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ARE BAD GOVERNMENTS A THREAT TO SOVEREIGN DEFAULTS? THE EFFECTS OF POLITICAL RISK ON DEBT SUSTAINABILITY

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Political risk is a significant determinant of bond yields and economic growth in both developed and emerging markets and we develop a debt sustainability analysis model with both channels using a country ratings proxy of political risk. Political risk also affects a sovereign's willingness to pay and it can render debt unsustainable, triggered by changes in the rating level, volatility or both. Conversely, sustainability can be restored through reforms that can be as effective as large-scale quantitative easing programmes. The political effects on debt are especially large for high-debt countries during periods of high interest rates, and have an impact on debt management through the choice of optimal financing maturities.

Keywords: Debt management; debt sustainability analysis; government stability; political risk; structural reforms.

JEL classifications: E52, E62, F30, F34, G15, G18, H62, H63, H68.

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1 Introduction

Sovereign debts have ballooned on the back of the Great Finance Crisis, with the COVID-19 spike compounded by debt increases from political shocks[1]. Political events including wars in Ukraine and the Middle East, collapsing government coalitions and snap elections and the 2024 US elections have put pressure on public finance. Increasing inequality fuels social discontent and increases political instability (Alesina and Perotti, 1996), as does climate change (Dell *et al*, 2014). Political risk is ranked among the top three risks in the World Economic Forum 2024 Global Risks Report (WEF, 2024) and is a factor in sovereign ratings[2]. Recent macro and finance literature has established political risk as a determinant of economic growth and asset prices, including bond returns[3]. However, no study on the debt effects of political risk has been done, notwithstanding the attention from international institutions[4].

In this paper, we ask whether the level of political risk in a country threatens its debt sustainability. The answer is yes, especially for high-debt countries, raising a further question about the role of structural reforms in lowering political risk and restoring sustainability. We uncover a positive predictive relationship between structural reforms and political ratings and benchmark the effects of reforms to find that they can be as effective as major quantitative easing programmes. We also explore the impact of unexpected political shocks that *"happen more often than you might think"* (Bremmer and Keat, 2010), in terms of rendering debt unsustainable.

Political risk refers to the probability of discontinuities in the economic or business environment (Kobrin, 2022) affecting asset valuation (Pástor and Veronesi, 2012) as a result of political forces and events. It is complex and multifaceted (Sottilotta, 2016). Disruptions can stem from government instability or changes in government policies, and these two are not necessarily correlated (Gala *et al*, 2023). Early works treated political risk as synonymous with government stability, with the World Bank proxying this risk by numbers of political assassinations, coups or revolutions. For developed economies, the focus was on political cycles (Alesina *et al*, 1997). Instead, we rely on a granular and frequently updated political risk proxy, the

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[1] See S&P Global at https://tinyurl.com/44xwcnue.
[2] Fitch found that political risk was the main factor in 21 percent of sovereign rating crisis episodes from 1997-2017, and was a supporting factor in another 26 percent; see https://tinyurl.com/33v3drn5.
[3] For the effects of political events on growth and foreign direct investments see Aisen and Veiga (2013), Alesina *et al* (1996), Alesina and Perotti (1996), Barro (1991). The theoretical foundations of political risk in asset pricing were laid by Kelly *et al* (2016). For empirical evidence see eg Bekaert *et al* (2014), Brogaard *et al* (2020), Liu and Shaliastovich (2022), Pástor and Veronesi (2012, 2013). Gala *et al* (2023) established a strong global factor structure of country political risk (P-factor) distinct from economic or financial variables, the global component of which is priced in the sovereign debt markets.
[4] Word counts in the IMF Annual Report, ECB Financial Stability Report and European Commission Fiscal Monitor find increasing use of 'politics', 'political uncertainty' and 'geopolitical risk', from fewer than five in each in 2015 to 45 recently. ECB sets red flags using political ratings but does not link them to debt dynamics (Bouabdallah *et al*, 2017).

International Country Risk Guide composite political ratings (produced by the PRS Group; see https://www.icrgonline.com/), which is the most common gauge of political risk. These monthly ratings reflect political rather than macroeconomic factors, with the PRS experts compiling separate indices for economic risks that are not highly correlated with political risk. These ratings predict political risk realisations (Bekaert *et al*, 2014). Their residual, when orthogonalised to economic ratings, inflation and economic growth, is also priced in the financial markets (Gala *et al*, 2024).

We document that ICRG is an economically and statistically significant determinant of sovereign bond yields and growth, even when controlling for several macroeconomic, governmental and external variables. We estimate the political sensitivity of yields and growth to ICRG and develop a political stochastic debt sustainability analysis model (DSA; Blanchard 2022) for both channels. The model predicts significant political effects on debt dynamics, exposing seemingly sustainable debt as unsustainable, especially for high-debt countries. Conversely, reforms can reduce political risk and stabilise debts. For a high-debt, high-risk country, reforms could stabilise debt that requires a fiscal effort of 1.75 percent of GDP per annum to sustain. We benchmark reforms against the European Central Bank's pandemic emergency purchase programme and find them equally effective.

The European Commission (2019) is of the view that political risk warrants consideration in sovereign debt analysis with caveats, since most empirical evidence is gathered from emerging economies (Bekaert *et al*, 2014, 2016; Block and Vaaler, 2004; Eichler, 2014). However, advanced economies are not immune (Hassan *et al*, 2024): the United States experienced six ICRG down-ratings by one standard deviation over one-year intervals from 1999 to 2021. Over the same period, Italy had seven one-standard deviations down-ratings and an improvement of two standard deviations from 2014 to 2019. The ratings are prone to crashes, such as a five-standard deviation drop after the 11 September 2001 terrorist attacks in the US, an almost two-standard deviation drop in the United Kingdom around Brexit, and a three-standard deviation drop in France related to the 2024 snap parliamentary elections. Such large swings and the asset pricing and growth effects of political risk raise the question of whether political risk can adversely affect sovereign debt analysis in developed economies. Using political DSA, we show that it does.

Stochastic debt sustainability analysis takes centre stage in the study of debt by international institutions and the European Union's new fiscal rules (Regulation (EU) 2024/1263), but the link between political risk and debt dynamics is missing. We develop the political DSA model following Zenios *et al* (2021) to represent stochastic financial, economic, fiscal and political rating variables as a discrete time- and state-space scenario tree. We obtain state-dependent debt stock and flow dynamics to develop a model optimising the maturity of issued debt securities to minimise the expected cost of debt financing subject to sustainability risk conditions. Debt is considered sustainable when the stock is on a non-increasing trajectory in the long run with a high probability (Blanchard, 2022), and the flow (refinancing needs) is below a threshold that markets can finance[5].

The model trades off financing costs with refinancing risk in line with the practice of public debt management offices[6]. Financing all debt at the minimum-cost maturity increases refinancing risk when all debt may need to be refinanced together; deviations from the minimum-cost maturity increase the cost of financing and, consequently, debt stock. We optimise debt issuance to develop efficient frontiers within the sustainability conditions. Political risk enters the model through the empirically calibrated political sensitivities of bond yields and growth: yields determine the cost of debt financing (numerator effect), and growth lowers the debt-to-GDP ratio (denominator effect). The model reveals that the political effects on debt come from both the level and uncertainty of political ratings; political risk is not only relevant during crashes. The political DSA model is our modelling contribution, and we demonstrate cases in which the traditional DSA would incorrectly predict debt sustainability.

Our empirical contribution is to estimate the sensitivity of sovereign debt fundamentals to a continuous country-level broad proxy of political risk. Political risk can modify debt sustainability through several channels[7]. First: through its impact on the expected values of economic fundamentals, the most prominent of which is economic growth. For example, political risk raises uncertainty, which is bad for investment and innovation and, hence, growth (Alesina and Perotti, 1996). Second, by impacting the volatility of the fundamentals, it increases risk premia. A third mechanism is reducing the willingness to pay, as opposed to the ability to pay determined by the economic fundamentals (Eaton and Gersovitz, 1981), further increasing risk premia. We document that both the volatility and willingness channels impact the yield spreads, and disentangle their effects. A final channel is through the potential effect of political risk on government spending.

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[5] We set a confidence level of 75 percent non-increasing debt stock trajectories over a risk horizon. Blanchard (2022) suggested a horizon of ten years; IMF (2022) uses five to ten and European Commission (2024) uses four to seven. In our tests, we consider a horizon of thirty years, covering all maturities of existing debt and extending past a five-year political cycle. We consider shorter horizons in robustness tests. The flow threshold is 15 percent of GDP for emerging and 20 percent for developed economies (Bouabdallah *et al*, 2017, p.29).
[6] The US, Dutch, Finnish and Italian treasury goals are to finance government borrowing *"at the lowest cost against acceptable risks"*. This practice is reflected in the International Organisation of Supreme Audit Institutions professional guidance 5250, Guidance on the Audit of Public Debt, 2020, at www.issai.org.
[7] The fundamentals for sovereign debt analysis are the debt-financing interest rates, growth and fiscal balance; see Blanchard (2022) and the large literature on structural debt models, eg Barro (2003), Conesa and Kehoe (2017), D'Erasmo *et al* (2016).

We run panel regressions of excess bond yields, GDP growth and primary balance on the ICRG ratings for a panel of 46 countries spanning 1999-2021 with macroeconomic, governmental and external controls. The regressions for yields and growth document economically and statistically significant coefficients on the political ratings. Deterioration of political ratings by ten units (out of 100) results in bond yields rising by 106 basis points (bp) and GDP growth being cut by two percentage points (pp). We find that political risk impacts yields through both the volatility and the willingness-to-pay channels; this is a new result in the literature. The political sensitivity of primary balance is not statistically significant. Subsample analysis shows that the political sensitivities of yield and growth are significant for high- and low-political risk, high- and low-debt, and emerging and developed countries. Our findings for developed countries show that political risk is of concern beyond emerging markets.

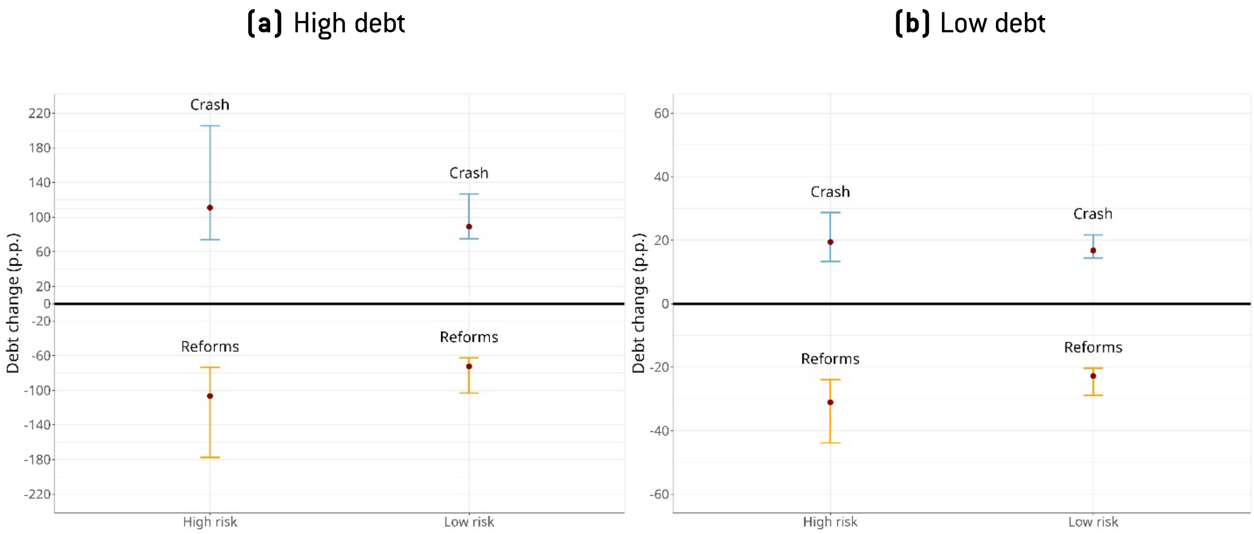
We put the model to work on representative euro-area countries in five steps: (i) document the effect of political risk on the risk-cost trade-off, (ii) assess the debt sustainability effects of political risk and uncover the mechanisms, (iii) assess the effects of reforms or crashes on debt sustainability, (iv) benchmark the effects of reforms against the ECB's pandemic quantitative easing programme, estimate the cost for the reforms to remain effective, and document the cost of delays, and (v) evaluate the marginal effects of the yields and growth channels. We also investigate what kinds of reforms can improve political ratings and uncover a positive predictive relationship between the structural reforms documented in Alesina *et al* (2020) and political ratings. We note that the representative countries have rather high political ratings, and the euro-area sovereign bond yields have been low compared to other markets and emerging economies. The effects we document in our tests are likely to be stronger for other countries.

Several observations follow from the tests. First, political risk shifts the cost-risk trade-off towards higher expected cost and significantly increases refinancing risk; the cost increase is about 1.5 percent of GDP for high-debt, high-risk countries, and 0.5 percent GDP for low-risk countries. Second, political risk can expose seemingly sustainable debt dynamics as unsustainable. Third, structural reforms can significantly lower debt levels, while the opposite is true for political rating crashes, as demonstrated in Figure 1. Reforms can restore debt sustainability, with the decrease in debt trajectories due to reforms equivalent to an extra fiscal effort of 1.75 percent of GDP per annum. This positive impact compares favourably with a benchmark of lowered debt due to the pandemic quantitative easing programme, though reform delays reduce the available fiscal space. Fourth, we show political risk effects on optimal debt financing maturities.

We corroborate the model predictions with two case studies of reforms in Italy from 2014 to 2019, and the ratings crash in France related to the snap 2024 parliamentary elections. The political DSA model would have better predicted Italian debt trajectories than the traditional model. It gives a very different view of France's expected future debt profile.

Our results have policy implications: (i) political risk can adversely affect debt sustainability in developed and not only emerging markets, (ii) structural reforms can reduce political risk and restore debt sustainability in high-debt countries, especially at times of high interest rates, and (iii) the management of public debt through optimal choice of debt-financing maturities must take into account expectations about political risk. These implications are relevant for international institutions, public debt management offices and the EU's new fiscal framework.

Figure 1: Long-term debt level effect of reforms or a crash



Note: this figure displays the interquartile and mean value changes of debt-to-GDP ratios for (a) high- and (b) low-debt countries from reforms or a political rating crash under high or low political risk at the end of the 30-year horizon. Results are from the tests of subsection 4.3.3.

1.1 Related literature

Manasse and Roubini (2009) documented that the electoral cycle is a significant determinant of sovereign debt defaults. We go beyond defaults, which are rare extreme events, to model debt (un)sustainability, which can result in default with high probability. We consider the numerator (bond yields) and denominator (economic growth) channels from political risk to the debt-to-GDP ratio, which is the fundamental variable in DSA.

Political effects on growth have been studied using government stability as a proxy for political risk, finding that political stability fosters growth (Aisen and Veiga, 2013; Alesina *et al*, 1996; Barro, 1991) and foreign direct investment (Alesina and Perotti, 1996). Political stability is proxied by slow-moving variables such as government personnel changes (Aisen and Veiga, 2013), regular or irregular transfers of executive power (Alesina *et al*, 1996) and politically motivated assassinations and property-rights violations (Alesina and Perotti, 1996). These proxies have two limitations. First, they do not capture higher-frequency changes in political risk, even if uncertainty around power transfer, peaceful or violent, builds up before the event itself. Second, they focus on political stability, but political risk is a multi-faceted concept (Kobrin, 2022; Sottilotta, 2016), and also includes government policy changes that foreshadow declines in total output (Baker *et al*, 2016). We overcome these limitations by using the monthly ICRG composite political ratings, which cover twelve political risk factors: government stability, socioeconomic conditions, investment profile, internal and external conflict, corruption, military in politics, religious and ethnic tensions, law and order, democratic accountability, and bureaucracy quality (https://www.icrgonline.com/). Our measure of political risk tracks a broad cross-section of countries over a long time series up to the present. In contrast, political stability measures stop at 1982 (Alesina *et al*, 1996), 1985 (Alesina and Perotti, 1996; Barro, 1991), or 2004 (Aisen and Veiga, 2013), and are less relevant for developed countries. We also uncover a significant positive predictive relationship between structural reforms (Alesina *et al*, 2020) and ICRG ratings.

Political risk also impacts the cost of debt (Eichler, 2014; Huang *et al*, 2015) and sovereign bond returns (Brogaard *et al*, 2020; Duyvesteyn *et al*, 2016). We follow Bekaert *et al* (2014) in computing a political risk spread to avoid double-counting political risk by using bond yields (Bekaert *et al*, 2016).

Earlier related literature focused on emerging markets (Bekaert *et al*, 2014, 2016; Block and Vaaler, 2004; Eichler, 2014), or mixed samples of emerging and developed countries (Aisen and Veiga, 2013; Alesina *et al*, 1996; Barro, 1991; Huang *et al*, 2015), and proxied political risk through extreme event indicators such the number of global crises (Huang *et al*, 2015) or (non)peaceful transfers of power (Aisen and Veiga, 2013; Alesina *et al*, 1996; Alesina and Perotti, 1996). We contribute to this literature a study of the sensitivity of yields and growth to political risk for developed or emerging markets. We use a continuous political rating variable instead of the slow-moving political cycle or violent political events. We provide evidence of sensitivities even in low-political risk countries and document significant sensitivities in developed countries.

Our empirical work is closer to Bekaert *et al* (2014), who documented a political risk premium on sovereign bond yields for emerging markets, but we differ in several ways. First, they looked at country ICRG deviations from US ratings to estimate bond spreads over the US government bond yields, whereas we use each country's ICRG rating to explain country yields. Second, we look at growth, capturing the denominator effect. Considering only yields underestimates significantly the impact of political risk; for a high-debt, high-risk country, the growth effect adds one-half of the yield effect on debt. Third, we carry out the exercise for developed markets.

Our model follows the tradition of DSA use by international institutions; see Bouabdallah *et al* (2017) for the ECB, European Commission (2020), IMF (2022), Zenios *et al* (2021) for the European Stability Mechanism (ESM) and Alberola *et al* (2022) for the Bank for International Settlements (BIS). None of these works link political risk to debt dynamics, and our model fills this gap. Recent DSA models account for uncertainty (Blanchard, 2022) through *ex-post* fan charts (Celasun *et al*, 2006). Ben Bernanke criticised the fan charts approach in his review of the Bank of England forecasting methods and suggested scenario analysis[8]. Our model uses *ex-ante* scenarios and a tail risk measure on debt stocks and flows.

We finally contribute to the literature on reforms and economic performance (Ostry *et al*, 2009). We show that structural reforms (Alesina *et al*, 2020) can improve political ratings, evaluate the long-term benefits to debt sustainability against the short-term reforms cost, and document a cost from delays in reforms. Thus, we add to Darvas *et al* (2024) – who argued that the EU fiscal rules should quantify the impacts of reforms – a study of structural reforms that improve political ratings and accounting for the cost of reforms relative to their impacts.

2 Political risk effects on yields and growth

We estimate the political risk effects on debt dynamics through the sovereign bond excess yields and GDP growth channels, and find economically and statistically significant results for both[9].

2.1 Bond yield spreads

Working from the earlier literature (Eichler, 2014; Huang *et al*, 2015), we estimate the sensitivity of country bond yields to our continuous measure of political risk for a broad sample of countries and subsamples of high- or low-risk, high- or low-debt, and developed or emerging economies. We run a panel linear regression of bond yield spreads (Bekaert *et al*, 2014) on the ICRG ratings to estimate the spread political sensitivity β_{PS}

$$Spread_{t,j} = \alpha + \beta_{PS} ICRG_{t,j} + \Theta X_{t,j} + \gamma_t + \delta_j + \epsilon_{t,j}. \quad (1)$$

X_t is a matrix of control variables, with regression coefficients Θ, from Afonso *et al* (2012) and Delatte *et al*

[8] See for example Larry Elliot, 'Do better: Bernanke gets strict with Bank of England over handling of inflation crisis', *The Guardian*, 12 April 2024, https://www.theguardian.com/business/2024/apr/12/do-better-bernanke-gets-strict-with-bank-of-england-over-handling-of-inflation-crisis. See also https://www.bankofengland.co.uk/independent-evaluation-office.

[9] Fiscal balance is under government control, with scant evidence of political cycle effects on deficit financing for municipalities (Bohn and Veiga, 2019). Regression of primary balance on ICRG (not shown, available from authors) does not find a statistically significant relationship when controlling for the debt level.

(2017), ie real GDP growth and inflation for macroeconomic controls, primary balance and nominal debt-to-GDP for government controls, current account balance as external controls and VIX to proxy risk appetite (Pan and Singleton, 2008).

To address a potential problem of omitted variables that is common in cross-country studies, we use time and country fixed-effects variables, γ_t and δ_j. These variables control for country variations that may be correlated with the political ratings and other control variables due to local socio-economic factors, so we do not need additional control proxies for such factors or for unobserved time-varying heterogeneity (Brogaard *et al*, 2020). The average of the fixed-effect variables within a country controls for time-invariant heterogeneity; their average across countries controls for common shocks.

We run the regression on a sample of 46 countries over 1999-2021[10]. We obtain all data from Datastream, except for the debt-to-GDP ratio, which is from the IMF. Debt-to GDP is available annually, GDP growth is quarterly and ICRG ratings, inflation, primary balance, current account and VIX are monthly. Spreads are computed over the risk-free rate, proxied by the one-month Euribor for euro-area countries and the US one-month T-bill rate from Kenneth French's website[11].

