficit outturn result, showing the coefficients on the election-year dummy from equations with components of the overall budget balance as outcomes. In all cases, election years are on average associated with significant swings, including a larger primary deficit, higher government consumption, and lower tax revenues, all in GDP terms. This might reflect the different dimensions along which political budget cycles arise across countries: for example, the patterns in Persson and Tabellini (2003) and David and Sever (2022, 2023) suggest the existence of tax collection effort cycles in advanced economies, while government spending cycles are especially pronounced in emerging market and developing economies (Ebeke and Ölçer 2017, de Haan, Ohnsorge, and Yu 2023).

[4] In the deficit surprise equation, controls include both the lag of the outcome and the lag of the deficit level.

Online Annex 1.4. Calculating the medium-term spending pressures[1]

This annex presents the assumptions used to calculate mounting spending pressures in Figure 1.18.

Assumptions underlying the Medium-Term Spending Pressures to 2030 Calculations

The medium-term spending pressures outlined in this annex (Online Annex Table 1.4.1) are based on assumptions of spending on population aging, rising costs to address climate change, higher defense spending arising from geo-political tensions and development spending needs to achieve the Sustainable Development Goals.[2] These are not necessarily projections of spending. In some cases, countries can make policy changes to contain these pressures. The main assumptions used to estimate spending pressures are as follows.

Online Table 1.4.1: Pressures to Public Spending, Potential Increases to 2030

	(percent of 2030 GDP)			(nominal billion dollars in 2030)		
	Advanced economies	Emerging makets	Low-income and developing countries	Advanced economies	Emerging markets	Low-income and developing countries
Total (relative to 2023 levels)	**6.0 - 7.4**	**8.0 - 8.7**	**13.8**	**4,892 - 6,027**	**4,880 - 5,308**	**703**
Industrial policy	0.8	0.2	0.0	649	122	0
Defense	0.6	0.3	0.0	489	199	0
SDGs	0.2	3.6	12.1	122	2,200	617
Pension and health care	2.9	2.0	0.7	2,351	1,222	36
Climate[1]	0.6 - 2.0	1.3 - 2.0	0.7	486 - 1,622	794 - 1,222	36
Interest payments	1.0	0.6	0.3	795	342	14

Source: World Economic Outlook database; and IMF staff estimates.
Note: [1] Low estimate: well-sequenced package for net-zero, including an ambitious increase in carbon pricing in advanced economies (emerging markets) to USD130 (USD45) per metric ton by 2030 and USD235 (USD150) per metric ton by 2050. High estimate: ample scaling up of green investment and subsidies to reach net zero, capping the carbon price at USD75 (USD45) a ton. For low-income developing countries, calculations assume the cost of adaptation to be 100 percent public.

Industrial policy refers to government policies that target specific industries, firms, or economic activities (see Chapter 2). Spending pressure on industrial policy is based on the size of recent packages enacted in the US, EU, Japan and elsewhere. This includes the allocation of USD39 billion by the *United States'* government to the Chips Act to support advanced semiconductor manufacturing, as part of an overall package includes USD370 billion in subsidies for clean energy. Similarly, the *European Union* is setting aside €160 billion of its COVID-19 recovery fund for digital innovations such as chips and climate (Agarwal, 2023). A fraction of this is assumed for emerging markets, as evidence points to a lower prevalence of such measures in the latter (Evenett and others, 2024).

Ongoing geopolitical tensions highlight potential pressures to scale-up *government defense spending*. Defense spending pressures are estimated as the difference between current defense spending in the *Government Finance Statistics* database and the 2 percent of GDP spending benchmark adopted by the *North Atlantic Treaty Organization* in 2014. This is well below defense spending in the 1970s and 1980s in many countries (Clements, Gupta, and Khamidova, 2021). The estimates assume that average spending for each income group will reach 2 percent of GDP.

Another area in urgent need of public spending is *climate*. Climate spending pressures are drawn from the estimates for public green investments and subsidies for net zero and climate adaptation costs from the

[1] Prepared by Nick Carroll.

[2] Following Guillemette and Turner (2021), the public spending pressures are calculated using simple reduced-form equations that rely either on coefficients estimated from historical data (health) or on stylized assumptions (pension and other expenditure). Country policy changes in health, pension and other program designs are generally not considered other than in initial expenditure levels (and in the trend estimates or country-averages).

October 2023 *Fiscal Monitor*, Chapter 1, including the high-cost scenario. The lower estimate is based on a well-sequenced policy package, while the high estimate assumes capped carbon taxation at USD75 per ton for advanced economies and USD45 per ton for large emerging mark economies.

The SDG spending estimate is based on Carapella and others (2023). This approach estimates the additional spending on human capital (education and health) and physical capital (water and sanitation, roads, and electricity) to make substantial progress in achieving the SDGs. The estimate assumes 75 percent of the additional spending is publicly financed.

Pension and health care spending pressures are based on estimates of ageing and long-run cost drivers (in the case of health) published in the April 2023 Fiscal Monitor, Chapter 1. Pension estimates are based on national authorities' projections, where available, or on the impact of ageing under current policies, otherwise. Health spending projections are based on estimates of long-term trend spending increase (as a share of GDP) and demographic projections from the United Nations Population Division.

Higher public debt and higher debt servicing costs will result in rising interest payments as a share of GDP through 2030. The interest payments are based on the World Economic Outlook projections of interest payments. They reflect both the level of public debt as well as debt servicing costs extrapolated to 2030.

These individual spending pressures are combined to produce aggregate spending pressures. In this aggregation, some spending functions appear in different categories. For example, part of the SDG spending pressures reflects higher costs associated with increasing coverage and quality of health care (largely for low-income and developing countries), while health spending pressures largely focus on long-run pressures to health care cost per capita, such as ageing and the cost impact of adopting new medical technologies. In addition, a share of *spending pressures on climate* are associated with industrial policy.

Online Annex 1.5. Analysis of the Fan-Chart for Italy's Primary Balance[1]

This online annex presents the underlying estimation of a time-series econometric model for the distribution (fan chart) of the primary balance in *Italy* in Figure 1.20 in the main text.

Data, Estimated Sample, and Variables Included in the Estimation

All data are retrieved from Haver and covers the period from 1999q1 to 2023q4. Only the primary balance in *Italy* as percent of GDP is used in the analysis.

Methodology

An Autoregressive Integrated Moving Average (ARIMA) time-series model is estimated and used for forecasting (8 quarters ahead). It models the temporal structure of a time series data by combining autoregression (AR), differencing (I for integrated), and moving average (MA) components, which is then used for prediction. Specification tests show that the model featuring AR=2, I=1 and MA=1 is the best fit to describe the evolution of fiscal balances. Resorting to this structure, the mean and different confidence intervals are subsequently forecast.

Results

Figure 1.20. shows the mean forecast and confidence intervals, from 50 percent (central, interior bands) to 95 percent (outer-most bands). It shows, for instance, that the likelihood of a primary balance close to zero is at the end of 2025 is below 50 percent (i.e., the area above the zero line).

[1] Prepared by Carlos Gonçalves.

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