Summary statistics for the ICRG variable are given in Appendix Table A.1 for the full country sample. Appendix Table A.3 provides summary statistics for temporal and cross-country ICRG variability per subsample. The ICRG ratings exhibit significant variability in the range 0-100. Country temporal standard deviations range from 1.49 to 6.44, with an average of 3.33, and cross-country standard deviations average 10.73. The ratings are non-Gaussian, with skewness in the range of -1.72 to -1.18 and excess kurtosis from -1.60 to -6.90. They are prone to crashes: over a window of up to five years, 5 percent of the down-ratings were by at least 9.5 units and 1 percent by at least 14.

We also run the regression on subsamples of high- and low-political-risk or high- and low- debt countries. Countries with ICRG ratings above the recent post-2008 median value of 77 are classified as high risk and those below as low risk, with respective mean ratings of 67 and 84. High-risk countries have a 5 percent probability of experiencing a large ICRG downrating of 10.5 units and a 1 percent probability of a down-rating by 16 units over a window of up to five years. For low-risk countries, the corresponding down-ratings are 9.5

[10] Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, UK and US (developed markets in our exercise), and Brazil, Chile, China, Colombia, Czechia, Egypt, Greece, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Peru, Philippines, Poland, Qatar, Russia, Saudi Arabia, South Africa, Taiwan, Thailand and Turkey (emerging). The classification is from MSCI 2021Q4.

[11] Available at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html#Developed.

and 12 units. There are also large up-ratings at the 5 percent and 1 percent levels of, respectively, 11 and 19 for high-risk and 8 and 11 for low-risk countries. High-debt countries are those with average temporal debt ratios above the median of 48 percent of GDP, with low-debt countries below and respective means of 85 percent and 35 percent. We also test the emerging and developed markets subsamples following the MSCI classification. The respective average debt ratios are 42 percent and 68 percent, with average ICRG ratings of 67 and 83; see Table A.1.

We run the regression on monthly data, with yearly or quarterly variables kept constant in the interim, and report the results in Table 1. The political sensitivities are economically and statistically significant in all country groups. The coefficients are negative as higher political ratings imply lower risk, reducing the bond yields. On the entire sample, we reach an R^2 of 0.43, with the lowest R^2 of 0.22 in low-risk countries. High-debt countries have the greatest sensitivity (-1.120), and low-risk countries have the least (-0.859). We find large and statistically significant coefficients in developed (-0.800) and emerging (-0.944) markets. This has a policy implication that political risk is not only relevant for emerging markets. Developed countries have, on average, higher political ratings but also experience rating crashes, and their bond yields are only slightly less sensitive to political risk than those of emerging markets.

A deterioration of the ICRG ratings by ten units leads to a full-sample average annual increase in bond yields by 106 bp, establishing political risk as a determinant of debt dynamics through the yields channel. The impact is stronger for the high-debt (10 bp larger than the low-debt) and high-risk (13 bp larger than the low-risk) subsamples[12].

[12] We also run a regression controlling for the volatilities of the fundamentals (growth, inflation, primary balance, current account and VIX), in addition to the levels, and find that the ICRG coefficient remains economically and statistically significant. Orthogonalising the ICRG to the volatilities and using the residuals as a regressor, we still find it carries significant coefficients. Hence, political ratings impact yields through both volatility and willingness-to-pay channels. For DSA, it is the aggregate impact in Table 1 that matters. The disentangled impact of the residual ICRG when controlling for volatilities is available from the authors.

Table 1: Political risk and bond yields

	All	HD	LD	HR	LR	EM	DM
Constant	0.102***	0.109***	0.096***	0.113***	0.075**	0.126***	0.066**
	(0.000)	(0.001)	(0.000)	(0.000)	(0.044)	(0.000)	(0.030)
Political risk	-1.057***	-1.120***	-1.020***	-0.993***	-0.859*	-0.944**	-0.800**
	(0.000)	(0.006)	(0.005)	(0.002)	(0.056)	(0.016)	(0.030)
Debt-to-GDP	1.304	0.813	0.868	0.104	2.018***	0.135	1.880***
	(0.125)	(0.533)	(0.483)	(0.950)	(0.016)	(0.963)	(0.006)
GDP growth	-0.100***	-0.072***	-0.133*	-0.090*	-0.083***	-0.122**	-0.039**
	(0.005)	(0.013)	(0.057)	(0.079)	(0.011)	(0.052)	(0.041)
Inflation	0.335*	0.424*	0.298	0.346	0.290*	0.350	0.056
	(0.097)	(0.062)	(0.211)	(0.178)	(0.072)	(0.177)	(0.526)
Primary balance	-0.476	0.267	-2.878*	-1.935	0.663	-3.084	0.762
	(0.571)	(0.640)	(0.092)	(0.174)	(0.264)	(0.216)	(0.146)
Current account	-0.035*	-0.044	-0.029	-0.055	-0.021	-0.097**	-0.007
	(0.077)	(0.112)	(0.355)	(0.159)	(0.153)	(0.024)	(0.530)
VIX	-0.770	-2.270	1.360	12.070	-9.670**	18.580***	-15.450***
	(0.863)	(0.740)	(0.823)	(0.112)	(0.048)	(0.015)	(0.000)
R^2	0.426	0.465	0.540	0.416	0.222	0.457	0.155
Nr. observations	9,546	5,006	4,540	4,135	5,411	4,040	5,506

Note: this table reports the results of a panel regression of excess bond yields on the ICRG political ratings and a set of control variables. Column 'All' is for all countries in our sample. The other columns report results on subsamples for different country classifications: high vs. low debt-to-GDP (HD, LD), high vs. low political risk (HR, LR), and emerging vs. developed markets (EM, DM). Yields are expressed in excess of the risk-free rate, proxied by the one-month Euribor for euro-area countries and the US one-month T-bill rate for all other countries. Debt is denominated in local currency and scaled by GDP. Real GDP and inflation are expressed in growth rates. The primary balance is denominated in billions of USD, and the current account is a percentage of GDP. The original coefficients are rescaled as follows: political risk and primary balance by 10^3, debt-to-GDP by 10^4, and VIX by 10^5. All regressions include country and time-fixed effects. Standard errors are robust and clustered at the country level. The asterisks (***), (**), and (*) denote statistical significance at the 1%, 5% and 10% levels, respectively. The sample spans 46 countries with monthly observations from 1999 to 2021.

2.2 Growth

We estimate next the growth political sensitivity β_{PG} through the panel regression

$$\Delta \mathrm{GDP}_{\mathrm{t,j}} = \alpha + \beta_{PG} \mathrm{ICRG}_{\mathrm{t,j}} + \Theta X_{t,j} + \gamma_t + \delta_j + \epsilon_{t,j}\,, \tag{2}$$

where $\Delta \mathrm{GDP}_{\mathrm{t,j}}$ is the growth rate of nominal national output[13]. As in (1), we use time and country fixed effects and the matrix of control variables Θ excluding GDP growth.

We run this regression with the quarterly frequency of GDP data and report the results in Table 2. The political sensitivities are economically and statistically significant in the entire sample, high-debt, low-risk and developed countries; the coefficients are positive as higher political ratings imply lower risk, increasing growth. The coefficients are positive but not statistically significant for high-risk and emerging markets; we surmise that this is because of the high growth rate and high volatility of the emerging high-risk countries during our sample period[14]. On the entire sample, we find that a deterioration of the political rating by ten units leads to an economically large and statistically significant average reduction in GDP growth by 2 pp.

[13] We estimate the political-risk effects on nominal GDP growth, as debt sustainability analysis is in nominal values. The estimates are robust to using real GDP growth and are available from the authors.
[14] The coefficient is not statistically significant for high-risk countries; with the available quarterly data, there is probably no sufficient power for the statistical test.

Table 2: Political risk and GDP growth

	All	HD	LD	HR	LR	EM	DM
Constant	0.008	-0.023	0.054**	0.032	-0.001	0.040	-0.009
	(0.603)	(0.109)	(0.042)	(0.204)	(0.944)	(0.144)	(0.566)
Political risk	0.480***	0.780***	-0.043	0.335	0.434***	0.280	0.552***
	(0.009)	(0.000)	(0.869)	(0.268)	(0.010)	(0.373)	(0.005)
Debt-to-GDP	-0.388	0.228	-2.138***	-0.949	-0.092	-2.077*	-0.183
	(0.265)	(0.493)	(0.003)	(0.243)	(0.685)	(0.084)	(0.294)
Inflation	1.452***	1.982***	1.261**	1.449**	1.417***	1.465**	1.318***
	(0.006)	(0.000)	(0.048)	(0.031)	(0.000)	(0.024)	(0.000)
Primary balance	8.638***	8.453***	7.938***	15.158*	7.296***	10.144*	8.191***
	(0.000	(0.000)	(0.010)	(0.091)	(0.000)	(0.090)	(0.000)
Current account	0.045***	0.020*	0.090**	0.060**	0.036*	0.063**	0.032*
	(0.008)	(0.085)	(0.016)	(0.050)	(0.076)	(0.040)	(0.096)
VIX	-1.060***	-1.086***	-0.979***	-1.420***	-0.768***	-1.348***	-0.844***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R^2	0.079	0.068	0.111	0.153	0.128	0.139	0.126
Observations	3,347	1,743	1,604	1,531	1,816	1,500	1,847

Note: this table reports the results of a panel regression of nominal GDP growth on the ICRG political ratings and a set of control variables. Column 'All' is for all countries in our sample. The other columns report results on subsamples for different country classifications: high vs. low debt-to-GDP (HD, LD), high vs. low political risk (HR, LR), and emerging vs. developed markets (EM, DM). Debt is denominated in local currency and scaled by GDP. Inflation is in growth rates. The primary balance is denominated in billions of USD, and the current account is a percentage of GDP. The original coefficients are rescaled as follows: political risk and primary balance by 10^3, debt-to-GDP by 10^4 and VIX by 10^5. All regressions include country and time-fixed effects. Standard errors are robust and clustered at the country level. The asterisks (***), (**), and (*) denote statistical significance at the 1%, 5% and 10% levels, respectively. The sample spans 46 countries with monthly observations from 1999 to 2021.

2.3 Robustness test

As a robustness test, we run the regressions for the recent period starting with the Great Financial Crisis of 2008. The results in Tables 3-4 show that political effects on bond yields and GDP growth are robust to the choice of calibration period and country characteristics. The sensitivity to political risk was greater during the recent period, with stronger statistical significance. Deterioration of political ratings by ten units leads to a full-sample average increase of yields by 171 bp and a reduction of nominal GDP growth by 3.05 pp.

Table 3: Political risk and bond yields, 2008–2021

	All	HD	LD	HR	LR	EM	DM
Constant	0.156***	0.176***	0.143***	0.180***	0.132**	0.215***	0.109***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.019)	(0.000)	(0.009)
Political risk	-1.707***	-2.115***	-1.282***	-1.856***	-1.503**	-2.234***	-1.284***
	(0.000)	(0.000)	(0.005)	(0.000)	(0.031)	(0.001)	(0.015)
Debt-to-GDP	1.877**	1.521	0.644	-0.275	2.404**	-0.452	2.042**
	(0.050)	(0.215)	(0.724)	(0.869)	(0.025)	(0.886)	(0.018)
GDP growth	-0.084***	-0.058***	-0.107*	-0.076*	-0.080***	-0.109**	-0.052***
	(0.006)	(0.008)	(0.077)	(0.081)	(0.002)	(0.049)	(0.006)
Inflation	0.298	0.248	0.291	0.302	0.251*	0.275	0.168
	(0.165)	(0.185)	(0.259)	(0.227)	(0.085)	(0.260)	(0.166)
Primary balance	0.286	0.727	-1.570	-0.707	0.992**	-1.152	0.837**
	(0.519)	(0.147)	(0.201)	(0.343)	(0.052)	(0.332)	(0.039)
Current account	-0.012	-0.022	-0.007	0.026	-0.023*	-0.029	-0.010
	(0.535)	(0.168)	(0.883)	(0.651)	(0.080)	(0.615)	(0.383)
VIX	-0.348	-2.980	1.970	9.620	-8.550*	15.680**	-13.610***
	(0.941)	(0.621)	(0.764)	(0.184)	(0.098)	(0.033)	(0.000)
R^2	0.465	0.503	0.574	0.431	0.201	0.484	0.170
Observations	6,812	3,553	3,259	3,137	3,675	3,071	3,741

Note: this table reports the results of a panel regression of excess bond yields on the ICRG political ratings and a set of control variables over the period 2008–2021. Column 'All' is for all countries in our sample. The other columns report results on subsamples for different country classifications: high vs. low debt-to-GDP (HD, LD), high vs. low political risk (HR, LR), and emerging vs. developed markets (EM, DM). Yields are expressed in excess of the risk-free rate, proxied by the one-month Euribor for euro-area countries and the US one-month T-bill rate for all the other countries. Debt is denominated in local currency and scaled by GDP. Real GDP and inflation are expressed in growth rates. The primary balance is denominated in billions of USD, and the current account is a percentage of GDP. The original coefficients are rescaled as follows: political risk and primary balance by 10^3, debt-to-GDP by 10^4 and VIX by 10^5. All regressions include country and time-fixed effects. Standard errors are robust and clustered at the country level. The asterisks (***), (**), and (*) denote statistical significance at the 1%, 5% and 10% levels, respectively. The sample spans 46 countries with monthly observations.

Table 4: Political risk and GDP growth, 2008–2021

	All	HD	LD	HR	LR	EM	DM
Constant	-0.015	-0.059***	0.046	0.022	-0.043**	0.020	-0.031*
	(0.483)	(0.015)	(0.157)	(0.529)	(0.023)	(0.628)	(0.090)
Political risk	0.763***	1.167***	0.047	0.522	0.853***	0.589	0.755***
	(0.004)	(0.001)	(0.895)	(0.248)	(0.000)	(0.265)	(0.002)
Debt-to-GDP	-0.415	0.563	-2.627***	0.580	-0.536	-0.946	-0.252
	(0.370)	(0.284)	(0.003)	(0.661)	(0.214)	(0.595)	(0.546)
Inflation	1.254**	1.987***	1.071*	1.264*	1.070**	1.299**	0.889*
	(0.027)	(0.000)	(0.085)	(0.063)	(0.024)	(0.052)	(0.101)
Primary balance	10.381***	9.708***	7.919***	16.698*	8.795***	11.011*	9.987***
	(0.000)	(0.000)	(0.004)	(0.099)	(0.000)	(0.070)	(0.000)
Current account	0.048*	0.015	0.102**	0.067*	0.037	0.086**	0.028
	(0.056)	(0.310)	(0.043)	(0.087)	(0.198)	(0.053)	(0.273)
VIX	-1.200***	-1.154***	-1.152***	-1.620***	-0.870***	-1.503***	-1.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R^2	0.040	0.034	0.075	0.071	0.103	0.082	0.108
Observations	2,325	1,226	1,099	1,098	1,227	1,076	1,249

Note: this table reports the results of a panel regression of nominal GDP growth on the ICRG political ratings and a set of control variables over the period 2008–2021. Column 'All' is for all countries in our sample. The other columns report results on subsamples for different country classifications: high vs. low debt-to-GDP (HD, LD), high vs. low political risk (HR, LR), and emerging vs. developed markets (EM, DM). Debt is denominated in local currency and scaled by GDP. Inflation is in growth rates. The primary balance is denominated in billions of USD, and the current account is a percentage of GDP. The original coefficients are rescaled as follows: political risk and primary balance by 10^3, debt-to-GDP by 10^4 and VIX by 10^5. All regressions include country and time- fixed effects. Standard errors are robust and clustered at the country level. The asterisks (***), (**), and (*) denote statistical significance at the 1%, 5% and 10% levels, respectively. The sample spans 46 countries with monthly observations.

3 Debt sustainability analysis with political risk

We now develop the political DSA model. We start with the debt stock and flow temporal equations and introduce scenario trees with interest rates, growth, fiscal balance and political ratings as stochastic variables that depend on the state of the tree. We then give the state-dependent debt dynamics, specify the risk measure and formulate the model for optimal debt financing with sustainability constraints.

3.1 Model setup

We assume a sovereign with nominal economic output Y_t over period *t*, holding debt stock D_{t-1} with legacy debt D_0, and running a primary balance PB_t. The sovereign's *gross financing needs* are given by the *flow* variable

$$\mathrm{GFN_t} = i_{t-1}D_{t-1} + A_t - \mathrm{PB_t} \tag{3}$$

where i_{t-1} is the *effective nominal interest rate* on debt, and A_t denotes the amortisation of debt stock D_{t-1}. The gross financing needs as a ratio to GDP is $gfn_t \ = \ GFNt/Yt$. The *debt stock* is given by

$$D_t = (1 + i_{t-1})D_{t-1} - PB_t \tag{4}$$

The sovereign issues debt securities with maturities denoted by $j = 1, 2, \ldots, J$, with *financing decisions* $X_t(j)$ denoting the nominal amount of debt with maturity *j* issued at *t*. The *debt financing equation* satisfies

$$\sum_{j=1}^{J} X_t(j) = GFN_t \tag{5}$$

The nominal interest rate on issued debt is determined by the forward rates on AAA-rated sovereign bonds, taken as the risk-free rate (r_{ft}), plus a risk premium on the sovereign. In standard DSA, the risk premium depends on the debt level (Blanchard, 2022; Zenios *et al*, 2021) as a function of the debt stock-to-GDP ratio, $d_t = D_t/Y_t$, with *term premia* for debt of different maturities. The interest rate for instrument *j* issued at *t* is given by

$$r_t(j) = r_{ft} + \rho(d_t, j) \tag{6}$$

where $\rho(d_t, j)$ denote premia for the *j*th instrument maturity given by

$$\rho(\mathrm{d}, \mathrm{j}) = \mathrm{a_j} + \hat{\rho}(\mathrm{d}) \quad (7)$$

a_j is the term premium, and $\hat{\rho}(\mathrm{d})$ is the risk premium as a function of debt stock, which we approximate using the piece-wise linear function with a lower bound zero for debt-to-GDP below d_{min} and increasing for higher debt, as has been calibrated for euro-area countries (Zenios *et al*, 2021)[15]. A smooth approximation is given by

$$\hat{\rho}(d) \doteq \widehat{\rho_c} \frac{d - d_{min}}{1 + exp(d_{min} - d)} \quad (8)$$

$r_t(j)$ determine the *effective interest rate* as a function of the debt financing decisions $X_t(j)$.

3.2 Scenario trees

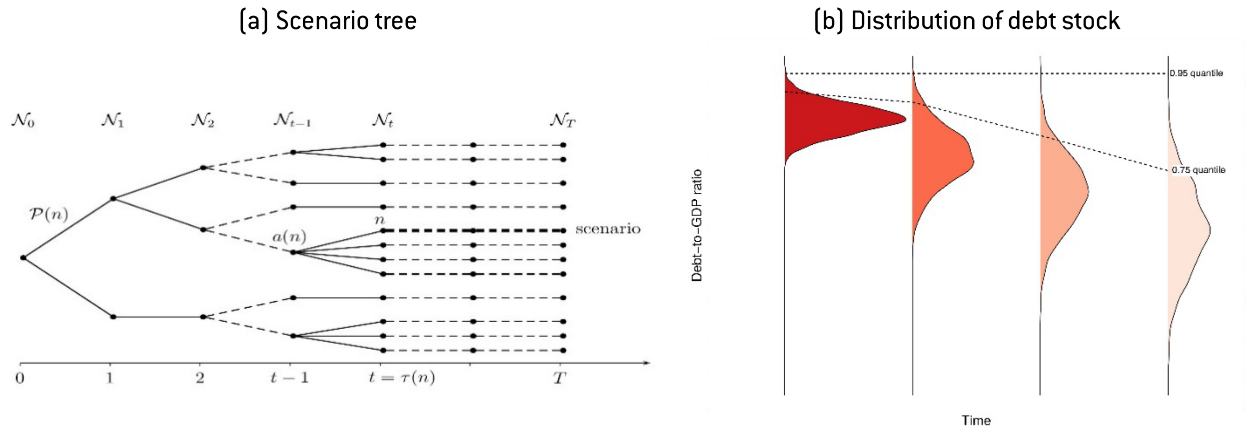
We introduce uncertainty in the risk-free interest rates, growth, fiscal balance and political ratings using a discrete time- and state-space scenario tree; see Figure 2, panel A. We denote time by $t = 0,1,2, \dots, T$, where T is our risk horizon, and *states* at *t* by $n \in N_t$. The number of states at *t* is N_t, with a total number of states *N*. Not all states at *t* can be reached from every state at *t* – 1, and *a*(*n*) denotes the unique *predecessor* of state *n*. *P*(*n*) denotes the set of states on the unique *path* from the *root state* 0 to *n*, with τ (*n*) denoting the time of *n*. Each path leading to a terminal state $n \in N_t$ is a *scenario* with probability $Prob^{(n)}$, the product of conditional probabilities on the path. For each state *n*, all information at $m \in P(n)$ is known since *m* precedes *n*. Data and variables are state-dependent, indexed by *n*.

We calibrate the scenario tree using moment matching (Consiglio *et al*, 2016; Høyland and Wallace, 2001; Pflug, 2001). We follow Consiglio *et al* (2016) to solve a global optimisation problem estimating the level of the state variables of the tree and the conditional probabilities at each state so that at each period, their mean values, standard deviations and correlations match input data. For the mean values of the risk-free forward rates state variables, we match the market expectations (from the yield curve of interest rates). For growth and fiscal stance state variables, we match economic forecasts (from the IMF World Economic Outlook). For the mean values of the risk-free forward rates state variables, we match the market expectations (from the yield curve of interest rates). For growth and fiscal stance state variables, we match economic forecasts (from the IMF World Economic Outlook). For the political state variable, we match mean

[15] We differ from the references in that we do not assume a cap on the increase, reached if a country loses market access and is financed by the official sector under strict conditionality. The cap is useful when deploying DSA in practice but introduces a non-linearity that can mask the political effects we are studying.

values for different regimes representing a reversion to the mean, reforms or crashes as described in section 4.1. We also match the standard deviations and correlations obtained from historical data. The tree need not be binomial or have a fixed number of branches at each period, and the simultaneous estimation of levels and conditional probabilities generates trees that can match the moments with a relatively small number of scenarios. Details on the tree calibration are given in subsection 4.2.

Figure 2: Modelling uncertain debt dynamics on a scenario tree



Note: this figure displays (a) a discrete time and state space scenario tree and (b) the distributions of debt-to-GDP ratio at different points in time. Time is denoted by $t = 0, 1, 2, \ldots T$, where T is the risk horizon, and states by $n \in N_t$. $P(n)$ denotes the set of states on the unique path from the root state 0 to n, $a(n)$ denotes the unique predecessor of state n, and $\tau(n)$ denotes the time of n. Each path leading to a terminal state $n \in N_T$ is a scenario.

3.3 Political risk-debt channels

The political variable enters into DSA through the debt financing interest rate (numerator effect) or GDP growth (denominator effect). Both effects depend on political rating changes conditioned on the state of the scenario tree.

Using the estimated sensitivity of yield spreads (β_{PS}), we introduce the political risk premium for deviations of $ICRG^n$ from its mean value $\overline{ICRG}$,

$$\rho_P(\mathrm{ICRG}_t^n) = -\beta_{PS}\left(\mathrm{ICRG}_t^n - \overline{\mathrm{ICRG}}\right) \tag{9}$$

Taking $\overline{\text{ICRG}}$ as the historical average, we calibrate $\hat{\rho}(d)$ and a_j to past data with the expected political rating constant at its historical average. A political premium is then added for deviations from the mean, and from (6), we obtain the state-dependent interest rates with political risk as

$$r_t^n(j) = r_{ft}^n + \rho(d_t^n, j) + \rho_P(ICRG_t^n) \tag{10}$$

Similarly, we introduce political risk through the growth channel. The state-dependent nominal GDP is given by $Y_t^n = Y_{t-1}^{a(n)}(1 + g_{t-1}^n)$ where g_{t-1}^n is the nominal growth rate, and adjusting for the political risk we have

$$Y_t^n = Y_{t-1}^{a(n)} \left(1 + g_{t-1}^n + \beta_{PG}\big(ICRG_t^n - \overline{ICRG}\big)\right). \tag{11}$$

3.4 Stochastic debt dynamics and the risk measure

We next define state-dependent financing decisions, $X_t^n(j)$, and write (5) as

$$\sum_{j=1}^{J} X_t^n(j) = GFN_t^n, \tag{12}$$

for $n \in N_t$ and $t = 0,1,2, \dots T$ where $GFN_t^n = i_{t-1}^{a(n)} D_{t-1}^{a(n)} + A_t^n - PB_t^n$, is the state-dependent stock equation (cf. eqn. 4). The interest rate is also dependent on the political state variable (cf. eqn. 10). The state-dependent debt stock and flow ratios are given by $d_t^n = D_t^n / Y_t^n$ and $gfn_t^n = GFN_t^n / Y_t^n$

We use the distributions of the stock and flow ratios to assess if refinancing needs are likely to remain below the threshold or if debt stock is on a non-increasing trajectory with a given probability. In Figure 2, Panel B, we illustrate an example of the temporal debt-to-GDP distributions shifting towards lower values for longer horizons. The 75th percentile is declining, and we infer with high confidence that debt is sustainable.

A tail risk measure of gross financing needs was introduced in Zenios *et al* (2021) using the coherent *conditional-Value-at-Risk* (CVaR) of Artzner *et al* (1999). This is defined as the expected value of financing needs above the right α percentile (eg 75th for a high confidence level). This is the expected value of the right tail of the flow distribution and it is the value bounded by constraints to reduce refinancing risks. We let *gfn* denote the gross financing needs stochastic variable over all periods and define the CVaR function for flow (conditional Flow-at-Risk) by

$$\Psi(gfn) \doteq E(\,gfn \mid gfn \geq gfn^{\diamond}\,), \tag{13}$$

where $gfn^{\diamond}$ is the Value-at-Risk. It is the right α-percentile of the gross financing needs, ie the

lowest value of gfn such that the probability of gross financing needs less or equal to $gfn^{\diamond}$ is greater or equal to α. $\Psi(gfn)$ measures the *refinancing risk*. Similarly, we can define CVaR of debt stock.

3.5 Optimal financing with sustainability conditions

Equipped with a debt risk measure, we formulate the model to determine optimal debt financing to minimise the expected *net interest payment* (NIP) subject to refinancing risk constraints and assess the sustainability of the debt-stock trajectories.

Interest payments on state *n* of the tree consist of interest on legacy debt I_t^n plus service

payments on the debt created by the financing decisions. Exploiting the tree structure, we calculate the service payments on a path leading to *n*. Let $CF_t^n\,(j,m)$ denote the nominal amount of interest

payment at state *n* of period *t*, per unit of debt $X_t^m\,(j)$ issued at state *m* of an earlier period

$\tau\,(m)$ on path $P(n)$. This amount is computed from scenarios of the term structure of interest rates, including premia (cf. eqn. 10) and the maturities of the issued debt. The state-dependent net interest payment, which the issuing sovereign controls through financing decisions, is given by

$$NIP_t^n = I_t^n + \sum_{m \in \boldsymbol{P}(n)} \sum_{j=1}^{J} X_{\tau(m)}^m(j) CF_t^n(j,m) \tag{14}$$

The model minimises the expected cost of debt subject to a refinancing risk constraint:

$$\text{Minimize}_X \quad \sum_{t=0}^{T} \sum_{n \in \mathcal{N}_t} \text{Prob}^{(n)} \text{NIP}_t^n \tag{15}$$

$$s.t. \qquad \Psi(gfn) \leq \omega \tag{16}$$

Issuing debt at the lowest yield maturity lowers the financing cost but increases the refinancing risk when all debt may need to be refinanced together. Deviations from the minimum-cost maturity increase the cost of financing and, consequently, debt stock. The lowest-cost maturity depends on the slope and shape of the yield curve, but the trade-off is pervasive. Varying the parameter ω, we trade off debt financing cost with refinancing risk with the increasing cost of debt pushing the debt stock dynamics upwards. There is a tension between stock and flow, which can be controlled through a constraint

$$\frac{\partial d}{\partial t} \leq \delta \tag{17}$$

If debt stock follows a non-increasing trajectory over our risk horizon with a high probability, then debt is sustainable. Hence, we seek solutions with $\delta \leq 0$ with a high probability.

Since *d* is a random variable with scenario values d_t^n, this constraint is also implemented using the risk measure; see (Zenios *et al,* 2021, Online Appendix A.2). A more straightforward implementation of the model, used in our numerical tests, finds the minimum cost solution with ω below a threshold and checks *ex post* if the debt stock dynamics are non-increasing with a high probability to ensure that both debt stock and flow are sustainable.

We reformulate the model using proportional weights $w_t^n(j) \geq 0$ to write

$$w_t^n(j) = \frac{X_t^n(j)}{GFN_t^n} \tag{18}$$

$$\sum_{j=1}^{J} w_t^n(j) = 1 \tag{19}$$

Three alternative strategies for debt management follow from this formulation: (i) the weights of the issued maturities are time-invariant $w(j)$, following a *fixed-mixed strategy* with simple *rules* for all periods; (ii) weights are time-dependent but state-invariant $w_t(j)$, following an *adaptive fixed-mixed strategy* that adapts with time but is identical for all states at each period; (iii) weights are state contingent $w^n(j)$, following a *dynamic strategy* whereby the issuer implements a decision, waits to observe the state at the next period, implements the optimal decision for that state, and waits again. A dynamic strategy is more efficient but needs to provide simple debt financing rules for the public debt management offices. The adaptive fixed mix can be described simply, eg with the weighted average maturity of issued debt or a debt schedule. It affords some flexibility to the public debt management office and is the default strategy in our tests.

In Appendix B, we give the state-dependent debt stock and flow equations and the computation of the risk measure. We implement the model using GAMS on AMD Ryzen 9 12-Core with 32 GB of memory, running Linux, with solvers BARON to fit the trees and CONOPT to solve the model.

4 Political risk effects on debt dynamics

We calibrate the model for different political regimes and put it to work in a $2 \times 2 \times 2$ controlled experiment on representative high- or low-risk and high- or low-debt countries (abbreviated, respectively, as HR/LR, HD/LD) in an interest rate environment with high or low bond yields (HY/LY).

4.1 Political regimes: mean reversion, reforms, and crashes

We test three regimes of political risk: (i) ratings deviating randomly around their mean value, (ii) gradually improving ratings, and (iii) sudden but transient rating crashes. Zero-mean deviations are the default, and crashes arise from snap elections, military conflicts, terrorist attacks or pandemics. In the data, we also observe several gradual improvements over one to five-year periods. The 5 percent and 1 percent extreme percentiles have improvements of, respectively, 11 and 19 units for high-risk and 8 and 11 units for low-risk countries, corresponding roughly to three to six standard deviations.

One way to see what may bring about such improvements is to test whether structural reforms – as measured by the IMF Structural Reforms Database aggregate index of advanced and developing economies (SRD, Alesina *et al*, 2020) – lead to higher ICRG ratings. SRD rates the degree of regulatory liberalisation from 0 (worst) to 1 (best) in the policy areas of domestic finance, external finance, labour market, product market and trade. We use the aggregate SRD index, which rates country reforms by the average of the five indicators; see descriptive statistics in Table 5, Panel A[16]. We compute the correlations of ICRG with the SRD index for the 46 countries in our sample[17]. The cross-country average correlation is 0.30, with a median of 0.42. One-quarter of the countries have correlations above 0.55, but the bottom 25th percentile of the cross-sectional distribution of the within-country correlations takes mildly negative values, suggesting that not all reforms are correlated with better ratings; the case of the *gilet jaunes* in France is an anecdotal example of this. This is in line with literature that reforms may be politically costly (Furceri *et al*, 2023) because of increasing

[16] The data is available at https://data.imf.org/?sk=8a361b05-ac3f-4cb2-be4a-f9a2b0cba124, accessed July 2024.
[17] The ICRG ratings are monthly and SRD is yearly, and we average the twelve ICRG ratings to obtain annual data; this can lower the correlations.

inequality (Ostry *et al*, 2021), although carefully designed reforms enacted early in an incumbent's term or in periods of strong economic activity do not carry political costs (Furceri *et al*, 2024).

Table 5: The impact of reforms on political ratings

(a) Descriptive statistics

	μ	σ_T	σ_C
Maximum	0.910	0.290	0.185
75th percentile	0.793	0.158	0.162
Mean	0.696	0.130	0.138
25th percentile	0.621	0.098	0.115
Minimum	0.292	0.041	0.091

(b) Panel regressions

	Contemporaneous of levels			Predictive of first differences		
	(1)	(2)	(3)	(1)	(2)	(3)
βRef	39.130***	17.473***	12.287*	14.048***	14.243***	9.871***
	(0.000)	(0.000)	(0.089)	(0.000)	(0.000)	(0.007)
R^2	0.327	0.327	0.254	0.014	0.014	0.153
Country FE	No	Yes	Yes	No	Yes	Yes
Year FE	No	No	Yes	No	No	Yes
Observations	1,309	1,309	1,309	1,226	1,226	1,226

Note: this table reports (a) descriptive statistics of the IMF's structural reforms database (SRD) aggregate index and (b) results from panel regressions of the ICRG political ratings on the SRD index. In Panel A, we compute, for each country, the time-series average and standard deviation of the IMF index and report the cross-country statistics of these country-level averages, μ, and standard deviations, σ_T). We also compute, at each period, the cross-country standard deviation of the reforms ratings and report the statistics of this time series of cross-sectional standard deviations (σ_C). Panel B reports the results of panel regressions of ICRG political ratings on the SRD index, both contemporaneous of levels and predictive with first differences of the reforms index forecasting changes in ICRG ratings. In column (1), we run pooled OLS regressions; in column (2), we control for country fixed effects; in column (3), we add year fixed effects. Standard errors are robust and clustered at the country level. The asterisks (***), (**), and (*) denote statistical significance at the 1%, 5% and 10% levels, respectively. The sample spans the overlapping ICRG and SRD data of 46 countries over the period 1984–2014 using yearly observations.

We run linear regressions of the ICRG ratings on the SRD index. We run a contemporaneous regression of the levels

$$\mathrm{ICRG}_{t,j} = \alpha + \beta_{\mathrm{Ref}}\,\mathrm{SDR}_{t,j} + \gamma_t + \delta_j + \epsilon_{t,j}. \tag{20}$$

We also run a predictive regression using first differences that reforms predict improved ratings,

$$\Delta \text{ICRG}_{t,j} = \alpha + \beta_{\text{Ref}} \Delta \text{SDR}_{t-1,j} + \gamma_{t-1} + \delta_j + \epsilon_{t-1,j}. \tag{21}$$

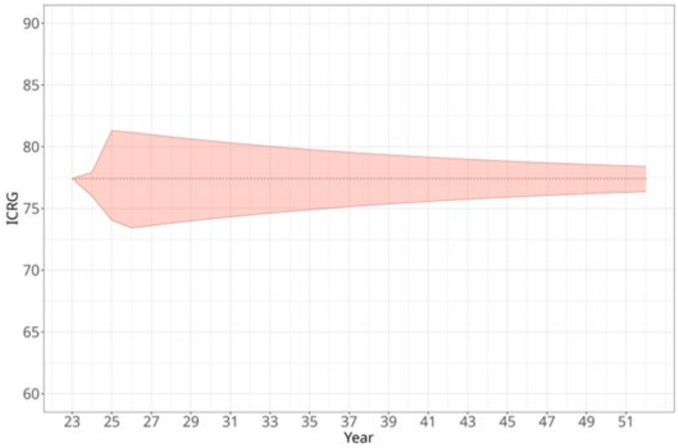
γ_t and δ_j denote time and country fixed effects variables to address a potential problem of omitted variables. We report the structural reform coefficients β_{Ref} and the regression statistics in Table 5, Panel B. In column (1), we run pooled OLS regressions; in column (2), we control for country fixed effects; and in column (3), we add year fixed effects. The coefficients on the SRD index are economically large and statistically significant at conventional levels in all specifications.

The results of the first regression allow us to proxy the slow-moving (annual) reforms index by the monthly ICRG ratings, using the more recent frequently updated ICRG ratings, whereas the reforms index stopped in 2014. The second regression first rules out that our results arise spuriously, due to the persistency in the time series. Second, it establishes the predictive nature of the relationship between reforms and political ratings, suggesting that tracking political reforms helps forecast the degree of political risk in a country. Third, and perhaps most important, it can shed some light on the direction of the causal relationship between reforms and political risk to alleviate potential concerns of reverse causality: running the opposite predictive regression of changes in political ratings on reform changes does not yield any significant result. This suggests that reforms lead to better expert assessments of political risk, while a stable political environment reflected in better ratings does not guarantee *per se* the implementation of structural reforms in the near future. Hence, we can study the debt effects of reforms via the political ratings proxy effect. To this end, we postulate a reform regime of gradual rating improvements and use it to study the impact of reforms on debt sustainability.

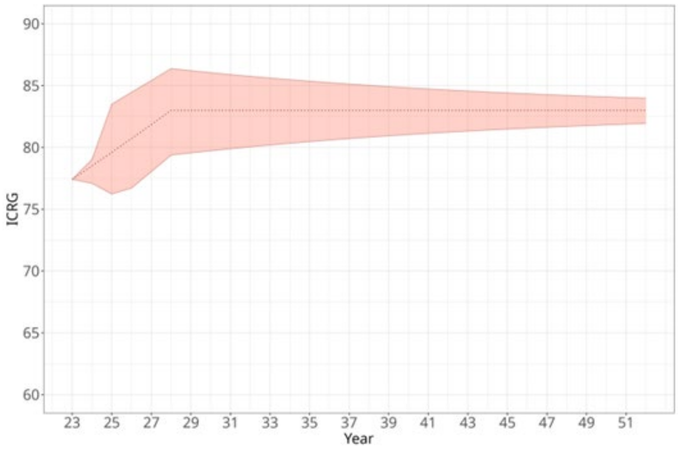
In Figure 3, we illustrate the ICRG interquartile fan charts obtained from a calibrated scenario tree (see subsection 4.2) for the three regimes for high-risk countries (see Appendix C.1 for low-risk). Panel A depicts *mean reversion* to a long-term average. Panel B depicts *reforms* improving the rating by five units over five years. Such improvements are observed in our data with a frequency of 26 percent for high-risk and 16 percent for low-risk countries. Panel C depicts a *crash*, with a drop by ten units, returning to its long-term average after four years. This drop is quite large, corresponding to about three standard deviations of the average ratings of high-risk countries. Comparable drops over five years occur in our data with a frequency of 5 percent for high-risk and 1 percent for low-risk countries, and were observed in France during the 2024 snap parliamentary elections.

Figure 3: Political regimes: mean reversion, reforms, and crashes

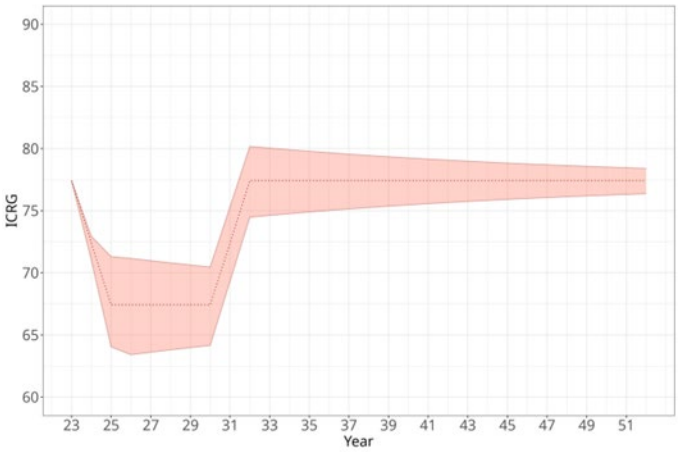
(a) Mean reversion



(b) Reforms



(c) Crash



In the next section, we demonstrate the debt effects of reforms or a crash, and in section 6 illustrate with case studies from Italy and France. However, a fundamental question is whether there is scope for political DSA for mean-reverting ratings, in which case, the expected value of the political spread is zero. This may suggest that the debt trajectories with and without political risk coincide. We show that mean-reverting deviations are consequential for DSA since the cumulative debt stock introduces a component linked to rating volatility in calculating its expectations.

Without loss of generality, we simplify the debt dynamics as following the exponential

$$Dt = Dt-1\ e^{rf+S(P,M)}, \tag{22}$$

where r_f is the risk-free rate and $S(P, M)$ is the total spread as a function of political risk P (Bekaert *et al*, 2014) and all other credit factors M. We consider a linear function of spreads on P and M,

$$S(P, M) = \alpha P + \beta M, \tag{23}$$

with coefficient α and β. P and M are random variables with means μ_P and μ_M, variances σ_p^2 and σ_M^2 and covariance Cov(P, M). $S(P, M)$ is also a random variable, with mean $\mu_S = \mathcal{E}[S(P, M)] = \alpha\mu_P + \beta\mu_M$ and variance $\sigma^2 = \text{Var}(S(P, M)) = \alpha^2\sigma^2 + \beta^2\sigma^2 + 2\alpha\beta\,\text{Cov}(P, M)$.

We omit for simplicity the dependence on the risk-free rate to focus on the spread and apply the result for the expectation of an exponential to obtain $Ee^{S(P,M)} = e^{\mu S+\frac{1}{2}\sigma^2}$. Substituting for μ_S and σ_S^2 we have

$$E\left[e^{S(P,M)}\right] = e^{\alpha\mu_P+\beta\mu_M+\frac{1}{2}\left(\alpha^2\sigma_P^2+\beta^2\sigma_M^2+2\alpha\beta Cov(P,M)\right)}. \tag{24}$$

It follows that even if the expected value of the political spread is zero, $E\left[e^{S(P,M)}\right] > \mathcal{E}[e^{\beta M}]$ due to the variance and covariance terms, assumed to be non-negative.

The economic interpretation of this result is that the political effects on debt also come from the uncertainty around the mean value of the ratings and not only from unexpected rating changes due to reforms or crashes. We demonstrate this result when putting the model to work. Furthermore, political risk amplifies the effects of other sources of risk through the positive covariance shown in Gala *et al* (2024) between ICRG and several economic sources of risk, such as the PRS economic ratings or inflation.

4.2 Model calibration

We set up representative countries using euro-area data. For a representative high-debt country, we average the legacy debt, including interest, of three highly indebted countries (Italy, Portugal, Spain). For low debt, we average Denmark, Finland and the Netherlands. This leads to debt levels of 125 percent (high debt) and 48 percent (low debt) of GDP. The term structure of legacy debt is obtained from Eikon-Refinitiv (see Appendix Figure C.2)[18]. For the representation of high-/low-risk countries, we rank the euro-area countries by their ICRG ratings and take the average rating of 77 of the bottom quartile as the high- risk country and the average of 87 of the top quartile as low-risk. These representative countries fall within the high/low debt and risk classification of the empirical section, and we use in our tests the political sensitivity coefficients for the recent period 2008–2019 from Tables 3-4.

The 10-year forward rates taken as risk-free are from the AAA yield curves for euro-area sovereigns from the ECB. For a high-yield environment, we take the yield curve of November 2023 with long-term AAA-rated bond yields of about 3 percent, and for low yields, we take the curve of January 2021 with long-term yields near the zero lower bound. We use GDP growth and primary balance projections from the 2022 IMF World Economic Outlook for five years and then converge to the historical averages. We average the IMF projections for the high- and low-debt countries to obtain representative mean values.

We calibrate the scenario tree using moment matching (Consiglio *et al*, 2016) so that at each period, the mean values of the risk-free forward rates, growth and fiscal stance state variables match the above projections. For the political state variable, we match mean values for the three regimes of section 4.1. The volatilities and correlations of the financial, economic and fiscal variables are matched to their historical estimates from Zenios *et al* (2021). For the political state variable, we need the ICRG standard deviations and correlations with the other variables. High-risk countries have more volatile ratings than low-risk and we estimate a linear relationship between inter-temporal standard deviation and average ICRG ratings to estimate standard deviations of 3.2 and 2.0, respectively[19]. See Appendix C.3 for the input data for tree calibration. The high-political-risk countries in the total sample have an average rating of 67, and the low- risk countries 84. These values are lower than the representative euro-area countries of 77 and 87, respectively. The standard deviations of the ICRG ratings of the total sample are, respectively, 3.75 and 2.91, higher than the representative countries with 3.2 and 2.0. Hence, the representative euro-area countries we test here are on the low side of the political risk spectrum. Also, the euro-area sovereign bond yields are lower than those of other

[18] We use an equally weighted average to avoid excessive emphasis on the larger economy.

[19] The slope is -0.12, the statistically significant intercept is 12.41, R^2 is 0.31 and adjusted R^2 is 0.27.

major markets and emerging economies. The effects we uncover when we put the model to work can be stronger when tested on different countries.

We consider debt financing with 1-, 3-, 5-, 10- and 20-year bonds. For credit risk and term premia (eqns. 7-8), we use the calibration of Alberola *et al* (2022) on panel data from 23 EU countries over the period 2015–2020, with $\hat{\rho}_c = 3.25$, a_j equal to -25, -15, 0, 50 and 90, respectively, for the five maturities, and d_{min} = 60; these estimates are very close to Zenios *et al* (2021) over 1995-2016. We also conduct robustness tests with different slopes of the credit risk premium for low- and high-risk countries, and for the fat tails of political risk.

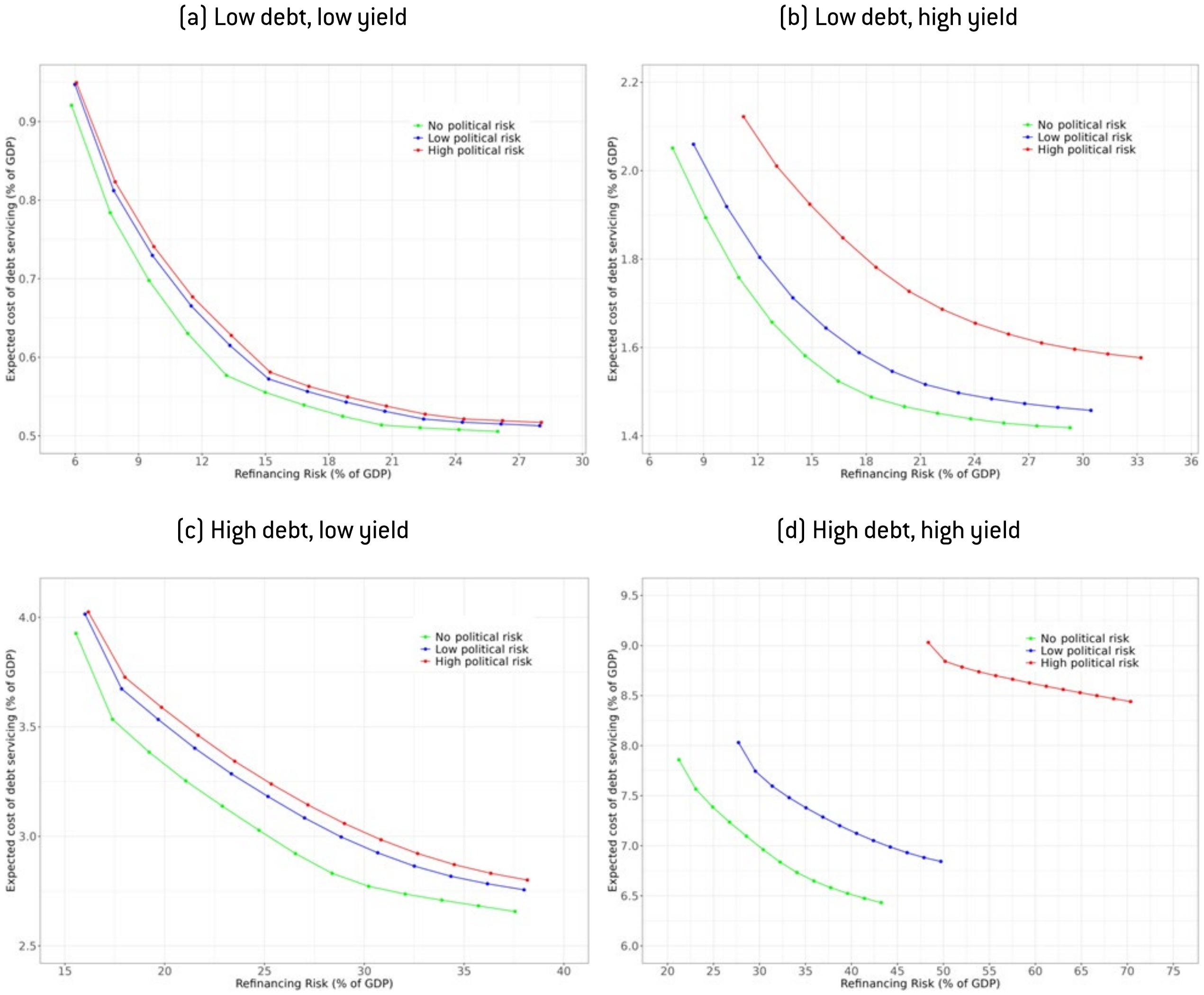
4.3 Model at work

We first put the model to work under mean-reverting political ratings to: (i) document the effect of political risk on the risk-cost trade-off, and (ii) assess the effects on debt sustainability and uncover the mechanisms through which political risk affects sustainability. We then use the reforms and crash regimes to (iii) assess their effects on debt sustainability, (iv) benchmark the effects of reforms against the ECB pandemic emergency purchasing programme (PEPP), estimate the fiscal cost for the reforms to remain effective and document the cost of delays. We finally (v) evaluate the marginal effects through the yields and growth channels. We also conduct two robustness tests.

4.3.1 Cost-risk trade-offs

We trace the efficient frontiers for the high- and low-risk representative countries without and with political risk. In Figure 4, we display the results for the $2 \times 2 \times 2$ controlled experiment. This test establishes the political-risk effect on the trade-off between debt financing cost (NIP) and refinancing risk (conditional Flow-at-Risk).

Figure 4: Political risk effects on the cost-risk trade-off



Note: this figure displays the trade-off between the expected cost of debt financing and refinancing risk when accounting for political risk under mean-reverting ratings. We display in the four panels results for the high- and low-debt representative countries in high- and low-yield environments, as indicated. The green curves are obtained without political risk, blue is for low political risk, and red is for high political risk. Cost is the expected value of net interest payments on debt as a proportion of GDP. Refinancing risk is the expected value of the 0.95 tail of gross financing needs as a proportion of GDP.

We observe significant shifts in the efficient frontiers under political risk. For low-debt countries and low yields (Panel A), there is a marginal shift from the baseline (green) frontier to the frontier with low (blue) or even high (red) political risk. The effects are more substantial under high yields (Panel B), especially for high-debt countries (Panel D), for which we observe a noticeable shift even for low political risk. High political risk increases debt financing costs by over 1 percent of GDP in a high- yield environment (Panel D), but it also remains significant at about 0.5 percent of GDP under low yields (Panel C). Refinancing risk increases by 6 percent to 18 percent of GDP in the different yield environments. The large shifts show that debt that satisfies the refinancing threshold (20 percent) when political risk is ignored may violate it when it is introduced. For instance, in Panel A, most debt-financing strategies have refinancing risks below the threshold, with or without political risk. In Panels B and C, more financing strategies breach the threshold when political risk is added. In Panel D, the threshold is clearly breached when adding political risk.

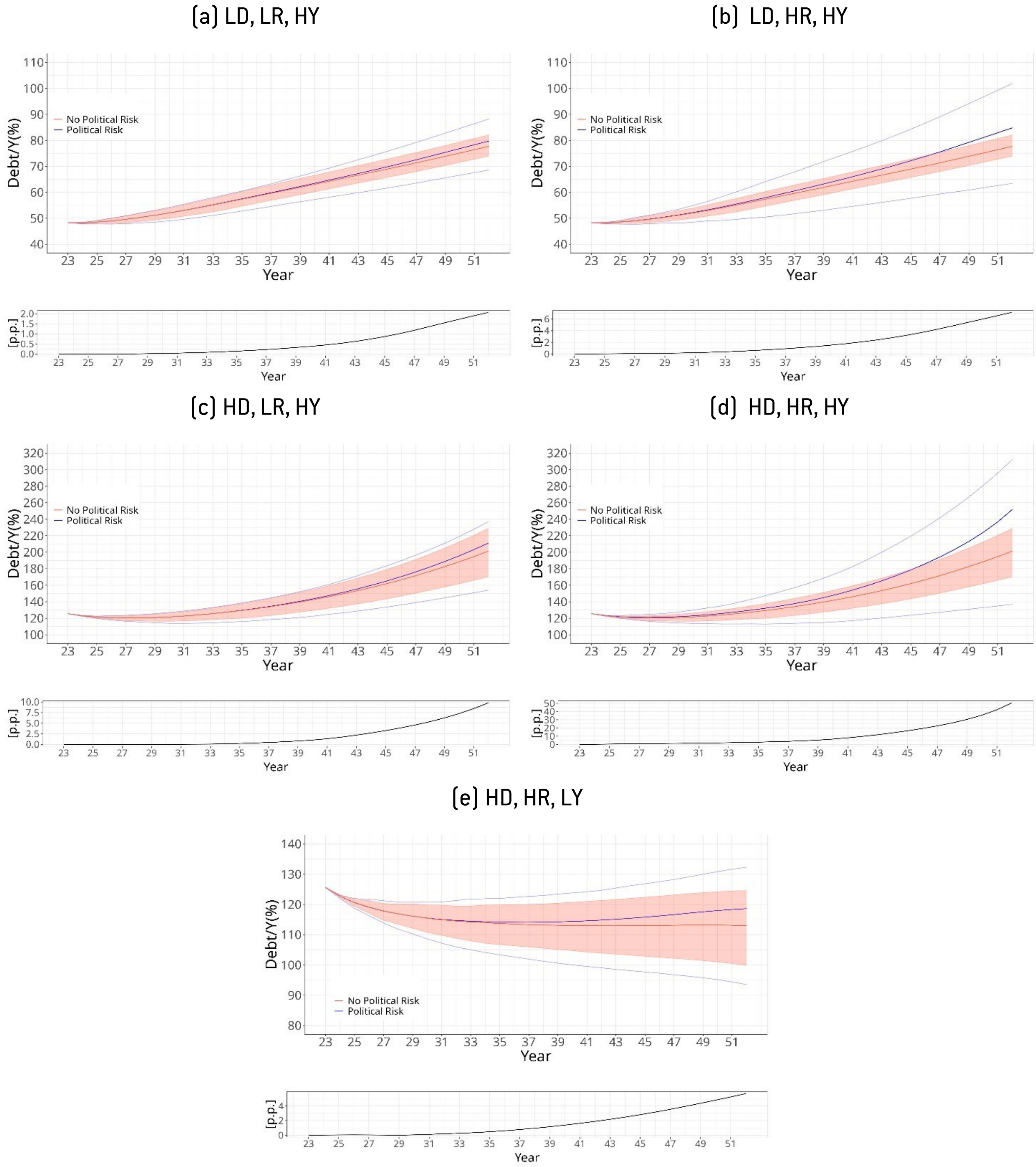
This analysis documents significant political risk effects for low- and high-risk countries, especially for high-debt countries. The effects are especially strong under high yields but remain noticeable under low yields as well.

4.3.2 Political risk effects on debt sustainability

We zoom in on an intermediate point of the frontiers to examine the political-risk effect on debt stock dynamics and assess the sustainability condition of non-increasing trajectories in the long run with high probability[20]. We display the debt-to-GDP ratio trajectories over a thirty-year horizon in Figure 5 for all combinations of debt and political risk levels in a high-yield environment in Panels A-D, and high-debt, high-risk, low-yields in Panel E. The coral-shaded fan charts display the interquartile range of debt dynamics without political risk, and the blue lines display the mean, 25th and 75th percentiles under political risk. The bottom figure in each panel shows the increase in mean values (pp) when adding political risk.

[20] We consider the seventh highest expected cost point, but our findings are robust to other choices. This test aims to illustrate the political effects on debt stock dynamics and fix an intermediate debt financing strategy.

Figure 5: Political risk effects on debt dynamics



Note: this figure displays debt-to-GDP trajectories without and with political risk, under mean-reverting ratings, for combinations of debt, political risk level, and yields. The coral fan charts are without political risk, and the blue lines display the mean, 25th, and 75th percentiles with political risk. The bottom figure in each panel displays the increase in mean values when adding political risk in percentage points (pp). HD/LD denotes high- and low-debt countries, HR/LR denotes high- and low-political risk countries, and HY/LY denotes high- and low-yields.

We make two observations from this figure. First, the interquartile range of debt is wider with political risk since we added one more risk factor to the model. This has ramifications for sustainability assessment that looks at the extreme values of the debt distribution. Second, the mean value also worsens, with increases of up to 50 pp for high-debt countries with high political risk. The increasing mean value debt trajectory, under the mean-reverting political ratings we consider in this test, demonstrates that rating uncertainty and not only the level has an effect on debt, as we argued in section 4.1. This aligns with the literature on the discount rate channel of political risk effects on asset prices, documented by Brogaard *et al* (2020) and Gala *et al* (2023). A second mechanism leading to an upward shift of the mean value trajectory is the nonlinear effect of debt stock on refinancing rates (eqn. 8). Even if the ICRG changes have zero means and zero average political spread, for those scenarios in which ICRG worsens, the political spread has a greater negative effect on debt increase than in scenarios in which political ratings improve and debt declines. Hence, even if the expected value of the political spread is zero, its effect on the expected debt is positive. We further demonstrate this mechanism by replacing the spread function with its average of 120 bp in the test of Figure 5, Panel D, for the high-debt country, thus assuming away the asymmetric effects of debt on spreads. The mean debt trajectory (not shown) increases by 12 pp instead of 50 pp, and the 75th percentile is lower by 110 pp.

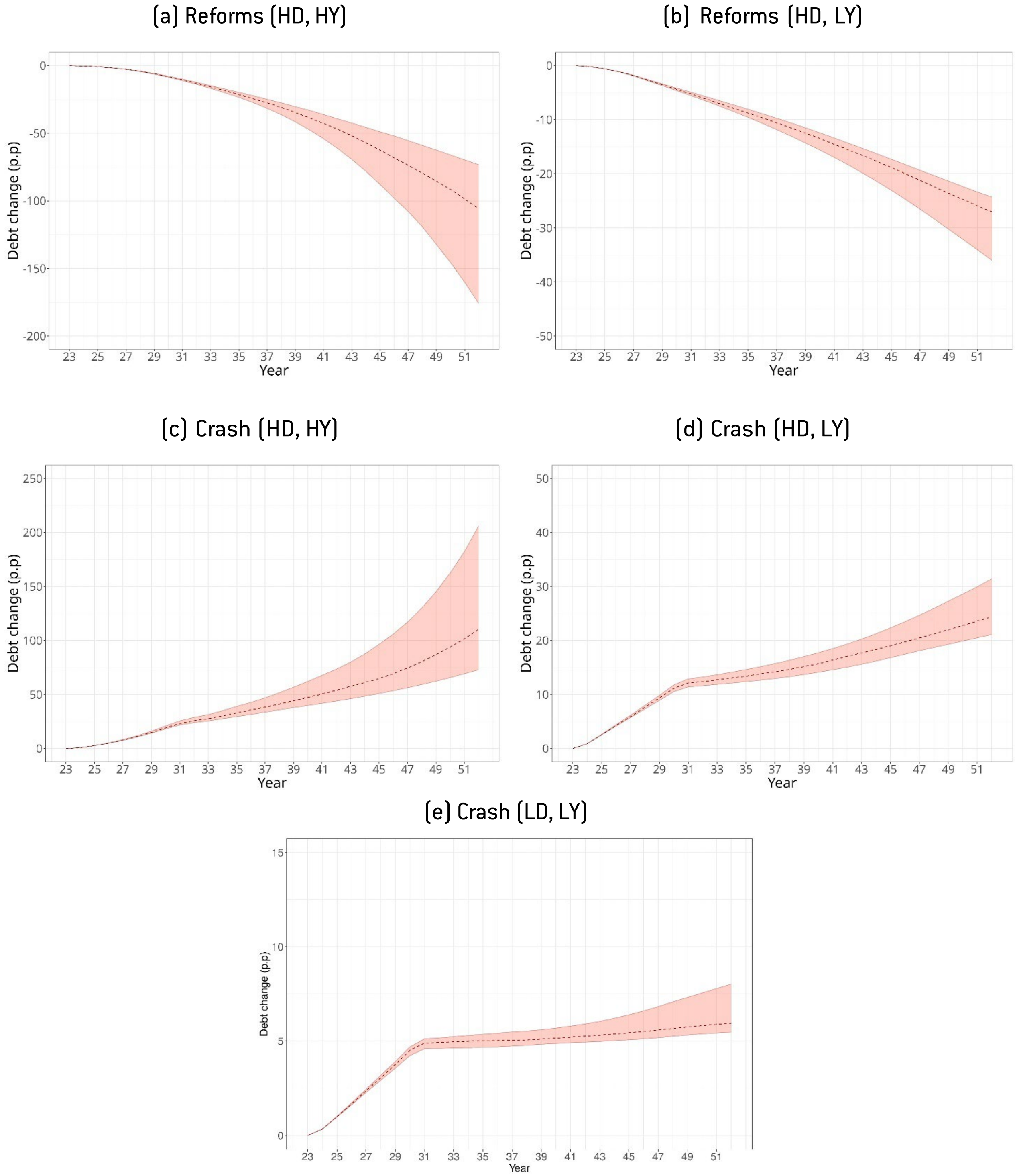
In Panel E, we observe that the average debt stock is declining and the 75th percentile is almost stable without political risk (coral-shaded fan charts), suggesting that high debt is sustainable in a low-yield environment, in line with Blanchard (2022). When introducing political risk (blue lines), the mean value and the 75th percentile increase, and the seemingly sustainable debt becomes unsustainable. The political effects are milder in the low-yield environment (compare Panel E with D) but can still significantly impact debt sustainability. See Appendix Figure D.1 for consistent results for all combinations of debt and risk levels under low yields but with smaller magnitudes.

In conclusion, omitting political risk from DSA can lead to overly-optimistic debt projections. Seemingly sustainable debt can be exposed as unsustainable if political risk is factored in. The differences are more pronounced for high-debt countries in a high-yield environment but can also be significant for low debt and low yields. The representative euro-area countries have political ratings at the high end of the spectrum, and the euro area's high yields have been low compared to other major markets and emerging economies. The political effects can be even more significant for other countries.

4.3.3 Reforms and rating crashes

We test the effects of the reforms or the crash from Figure 3, Panels B-C, and obtain the impulse-response function of the debt ratios to these rating regimes. In Figure 6, Panels A-B, we show the impulse response from reforms on high-debt countries in high- and low-yield environments, and we observe debt decreasing at an accelerating rate. Panels C-D display results for the crash, with an increasing impulse response persisting past the crash. We note an inflection point around the year 2032, when the ICRG reverts to its long-term average after the crash. Still, debt increased further since it drifted into unsustainable territory during the crash. For low-debt countries in a low- yield environment (Panel E), debt can stabilise after the crash, albeit at a higher level. Overall, temporary political shocks can have persistent effects on debt dynamics. We obtain consistent results for low-risk countries but with smaller magnitude, as reported in Appendix Figure D.2.

Figure 6: Debt impulse response to reforms or a crash



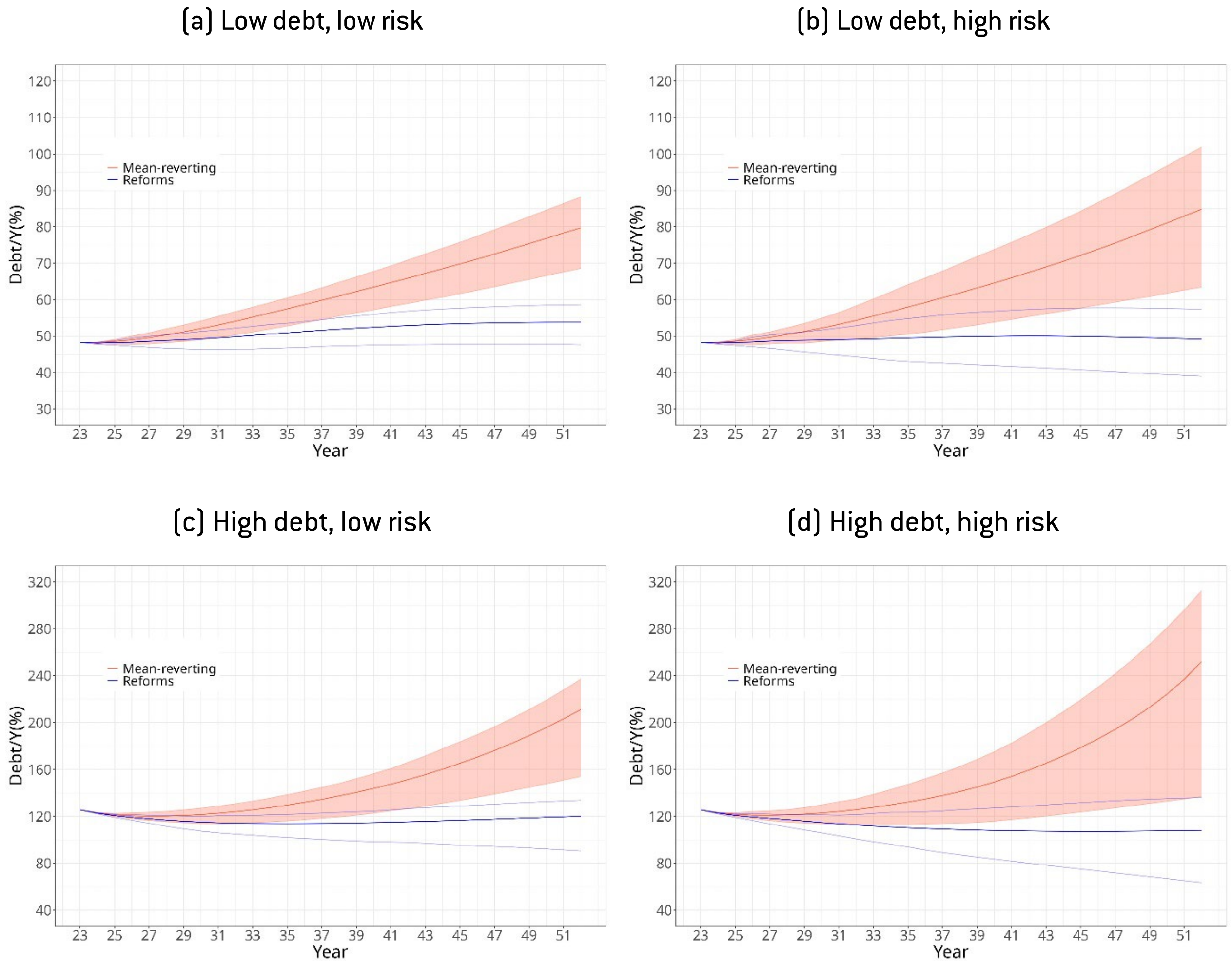
Note: this figure displays the interquartile fan charts and median differences of debt-to-GDP trajectories after reforms or an adverse political shock. (a) and (b) are for the reforms illustrated in Figure 3, Panel B, (c) and (e) are for the crash illustrated in Figure 3, Panel C (a)-(d) are for high-debt (HD) and (e) for low-debt (LD) countries. Results are reported for high and low yields (HY/LY).

In Figure 1, we summarise the long-term debt levels following reforms or a crash. We display the interquartile range and the mean value of the differences in debt ratios at the end of the horizon for high- and low-debt countries. We observe considerable improvements from the reforms and significant worsening after a crash. For high-risk and high-debt countries, the average change of the debt ratio is a large $\pm$ 110 percent (negative for reforms, positive for a crash). The differences are smaller for low-debt, low-risk countries but still significant, averaging about $\pm$20 percent. These results are robust, in the direction and statistical significance of the changes, to the use of shorter time horizons, although the magnitude of the impact is greater for longer horizons, as expected; see Appendix Figure D.8.

4.3.4 Benchmarking reform effectiveness

We ask next whether structural reforms can be effective in restoring debt sustainability. We show in Figure 7 the debt dynamics under reforms (blue lines of mean, 25th and 75th percentiles) compared to the original ratings (coral-shaded fan charts). We observe that the 75th percentile trajectories are stabilised or turn downwards. Reforms can foster stable sovereign debt for high- and low-debt countries with high or low political risk.

Figure 7: Restoring debt sustainability through reforms



Note: this figure displays debt-to-GDP trajectories with and without the effects of reforms. The coral fan charts are with mean-reverting political risk, and the blue lines display the mean, 25th, and 75th percentiles with reforms. Each panel corresponds to different debt levels under different levels of political risk, as indicated. The test is conducted in a high-yields environment.

To put this finding into perspective, we ask how much fiscal effort is required to stabilise the debt of the high-debt, high-risk country in the absence of reforms. We iteratively add a fixed proportion of GDP to the country's primary balance – which starts with a deficit of -0.36 percent of GDP and increases to a long-term surplus of 0.19 percent – until the 75th percentile is stabilised when adding 1.75 percent. The effect of reforms is comparable to fiscal spending of 1.75 percent of GDP in debt repayment. We take a step further and benchmark the effects of reforms with the ECB's PEPP in a natural experiment[21]. We follow Alberola *et al*

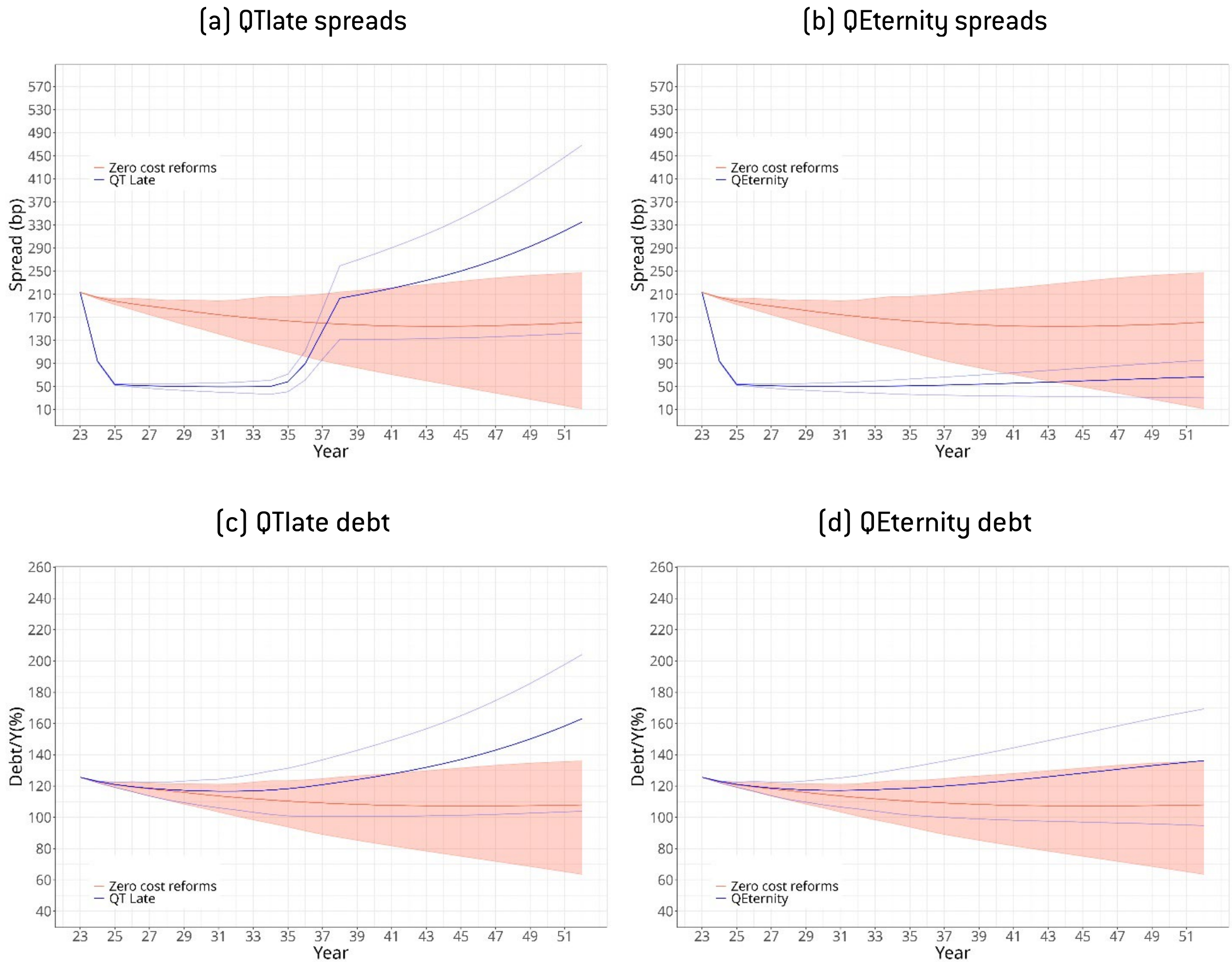
[21] The programme is described at www.ecb.europa.eu/mopo/implement/pepp/html/index.en.html. It reached €1850 billion within ten months of its launch in March 2020. At its peak, it financed all of the Netherlands' borrowing needs, 1.5 times those of Greece and over half of thirteen countries, significantly lowering financing costs.

(2022), who documented the impact of PEPP on debt sustainability. They estimated a *spread suppression function* of the ECB's asset purchases and considered exit strategies with quantitative tightening starting after five or ten years (QTearly and QTlate, respectively) and lasting for five years. They also considered the case of assets rolled over forever (QEternity). Applying the spread suppression to the euro-area high-debt countries, they documented a strong downward effect on debt dynamics. With QTearly, the debt trajectories increase to a long-term average above the pre-pandemic level. With QTlate, the long- term average is slightly below the pre-pandemic level, and with QEternity, it trends downwards[22]. We apply our political DSA to benchmark the effects of reforms for a high-debt country compared to the PEPP. For PEPP, we follow Alberola *et al* (2022) and suppress spreads with asset purchases and increase them with programme reversal[23]. Since the rating improvements from reforms are long-term, we benchmark their effects against QTlate and QEterinity and report the results in Figure 8. In Panels A-B, we display the spreads from reforms (coral-shaded fan chart) and those of QTlate and QEternity (blue lines of mean, 25th and 75th percentiles). The reforms are more impactful than the medium-lived QTlate (Panel A), with spreads following trajectories similar to QEternity (Panel B). In Panels C-D, we compare the debt trajectories. The debt trajectories with reforms are non-increasing at the 0.75 level and are lower than those achieved with QTlate or QEternity. While the reform spreads are somewhat higher than those with QEternity (Panel B), the debt trajectories are lower because of the additional growth effect of reforms.

[22] The ECB announced in December 2023 that it would discontinue reinvestments under the PEPP at the end of 2024. With an average maturity of asset purchases of about eight years, QTlate matches the planned exit strategy.

[23] We apply the spread suppression calibrated function from the reference using the ECB's rate of asset purchased from the PEPP as a share of the country's marketable securities.

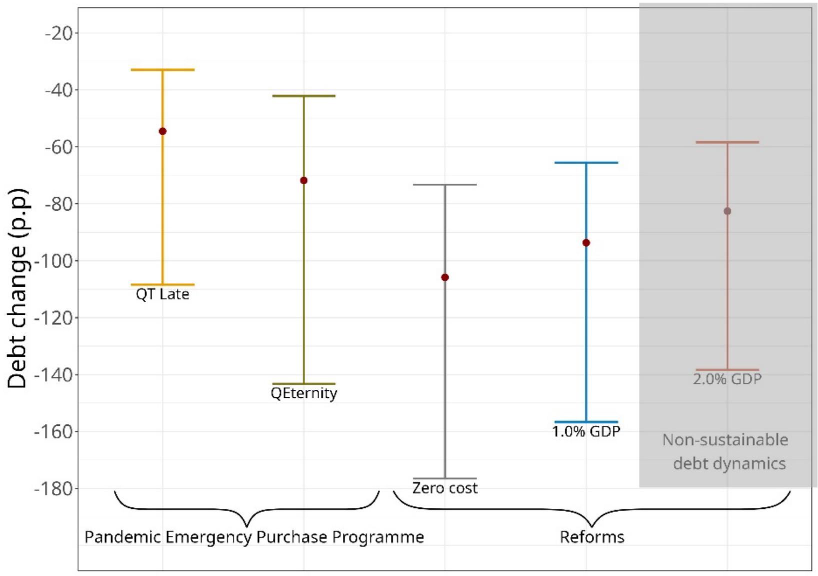
Figure 8: Benchmarking reforms against quantitative easing



Note: this figure displays in (a) and (b) the spreads under the improved ratings from the reforms of Figure 3, Panel B, with alternative exit strategies from ECB's pandemic quantitative easing programme. (c) and (d) display the corresponding debt-to-GDP ratios. Exist strategy QTlate reverses the asset purchases quantitative tightening after ten years, and QEternity rolls over the purchases forever.

Our analysis assumes that the improved ratings are achieved with zero-cost reforms, as in Darvas *et al* (2024) and Ostry *et al* (2009). We take a step further and ask how costly reforms can be and still stabilise debt. We assess costs of up to a large 2 percent of GDP per annum for the duration of the reforms and compute the difference of debt ratios from the mean-reverting case at the end of the horizon. In Figure 9, we display the mean and interquartile range of the difference and compare the results with the quantitative easing programmes. We observe debt changes comparable to those from QEternity. For costs below 1 percent of GDP, the debt trajectories (not shown) are stable or downward sloping, but more costly reforms do not stabilise the debt. This finding is consistent with Sajedi (2018), who quantified that short-run fiscal costs in the range of about 0.7 percent of pre-reform GDP for Germany, France, Italy and Spain were offset by the long-run fiscal benefits.

Figure 9: Benchmarking the cost of reforms



Note: this figure displays the changes in debt-to-GDP ratios at the end of the horizon of alternative exit strategies from ECB's pandemic emergency purchase programme and for costly reforms that improve the political ratings. We report the results for costs of zero, 1% or 2% of GDP per annum for the duration of the reforms. The grey-shaded area corresponds to upward-sloping debt stock trajectories. QTlate corresponds to exiting the PEPP with quantitative tightening after ten years, and QEternity corresponds to rolling over the purchases forever.

The answer to the question posed in this section is that structural reforms of modest cost can have comparable effects to a major quantitative easing programme. The political rating improvements from such reforms are demonstrated to be a first-order issue in debt analysis and can foster stable sovereign debt. We consider this an important finding with policy implications for the international institutions that rely on DSA.

We finally test reform delays. Specifically, we assume that the ICRG rating remains unchanged for two to four years before gradually drifting towards a higher level. We find that such delays reduce the affordable cost of reforms. To achieve the stable dynamics of immediate 1 percent-cost reforms after a two-year delay, the cost has to be reduced to 0.5 percent of GDP per annum. With a four-year delay, the cost has to be reduced to zero (see Appendix Figure D.3). Reform delays can reduce the available fiscal space. This finding aligns with Blanchard *et al* (1990), who argued that delaying fiscal adjustments for sustainability increases the cost of the adjustment.

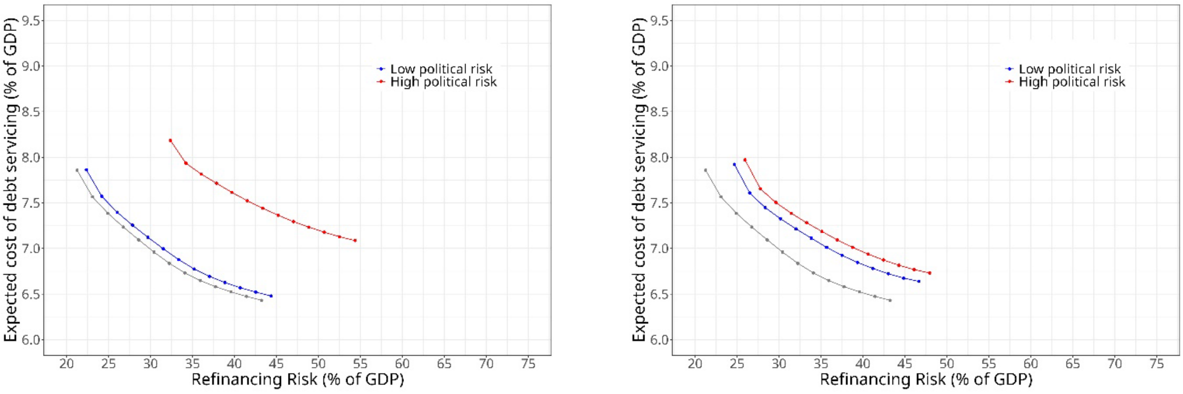
4.3.5 Marginal effects of yields and growth channels

Finally, we test the margins of political-risk effects through the yields and growth channels. In Figure 10, we illustrate the shifts of the cost-risk trade-off from political risk entering through the yields (Panel A) or growth (Panel B) channels for high-debt countries in the high-yields environment. We notice significant shifts for high-risk countries with either channel, with slight shifts for low-risk, but the joint effect reported in Figure 4, Panel D, is more than the sum of the marginals.

Figure 10: Marginal effects of the yields and growth channels

(a) Yields channel

(b) Growth channel



Note: this figure displays results on the marginal effects of the yields and growth channels on the cost- risk trade-offs, drawn at the same scale as Figure 5 with the joint effects. (a) and (b) display the trade-off between the expected cost of debt financing and refinancing risk when accounting, respectively, only for the yields or growth channels. Red curves are obtained without political risk, green is for low political risk, and blue is for high political risk under mean-reverting ratings. Results are for high-debt countries in a high-yield environment.

We also obtain the debt stock fan charts over the risk horizon considering each channel separately (see Appendix Figure D.4). For high-debt, high-risk countries in a high-yield environment, we obtain an increase in the mean debt ratio by about 15 bp from the yields effect and eight bp from the growth effect. Compared to the 50 bp increase from the joint effects (Figure 5, Panel D), we see that political risk effects are amplified when considered jointly. The effects are more than cumulative since the debt increase from either channel increases the risk premium, adding to the cost of debt financing and increasing debt stock further.

These tests highlight the significance of adding political risk to debt analysis through both channels. Debt determinants that appear less critical on their own become very strong when compounded by other factors.

4.3.6 Robustness tests

We conduct two tests using different calibrations of the model to establish the robustness of our findings. To deploy the political DSA in practice, a country-specific calibration is warranted. For the present paper, we ask whether our findings for representative countries are robust to different calibrations and whether the model results are stable to data perturbations.

We first test a calibration of the credit risk premium, addressing a potential concern that the slope of the risk premium function (8) may differ for high- and low-political risk countries. We test for slopes $\widehat{\rho_c} = 2 \; and \; 4$; this is the range suggested by Blanchard *et al* (2021) and brackets our estimate of 3.25. We develop the cost-risk frontiers for high-risk countries with a slope of 4 and low-risk countries with a slope of 2; see Appendix Figure D.6. The frontiers shift to the right for the higher slope, and the magnitude of the political effect increases. Conversely, the frontiers move to the left for the lower slope, with a smaller political effect. Still, our main finding of significant political risk effects on the cost-risk trade-off is robust to these calibrations, although the magnitude is calibration-dependent.

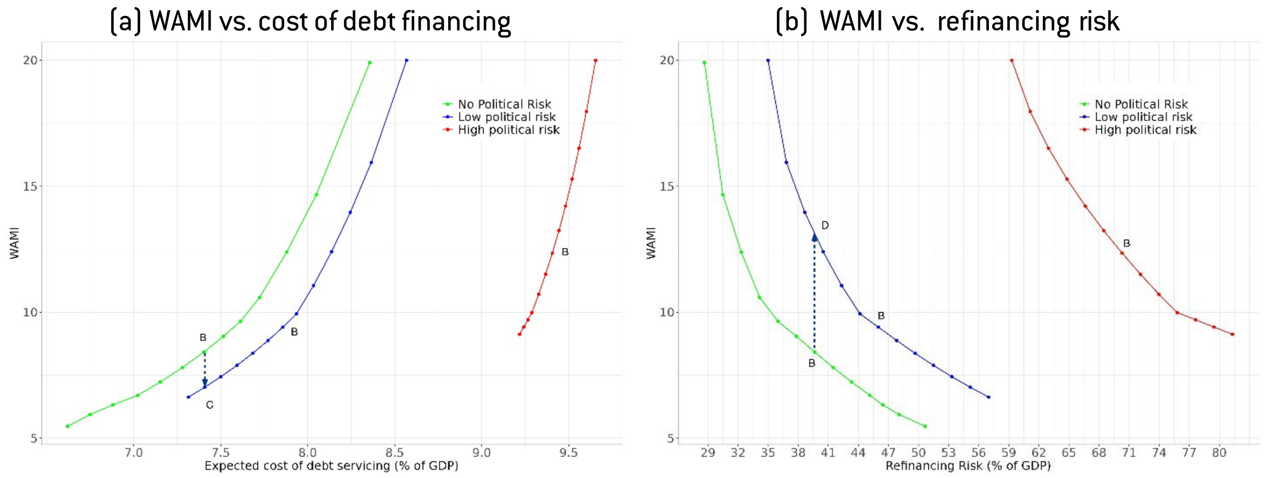
A second issue that deserves attention is the fat tails of political risk (Bremmer and Keat, 2010; Gala *et al*, 2023). The calibration of the scenario tree can match higher-order moments (Consiglio, *et al*, 2016), but in our tests, we matched means, variances and correlations for parsimony. We re-calibrate a tree to match also the skewness and kurtosis of the ICRG ratings (averaging -0.21 and 2.27, respectively, over the three countries in our high-debt representative). We repeat the test of the political risk effects on debt dynamics from Figure 5, Panel D, on the new tree and notice marginal differences (see Appendix Figure D.7).

5 Extension: sovereign debt management

We assess the effect of political risk on sovereign debt management through the choice of optimal financing maturities. The shift of efficient frontiers with political risk suggests that debt managers may change financing maturities. At the extremes of minimum risk or minimum cost, the financing strategies remain unchanged, but for intermediate strategies, the optimal maturities can change. We plot in Figure 11 the optimal weighted average maturity at issuance (WAMI) vs. the expected cost of debt financing (Panel A) and refinancing risk (Panel B)[24].

[24] For simplicity, we report results using a fixed mix strategy. We obtain similar results for the average WAMI over the test period when using an adaptive fixed mix.

Figure 11: Optimal debt financing maturities under political risk



Note: this figure displays the weighted average maturity at issuance (WAMI) at different points of the efficient frontier. It displays the WAMI vs (a) expected cost of debt financing and (b) vs. refinancing risk. Point B denotes the intermediate financing strategies for all political risk levels. Point C is the low political risk strategy with the same cost as the intermediate no political risk strategy, and D is the low political risk strategy with the same risk as the intermediate no political risk strategy. This example is for high-debt countries in a high-yield environment and political risk under mean-reverting ratings.

From Panel A, we observe that we cannot maintain a constant cost of debt financing under high political risk. The red and blue frontiers do not overlap, and the intermediate strategies (point B on both frontiers) are achieved with WAMI of nine and 12 years, respectively, with correspondingly higher expected costs from 8 percent to 9.5 percent of GDP. For low political risk, it is possible to maintain the expected cost below 7.5 percent by shifting from point B on the green frontier to point C on the blue with a somewhat shorter maturity of about one year, but this entails an increase in refinancing risk.

From Panel B, we observe that we cannot maintain constant refinancing risk under high political risk; the intermediate strategy (points B) has a 75th percentile of refinancing risk of about 70 percent GDP with political risk, compared to 40 percent without. Under low political risk, it is possible to keep refinancing risk constant by shifting to point D with WAMI of about 13 years, at an expected cost increase from 7.5 percent to 8.25 percent.

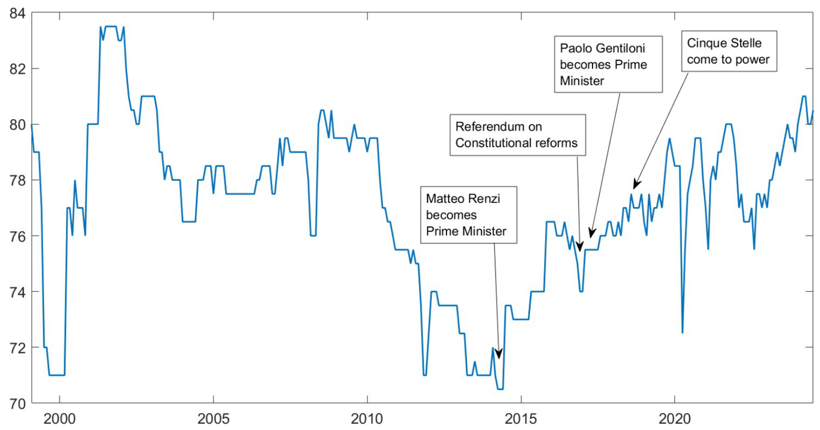
Political risk affects the optimal debt-financing maturities. This has a policy implication that public debt management must take into account expectations about political risk in setting the key policy parameter of the maturity of newly issued debt. This requires an analysis of potential changes in the political risk and an estimation of the country's yield and growth political sensitivities.

6 Case studies for France and Italy

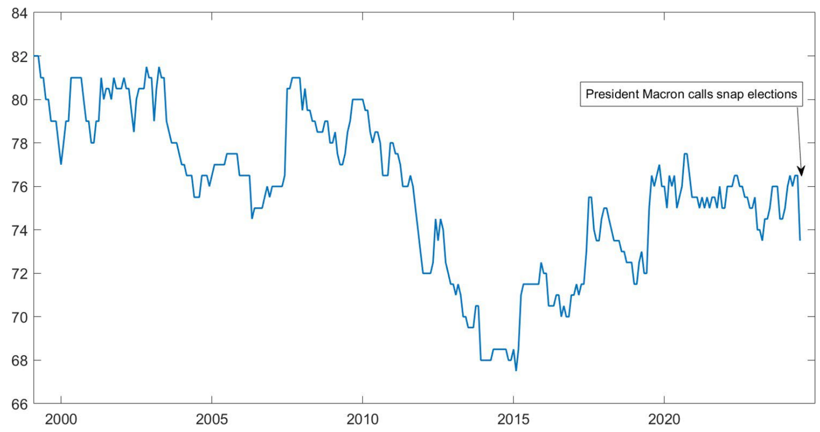
We use the model to study the effects of reforms in Italy over the period 2014-2019 and the rating crash in France related to the 2024 snap elections, as reflected in the ICRG ratings of Figure 12. The former is fully *ex post* and corroborates the model predictions. Both reaffirm the significance of incorporating political risk in sovereign debt sustainability analysis.

Figure 12: Large swings of political ratings in Italy and France

a) Italy



b) France



Note: this figure displays the time-series dynamics of the political ratings for (a) the US and (b) Italy. Political risk is measured through the ICRG aggregate political risk ratings (https://www.icrgonline.com/). The ratings are in the range of 0-100, with the standard deviations for these two countries of, respectively, 3.12 and 3.01. Data are monthly, spanning the period 1999-2021.

6.1 Italy's 2014-2019 reforms

From 2014-2019, Italy's political ratings improved significantly (Figure 12, Panel A). The pro-reform Matteo Renzi became prime minister of a coalition government following the strong showing of his Democratic Party in the February 2014 elections on a '1000-day reform agenda' that included the Jobs Act of 2015, the Annual Competition Law and reforms to public administration and the judiciary. However, Remzi failed to win a referendum on constitutional reforms in December 2016 and was succeeded by foreign minister Paolo Gentiloni, who continued the reforms until June 2018, when the opposition party Cinque Stelle came to power. While some of these reforms were controversial[25], political ratings increased by two standard deviations, from 73 to above 79, during this period, providing an example of ratings-improving reforms.

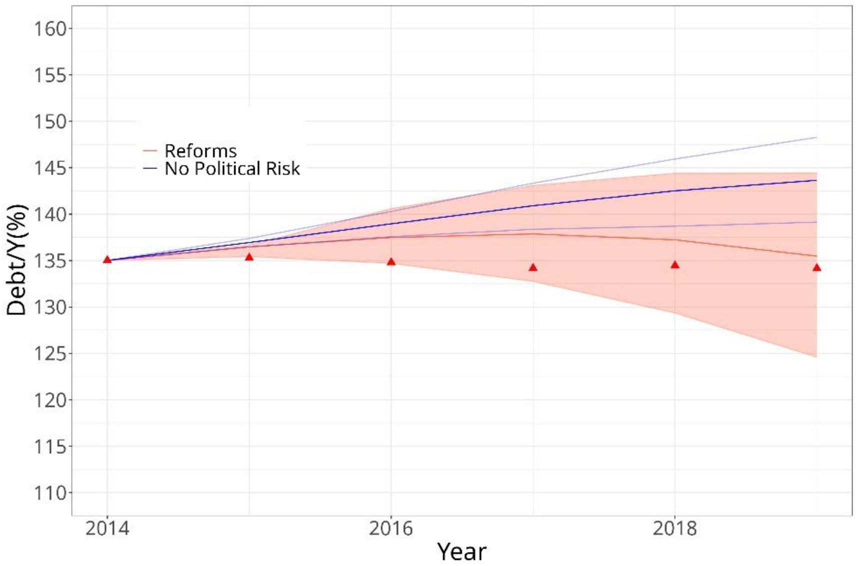
To isolate the impact of these changes on Italian debt sustainability, we run a debt sustainability analysis with the improved ICRG ratings and filter out fiscal spending effects using the actual primary balance. As a counterfactual, we project debt trajectories without rating improvements. We calibrated the model to country-specific estimates of the political sensitivities of yields and growth. We regress monthly GDP excess yields eqn. (1) or growth (2) on the demeaned ICRG and control variables for the period from the Great Financial Crisis to 2014, to obtain the annualised coefficients for political DSA. The GDP intercept is 1.09 percent, and for the yields it is 2.09 percent for the univariate and multivariate regressions, with the multivariate betas strongly statistically significant. Forward-looking projections of expected bond yields and growth for the DSA are obtained from eqns. (10) (11), conditional on the ICRG states from a scenario tree calibrated around the factual ICRG (linearly smoothed). Primary balances with growth projections are from the 2013 World Economic Outlook. Volatilities and correlations are from Appendix C.3.

Figure 13, Panel A, shows that mean projections that account for the improvement in political ratings (red line) are much closer to the *ex-post* observed values (red triangles) than projections that do not (thick blue line). The coral-shaded fan displays the 25th and 75th percentiles of the factual and the thin blue lines of the counterfactual. The observed values are within the 25th-75th percentiles of the political DSA projections but well below the 25th percentile of the counterfactual. The projected debt dynamics are sustainable with high confidence, whereas ignoring improved ratings would predict steadily rising debt. Accounting for political risk gives better predictions.

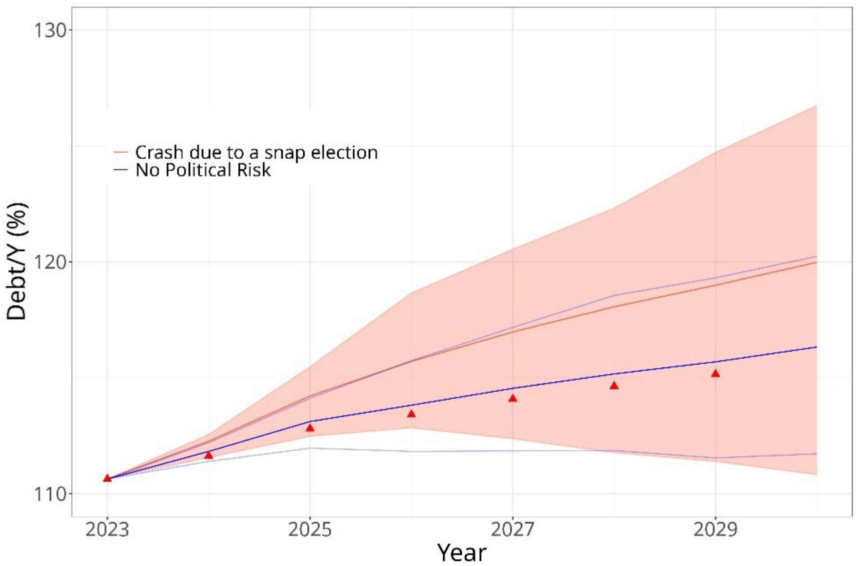
[25] See eg *The Economist*, 'Renzi's struggle with the swamp', 22 January 2015, or Tony Barber, 'Matteo Renzi's reforms are a constitutional bridge to nowhere', *Financial Times*, 4 October 2017.

Figure 13: Country case studies: Italy 2014-2019 and France 2024

(a) Italian reforms 2014-2019



(b) French snap elections 2024



Note: this figure displays the debt-to-GDP trajectories obtained with and without political DSA for the case of (a) the Italian reforms during 2014-2019 and (b) the French snap elections of the summer of 2024. The coral fan charts are factual with political risk projections, and the blue lines display the mean, 25th, and 75th percentiles of a counterfactual without changes in political ratings. The counterfactual for Italy is that the ratings did not change (increase) during the 2014-2019 reforms. For France, the counterfactual is that political ratings do not change (drop) due to the 2024 snap elections. Triangles denote the *ex-post* realised debt ratios for Italy and the 2024 World Economic Outlook debt projections for France.

6.2 The French 2024 snap elections

Following his party's defeat in the 2024 European elections, President Macron announced on 9 June that he was dissolving the National Assembly and calling parliamentary elections within four weeks. The end of the five-year term of the Assembly was advanced to 2024 from 2027, when France will also hold presidential elections. French political risk ratings, which had been stable at around 76 for five years, with a standard deviation of 0.85, crashed by almost three standard deviations.

We project the debt trajectories accounting for the 2024 sudden ratings drop, which we assume will persist until the 2027 elections[26]. We display the debt dynamics until 2030 in Figure 13, Panel B. The coral-shaded fan displays the results with the political DSA, the blue lines are the mean, 25th, and 75th percentiles without the political risk, and the red triangles are the projections from the World Economic Outlook. Without political risk, the mean values are close to the IMF projections, but the crash pushes the debt trajectories upwards. Accounting for political risk gives a very different view of the country's expected debt profile. To quantify the magnitude of the political impact, we estimate the adjustments to the primary balance that will stabilise the 75th percentiles of the debt ratio by 2030 without and with the ratings crash. Without the crash, an increase in the primary balance by 0.5 percent of GDP per annum will suffice; this is in line with the estimates of 0.4 percent to 0.6 percent of Darvas *et al* (2023, Table 1B). Accounting for the crash, a primary balance adjustment of about 1.25 percent of GDP is required.

7 Conclusion

Using a continuous country-level proxy for political risk, we document significant political sensitivities of sovereign bond yields and economic growth for a large panel of countries. Subsample analysis shows political sensitivities of yield and growth for developed countries. We also uncover a positive predictive relationship between structural reforms and political ratings. A political debt sustainability analysis model incorporates both the yields and growth channels. Putting the model to work on representative euro-area countries under political regimes of mean-reverting political risk, long-term reforms or a crash, we establish several new findings. Political risk matters even when its expected value is zero, with its effects on debt coming from both the level and uncertainty of political ratings, and it amplifies the debt effects through the positive covariance with other economic sources of risk. The effects on debt dynamics are large and can reveal that seemingly sustainable debt is unsustainable, and they affect public debt management through

[26] Debt is obtained from Eikon-Refinitive, primary balance projections are from the 2024 World Economic Outlook, and we approximate French government bond yields as the average of the AAA-rated and 'All' bond yields from the ECB website: https://www.ecb.europa.eu/stats/financial_markets_and_interest_rates/euro_area_yield_curves/html/index.en.html. We use the political sensitivity coefficients from Tables 3-4 for a high-risk country, such as France.

the choice of optimal maturities. Conversely, reforms can lower political risk and stabilise debts, pre-empting significant fiscal spending for debt repayment. Reforms are shown to be equally effective as the ECB's major pandemic emergency purchase quantitative easing programme. Crashes of political ratings are observed to be not that rare in the data, and they can have a very large impact. The political effects on debt are especially large for high-debt countries during periods of high interest rates. Political risk is salient for the debt sustainability of developed and not only emerging markets; structural reforms can restore debt sustainability of high-debt countries at times of high interest rates, and public debt management must consider political-risk expectations. These results have policy implications, suggesting a need to rethink debt sustainability analysis to account for political risk by international institutions, public debt management offices and the EU fiscal framework.

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Appendix

A) The ICRG data

Table A.1: ICRG summary statistics

This table displays statistics for the International Country Risk Guide (ICRG) composite political ratings for developed (A.1) and emerging (A.2) markets over the period 1999-2021.

(a) Developed economies

Country	Mean	StDev	Skewness	Kurtosis	95%	99%
Australia	85.50	2.25	-0.17	-1.08	89.00	89.00
Austria	85.10	3.30	0.22	-1.34	90.00	91.13
Belgium	81.10	3.06	0.49	-1.08	86.50	87.00
Canada	86.50	1.49	0.78	0.68	89.50	91.00
Denmark	84.10	4.83	0.22	-0.77	93.00	94.00
Finland	90.50	3.07	-0.15	-1.60	94.50	95.00
France	75.80	3.70	-0.40	-0.76	81.00	81.63
Germany	84.40	2.10	0.17	-0.71	88.00	89.00
Hong Kong	77.80	4.03	-0.88	-0.20	82.63	83.50
Ireland	85.90	4.33	-0.55	-0.56	92.00	92.50
Israel	64.40	2.97	-0.84	0.46	68.00	69.00
Italy	76.90	3.01	-0.31	-0.27	81.00	83.50
Japan	81.80	2.61	0.24	-0.40	86.50	88.00
Netherlands	86.40	4.14	1.18	0.33	96.00	97.00
New Zealand	87.80	1.72	0.35	-0.29	91.00	91.50
Norway	87.80	1.74	-1.72	6.90	90.00	91.13
Portugal	81.10	5.51	-0.21	-0.69	90.00	90.00
Singapore	83.70	2.32	0.79	0.50	89.00	90.00
Spain	75.50	4.68	0.02	-1.13	82.50	83.50
Sweden	88.00	2.05	0.67	-0.45	92.00	93.00
Switzerland	88.20	1.93	1.03	0.94	92.50	93.00
United Kingdom	82.80	4.01	0.36	-0.41	90.00	92.00
United States	82.70	3.12	0.54	0.51	89.50	90.25
Overall mean	82.77	3.13	0.08	-0.06	88.01	88.94

Table A.2

(b) Emerging economies

Country	Mean	StDev	Skewness	Kurtosis	95%	99%
Brazil	65.50	2.48	-0.36	-0.48	69.00	69.63
Chile	75.90	3.35	-0.04	-0.64	81.00	82.50
China	62.90	4.72	0.12	-1.19	70.50	70.50
Colombia	57.60	4.08	-1.01	0.34	62.50	63.00
Czech Republic	77.90	1.88	-0.37	0.38	81.00	82.00
Egypt	58.10	5.75	-0.46	-1.02	65.00	66.50
Greece	73.60	4.40	-0.60	-0.80	79.00	80.00
Hungary	77.70	3.04	0.25	0.00	82.63	85.25
India	60.50	2.98	-0.57	-0.27	64.50	65.25
Indonesia	55.50	5.69	-0.92	-0.25	61.50	62.50
Korea, South	77.00	1.77	-0.60	0.20	79.50	80.50
Malaysia	71.80	2.87	0.02	-0.47	77.00	77.50
Mexico	67.70	4.91	-0.24	-1.05	75.00	76.00
Peru	63.50	2.28	1.00	1.93	68.00	71.50
Philippines	63.40	3.06	1.02	0.82	69.00	73.00
Poland	77.20	2.34	0.64	0.76	81.00	85.00
Qatar	72.80	1.93	0.55	2.29	76.00	80.00
Russia	60.40	5.12	-0.60	0.98	67.50	68.63
Saudi Arabia	67.50	2.25	0.23	-0.40	71.63	72.50
South Africa	66.20	2.52	0.32	-0.69	71.00	71.50
Taiwan	78.30	2.06	-0.18	-0.68	81.50	82.13
Thailand	60.90	6.44	0.84	-0.94	72.50	73.00
Turkey	57.40	5.28	0.80	-0.29	68.00	70.00
Overall mean	67.36	3.53	-0.01	-0.06	72.79	74.28

Table A.3: Subsample temporal and cross-country statistics of the ICRG

This table displays statistics for the International Country Risk Guide (ICRG) composite political ratings for the different subsamples of the 46 countries, respectively, mean value, stan- dard deviation, skewness, and excess kurtosis. Panel A displays statistics of the temporal variability over 1999-2001 averaged over all countries in each subsample. Panel B displays the cross-country variability in each subsample, averaged over the sample period.

(a) Temporal variability

	Mean	StDev	Skew	Kurt	95%	99%
All countries	75.07	3.33	0.04	-0.06	80.40	81.61
Developed economies	82.77	3.13	0.08	-0.06	88.01	88.94
Emerging economies	67.36	3.53	-0.01	-0.06	72.79	74.28
Low debt	72.95	3.27	0.00	0.25	78.18	79.41
High debt	77.18	3.39	0.07	-0.38	82.61	83.81
Low political risk	83.58	2.91	0.16	0.03	88.60	89.67
High political risk	66.56	3.75	-0.09	-0.16	72.20	73.55
(b) Cross-country variability						
All Countries	75.07	10.73	-0.45	-0.82	88.78	90.51
Developed economies	82.78	6.32	-1.36	2.67	89.50	90.90
Emerging economies	67.37	8.42	-0.12	-0.83	78.86	80.03
Low debt	72.96	11.48	-0.17	-1.08	88.50	89.27
High debt	77.19	9.65	-0.73	-0.27	88.61	90.38
Low political risk	83.58	4.65	-0.35	-0.39	89.50	90.90
High political risk	66.56	7.84	-0.09	-0.71	77.82	79.09

B) The scenario optimisation model

B.1 Debt refinancing risk constraint

Following Rockafellar and Uryasev (2002), we compute aggregate conditional Flow-at-Risk (cf. eqn. 13) on the tree, denoted by $gfn^{\diamond\diamond}$, using the following linear system

$$gfn^{\diamond\diamond} = gfn^{\diamond} + \frac{1}{1-\alpha}\sum_{n\in N} p^n z^n \tag{25}$$

$$z^n \geq gfn_t^n - gfn^{\diamond}, n \in N \tag{26}$$

$$z^n \geq 0, n \in N \tag{27}$$

and the flow risk constraint (16) becomes

$$gfn^{\diamond\diamond} \leq \omega \tag{28}$$

Since $n \in N$ is equivalent to $n \in N_t$ for all $t = 0, 1, 2, \ldots T$, it follows that eqn. (26) with time indexed gfn_t^n but time independent z^n, is well defined.

B.2 Debt stock and flow state-dependent dynamics

To give the accounting identities for debt dynamics, for states $n \in N_t$ at $t = 0, 1, 2, \ldots T$, on the tree structure, we use the state-dependent indicator function $\mathbb{1}^{t(n)}\big(j, \tau(m)\big)$ to keep track of maturing endogenous debt,

$$\mathbb{1}^t\big(j, \tau(m)\big) = \begin{cases} 1 \; if \; instrument \; j \; issued \; at \; \tau(m) \; matures \; at \; t = \tau(n); \; where \; m \in \mathcal{P}(n) \\ 0, otherwise \end{cases}$$

The flow dynamics equation on the tree is written as

$$GFN_t^n = \underbrace{LI_t^n + LA_t^n}_{Legacy\ service\ payments} - \underbrace{PB_t^n}_{Primary\ balance} \tag{29a}$$

$$+ \underbrace{\sum_{m\in P(n)} \sum_{j=1}^{J} X_{\tau(m)}^m(j) CF_t^n(j,m)}_{\substack{Interest\ payment\ of \\ debt\ financing\ decisions}} \tag{29b}$$

$$+\underbrace{\sum_{m\in P(n)}\sum_{j=1}^{J} X_{\tau(m)}^{m}(j)\mathbb{1}^{t}\big(j,\tau(m)\big)}_{\substack{Principal\ amortization\ of\\ debt\ financing\ decisions}} \tag{29c}$$

The debt stock dynamics can be expressed in terms of flows on the tree,

$$D_t^n = D_{t-1}^{a(n)} + GFN_t^n - \sum_{m\in P(n)}\sum_{j=1}^{J} X_{t(m)}^{m}\mathbb{1}\big(j,\tau(m)\big) - A_t^n \tag{30}$$

Substituting (29) into (30), we link financing decisions to the effective interest rate on debt

$$D_t^n = D_{t-1}^{a(n)} + I_t^n - PB_t^n + \sum_{m\in P(n)}\sum_{j=1}^{J} X_{\tau(m)}^{m}(j)CF_t^n(j,m) \tag{31}$$

The *effective interest rate on debt* i_t at state *n* is given by

$$i_t^n = \frac{LI_t^n + \sum_{m\in P(n)}\sum_{j=1}^{J} X_{\tau(m)}^{m}(j)CF_t^n(j,m)}{D_t^n} \tag{32}$$

The numerator is the net interest payment optimised in the objective function (15).

The complete model on the scenario tree consists of the decision variable definitions, objective function (15), flow risk constraint (28), flow (29) and stock (31) dynamics, and the yield curve with the political risk premium (10).

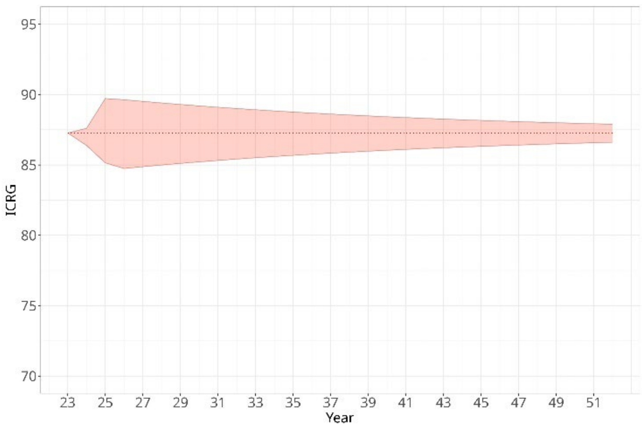
C) Model calibration

C.1 Political regimes for low-risk country

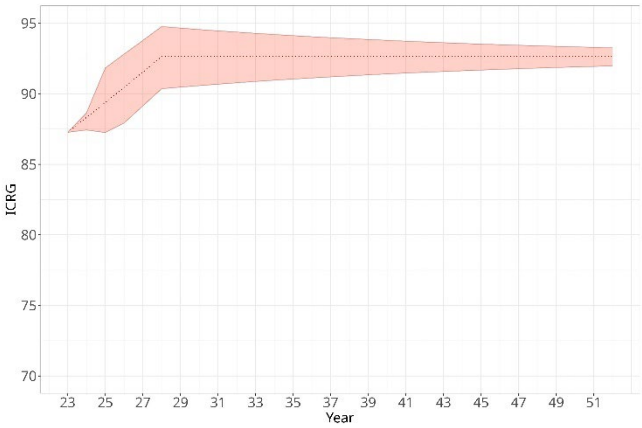
Figure C.1: Political regimes for a low-risk country: mean reversion, reforms and crashes

This figure displays the fan charts of the ICRG political ratings for three regimes: (a) Political risk reverting to its long-term mean (dashed line), (b) improved political rating by one standard deviation over five years, and (c) a crash with a significant drop in rating by three standard deviations and subsequent return to the mean.

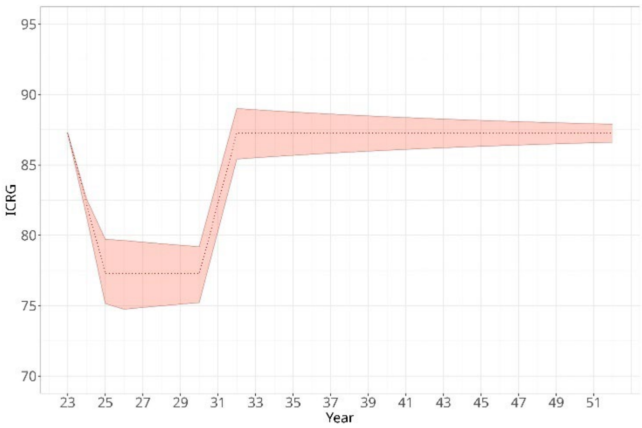
a) Mean reversion



b) Reforms



c) Crash

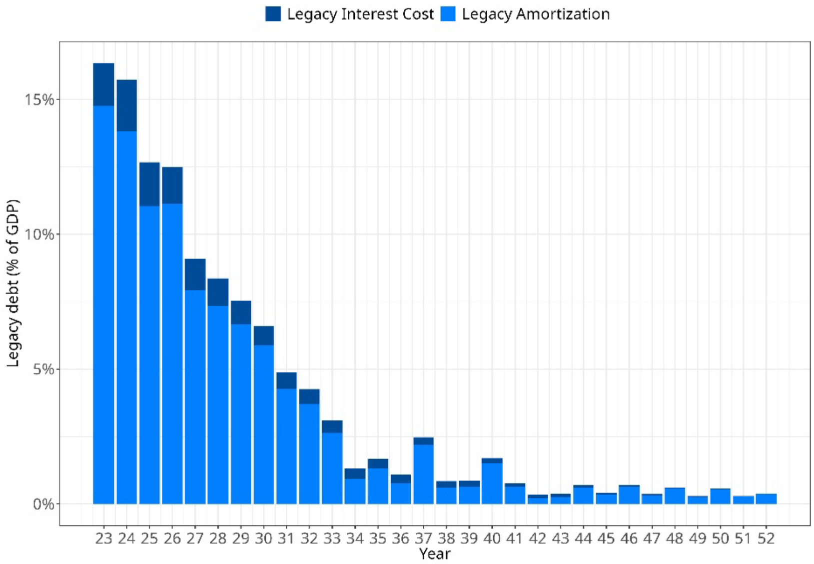


C.2 Representative countries

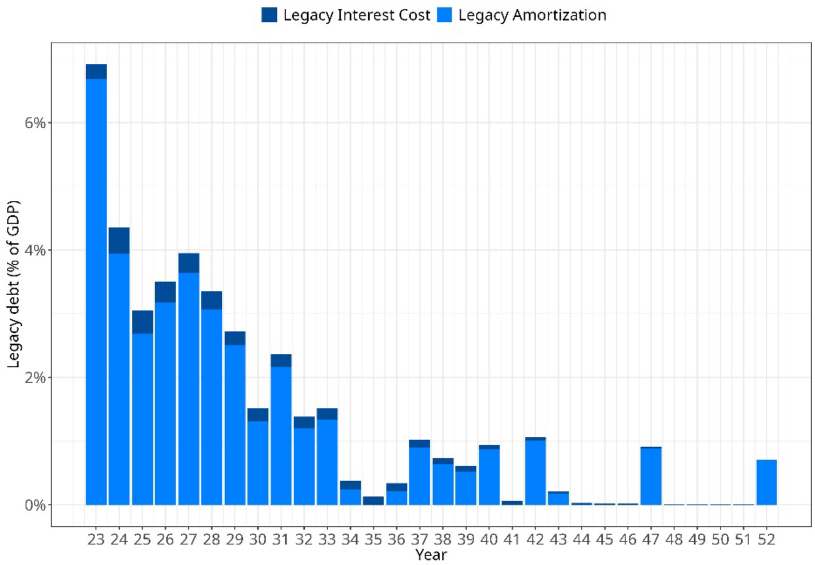
The term structure of the legacy debt stock and interest payments of the representative high- and low-debt countries (HD, LD) is shown in Figure C.2.

Figure C.2: Legacy debt for high- and low-debt countries

a) High debt



b) Low debt



C.3 Scenario trees

We provide here the moments for matching the trees and display the resulting fan charts.

We estimate standard deviations and correlations of the exogenous variables from the time series of the IMF World Economic Outlook data from 1998-2019 and show the results in Table C.1. For the real growth and primary balance time series, we average the data of Italy, Spain, and Portugal, equally weighted. The high and low bond yields are displayed in Figure C.3.

Table C.1: Moments for the scenario tree calibration

(a) Long-term mean value

	High debt	Low debt
High yields	2.87%	
Low yields	1.20%	
GDP growth	3.30%	3.50%
Primary balance	0.19%	-1.42%
High risk ICRG	77	
Low risk ICRG	87	

(b) Volatilities and correlations

Factors	Standard Deviations	Correlations			
Yield	0.85	1.0	-0.20	-0.03	0.33
GDP Growth	0.75		1.0	0.25	0.20
Primary Balance	0.15			1.0	-0.16
ICRG (High risk/Low risk)	3.2/2.0				1.0

We calibrate a tree on these input data. For computational tractability, our tree has four branches at each period for the first five years with no further branching afterward for a total of 256 scenarios. In Figure C.4, we illustrative fan charts of GDP growth and primary balance of high- and low-debt countries. In Figure C.1, we illustrative the political scenarios for the low-risk representative country. The dashed lines show the mean-value input data.

Figure C.3: Reference yield curves

We display the reference yield curves of AAA-rated euro-area sovereign bonds from the European Central Bank. The high-yields (HY) scenario is based on the curve of 15/11/2023, and the low-yield (LY) scenario uses the curve of 09/01/2021.

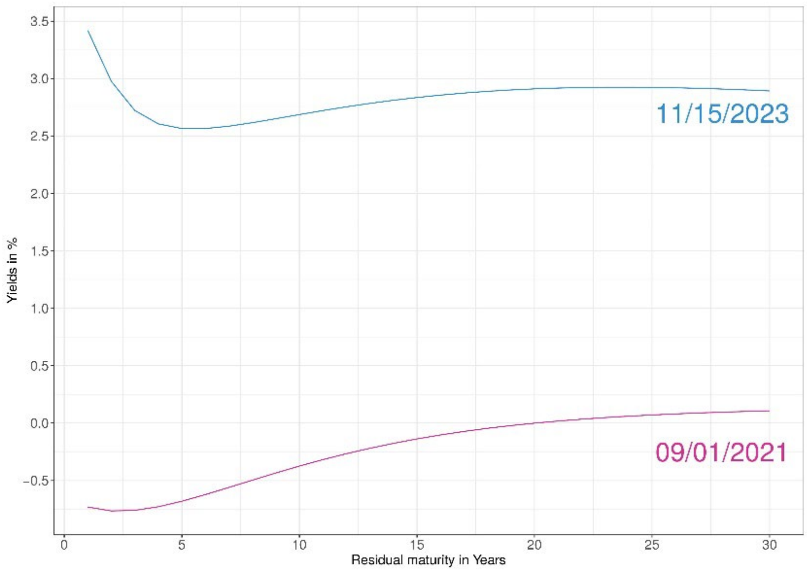
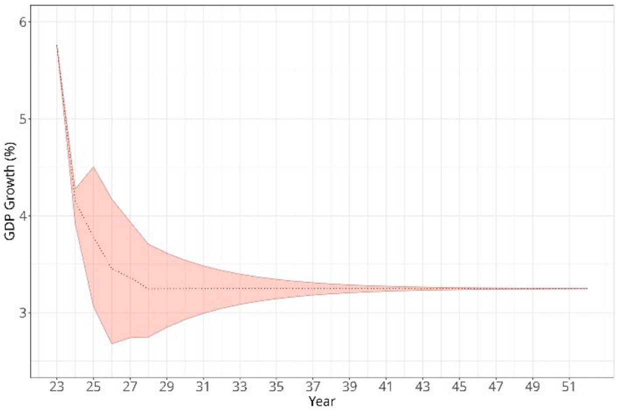
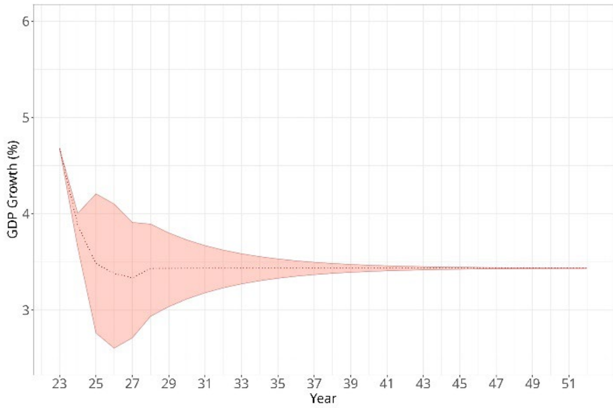


Figure C.4: GDP growth and primary balance for the representative countries

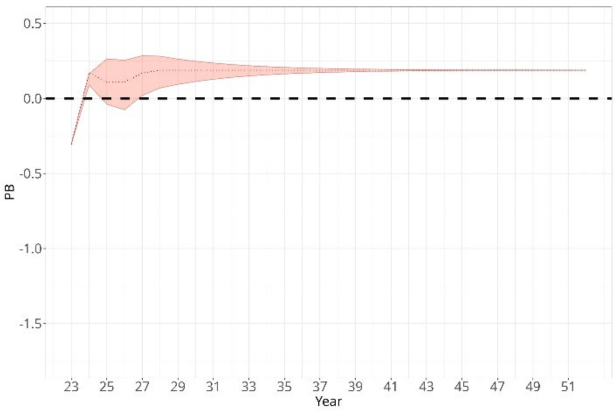
(a) GDP growth, HD



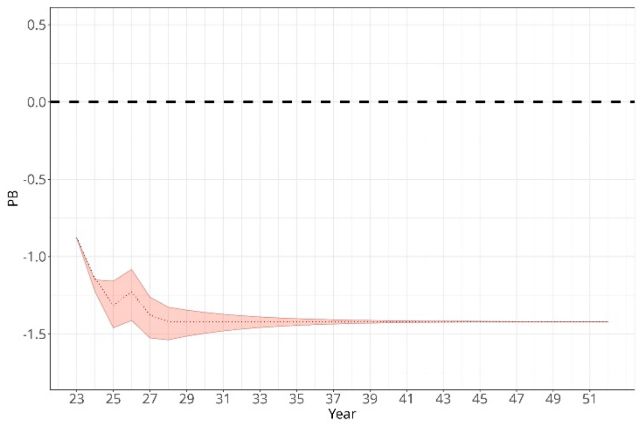
(b) GDP growth, LD



(c) Primary Balance, HD



(b) Primary Balance, LD

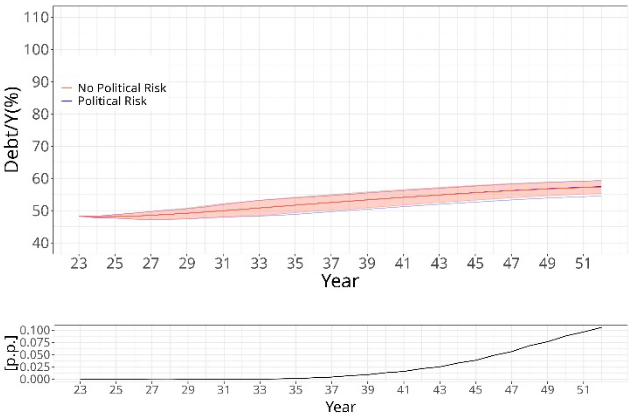


D Supplementary results

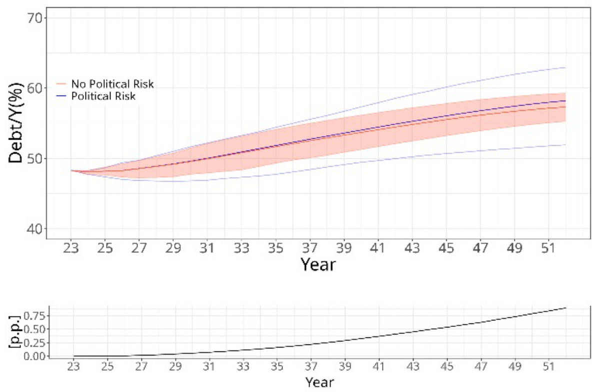
Figure D.1: Political risk effects under low interest rates

We display debt-to-GDP trajectories with and without political risk in a low-yield environment. The coral fan charts are without political risk, and the blue lines display the mean, 25th and 75th percentiles with political risk. Below the fan charts in each panel, we display the increase in mean values when adding political risk in percentage points (pp). Each panel corresponds to different debt levels and under different levels of political risk, as indicated.

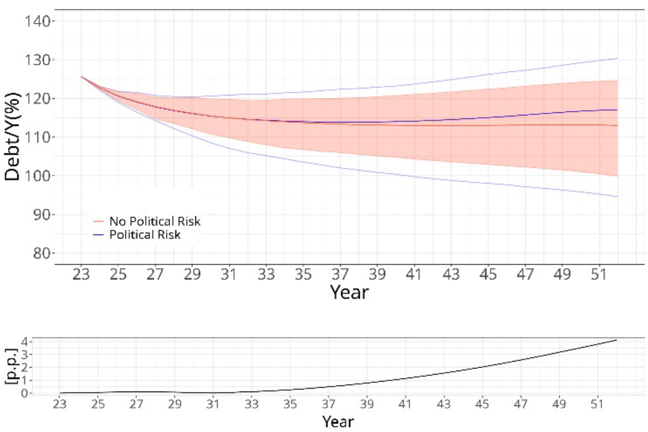
(a) Low debt, low risk



(b) Low debt, high risk



(c) High debt, low risk



(d) High debt, high risk

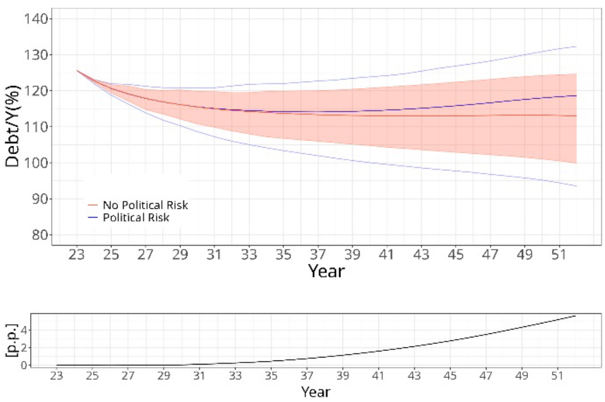
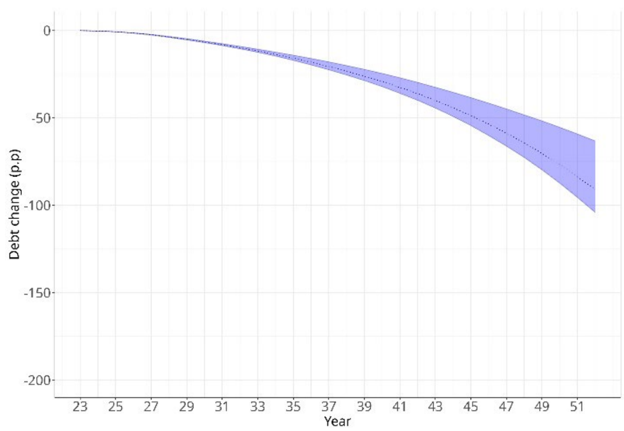


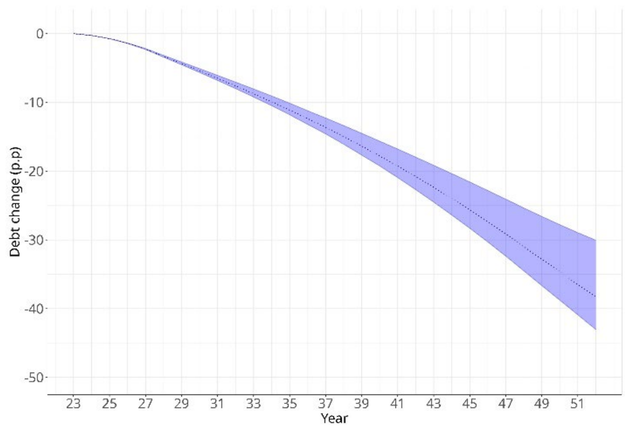
Figure D.2: Debt impulse response to reforms or a crash for low-risk countries

We display the interquartile fan charts and median differences of debt-to-GDP trajectories after reforms or a crash for low-risk countries. Panels A-B correspond to the political regime of Figure C.1, Panel B, and Panels C-E to Figure C.1, Panel C. Panels C-D are for high-debt countries and Panel E for low-debt. Results are reported for high- and low-yields environments.

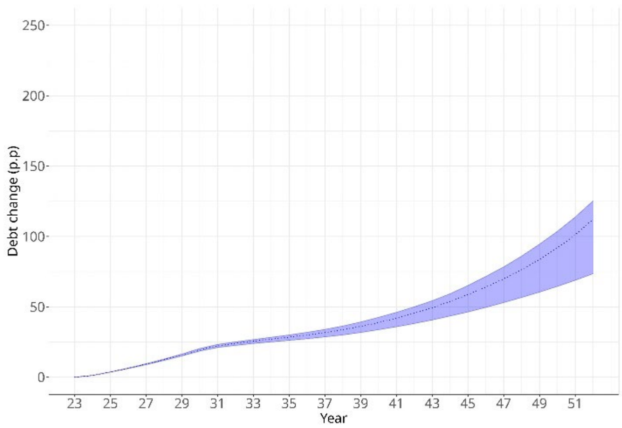
(a) Reforms (HD, HY)



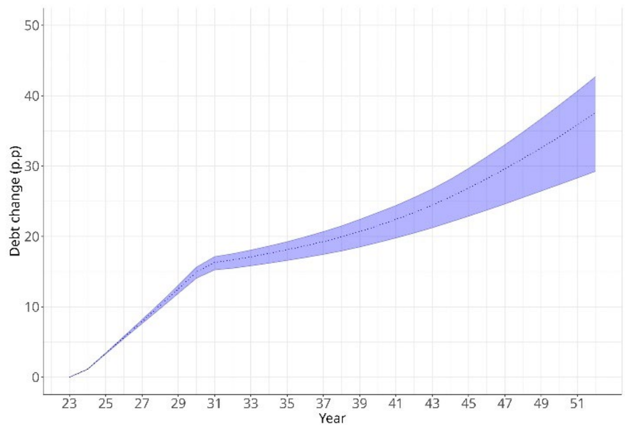
(b) Reforms (HD, LY)



(c) Crash (HD, HY)



(d) Crash (HD, LY)



(e) Crash (LD, LY)

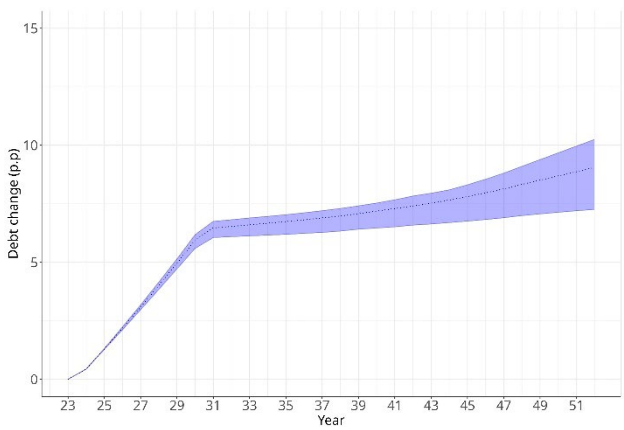
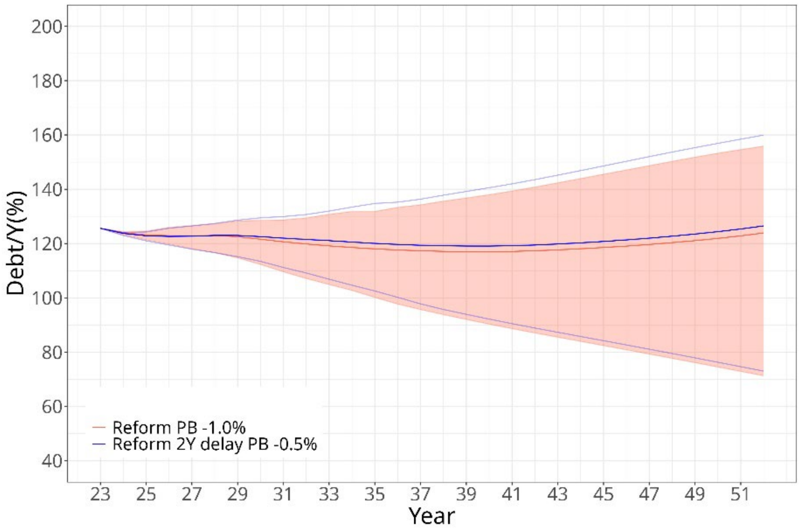


Figure D.3: Reform delays

We display debt-to-GDP trajectories under reforms that lead to improved political ratings. The coral fan charts are with reforms starting in 2022 with a cost of 1% of GDP for the duration of the improvements. The blue lines display the mean, 25th, and 75th percentiles, when improvements are delayed by (a) two years or (b) four years, with corresponding costs of 0.5% and 0% of GDP.

(a) Two-year delay with cost 0.5% GDP



(b) Four-year delay with cost 0% GDP

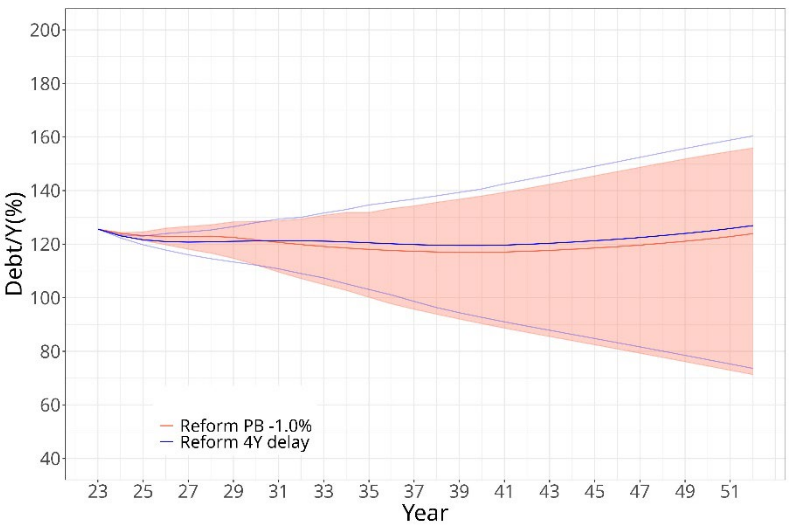
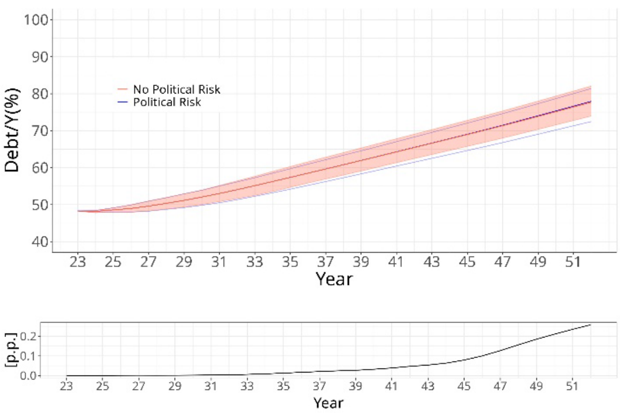


Figure D.4: Yields and growth channel effects of political risk on debt dynamics

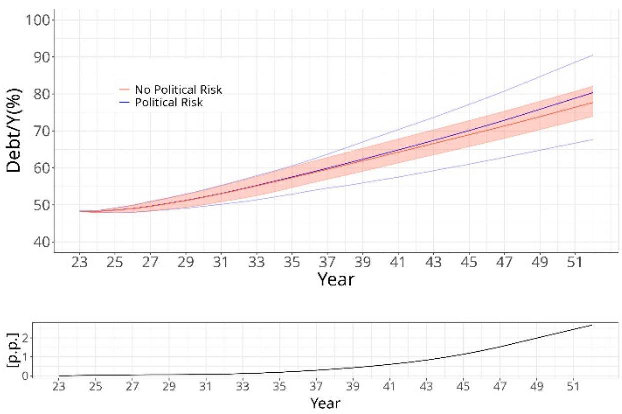
We display debt-to-GDP trajectories with and without political risk, first through (i) the yields channel and (ii) the growth channel. The coral fan charts are without political risk, and the blue lines display the mean, 25th and 75th percentiles with political risk. Below the fan charts in each panel, we display the increase in mean values when adding political risk in percentage points (pp). Each panel corresponds to different debt levels and under different levels of political risk, as indicated. The test is conducted in a high-yield environment.

(i) Yields channel

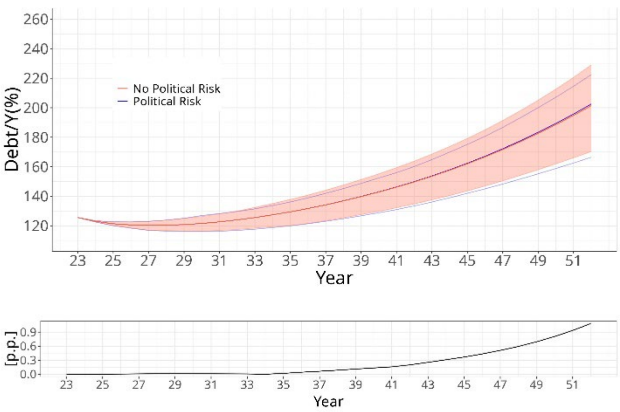
(a) Low debt, low risk



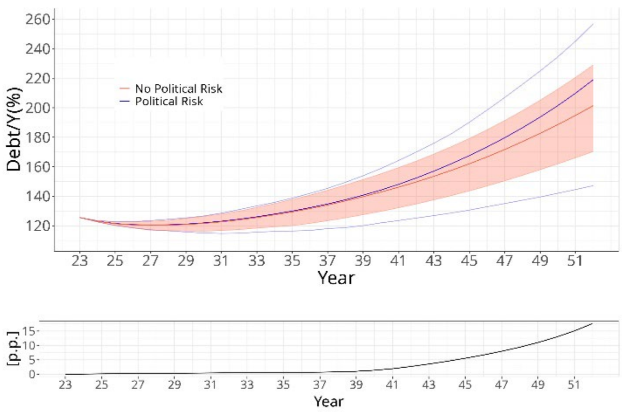
(b) Low debt, high risk



(c) High debt, low risk

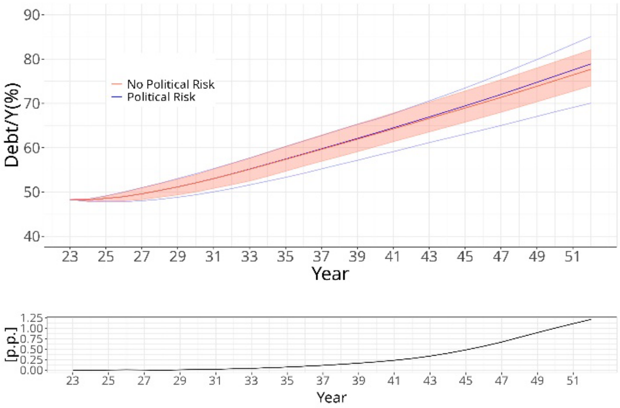


(d) High debt, high risk

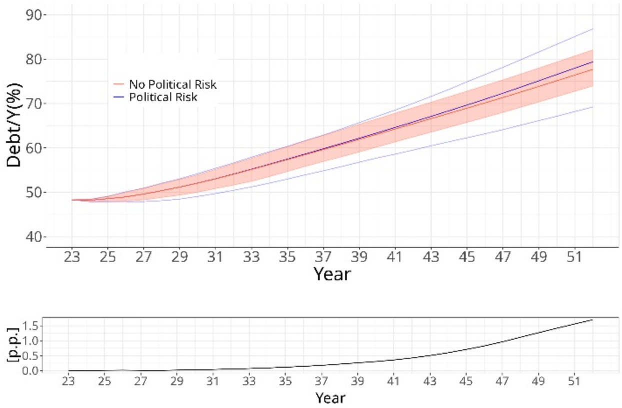


(ii) Growth channel

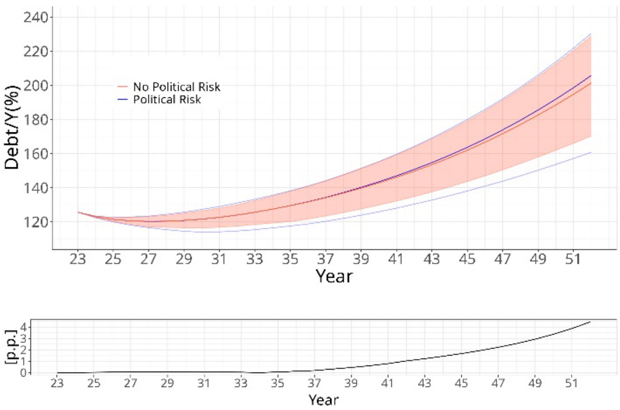
(a) Low debt, low risk



(b) Low debt, high risk



(c) High debt, low risk



(d) High debt, high risk

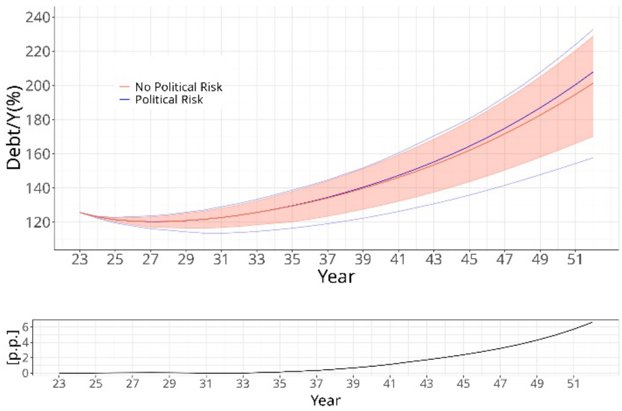
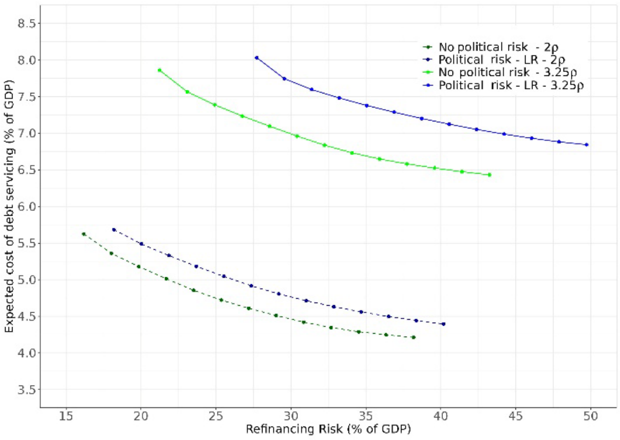


Figure D.5: Robustness of cost-risk trade-off with political risk to credit risk

We display the trade-off between the expected cost of debt financing and refinancing risk when accounting for the effects of political risk under different estimates of the credit risk premium. We display results for (a) low-risk countries with $\rho = 2$ and (b) high-risk countries with $\rho = 4$, dashed line. In each figure, we show the results without and with political risk and, for comparison, the frontiers from Figure 4, Panel D, for $\rho = 3.25$, solid line.

(a) Low-risk country, $\rho = 2$



(b) High-risk country, $\rho = 4$

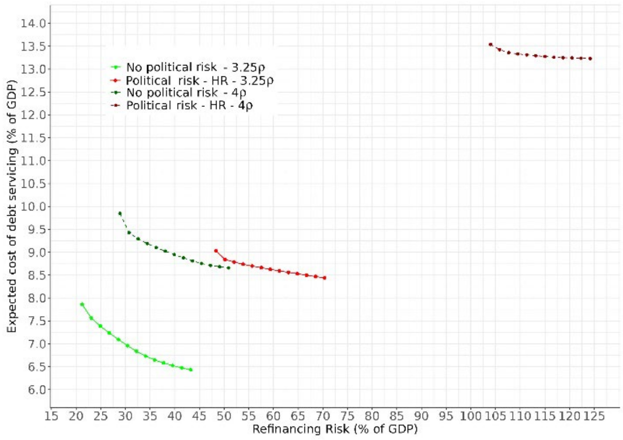


Figure D.6: Robustness test of debt dynamics to the fat tails of political ratings

We display debt-to-GDP trajectories with political risk on a scenario tree that matches only first and second moments (coral fan charts) and on a tree that matches the skewness and kurtosis of political ratings (blue lines of the mean, 25th and 75th percentiles). The test is for high-debt, high-risk countries and is conducted in a high-yield environment.

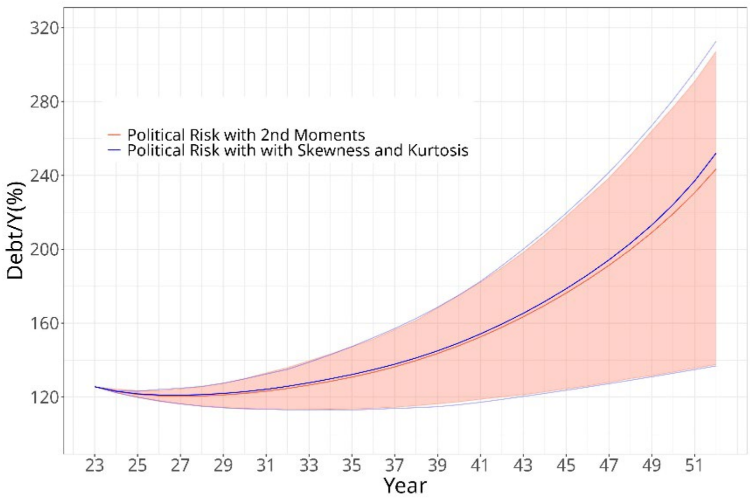
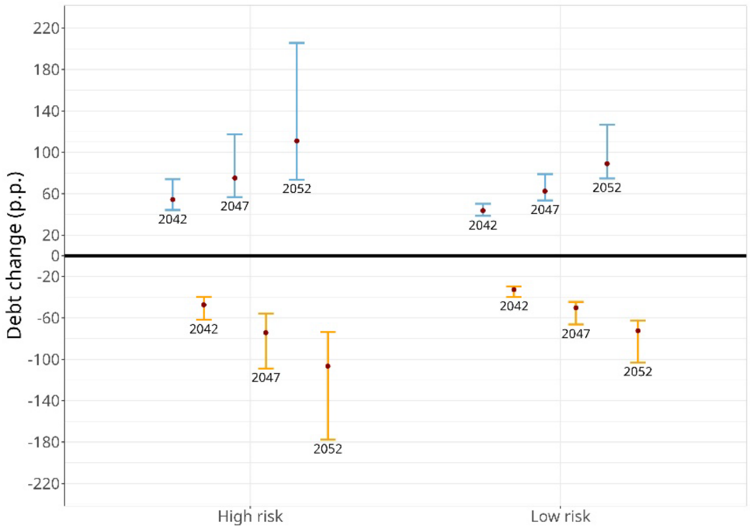


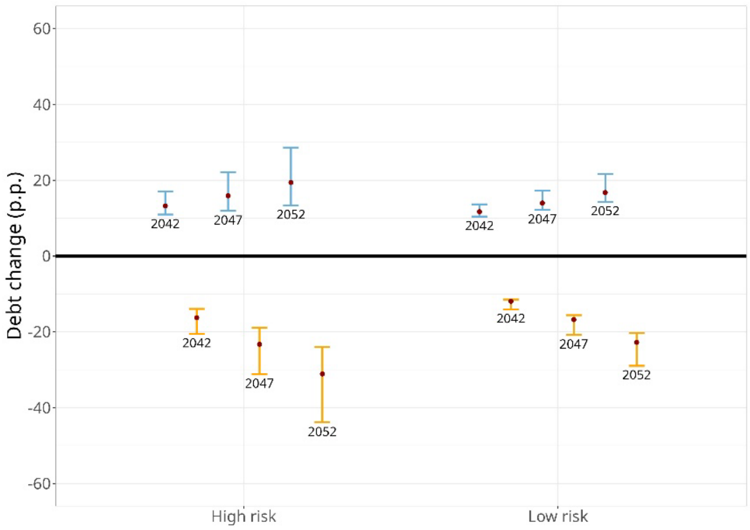
Figure D.7: Robustness test of Debt-to-GDP ratio responses to political rating crashes and reforms

This figure displays changes in the interquartile range and the mean values of debt-to-GDP ratios for (a) high-debt and (b) low-debt countries, due to reforms (below the zero axis) or a political rating crash (above the zero axis). Results are displayed for high or low political debt countries at the end of 20-, 25-, and 30-year horizons.

(a) High debt



(b) Low debt



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