IMPACT OF CLIMATE RISK ON FISCAL SPACE

DO POLITICAL STABILITY AND FINANCIAL DEVELOPMENT MATTER?

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ABSTRACT

We analyze the relationship between climate risk and fiscal space in a systematic and rigorous way. To do so, we use panel local projections to examine the role of political stability and financial development in the relationship. For a sample of 199 economies in 1990–2022, we first empirically confirm that climate risks adversely affect fiscal space. We find that such effects are most pronounced for the economies that are most vulnerable to climate change. However, our evidence indicates that political stability and financial development can mitigate such effects. We also identify nonlinearities in the climate risk–fiscal space nexus. More specifically, the impact of climate risk on fiscal space is greater when fiscal space is most constrained—i.e., in the upper quantile of the distribution. While fiscal consolidation is the key to mitigating the adverse effect of climate risks on fiscal space, our results suggest both political stability and financial development can contribute as well.

Keywords: climate risk, institutional quality, fiscal space, bond yields, sovereign ratings

JEL codes: F32, F41, F62

1. Introduction

Climate risks, which refer to the potential adverse socioeconomic impacts of climate change, entail substantial fiscal risks, especially through their adverse effects on fiscal space. For instance, a big disaster caused by climate change is likely to necessitate large fiscal outlays for relief and recovery efforts. Or extreme heat resulting from global warming could cause extensive agricultural damage, forcing governments to provide subsidies to hard-hit farmers. At a broader level, public spending on climate change adaptation and mitigation is coming to represent one of the biggest sources of fiscal demand around the world. In combination with other large looming fiscal demands, such as those related to population aging, climate change-related fiscal expenditures pose a major threat to fiscal space and fiscal sustainability in the future.

The primary original contribution of our paper to the literature is that we empirically examine the link between climate risk and fiscal space in a systematic and rigorous way. To do so, we first investigate whether climate risk has an adverse effect on fiscal space and whether this effect depends on the relative amount of fiscal space. We then examine the role of political stability and financial development in mitigating such climate-related fiscal risks.

Political stability is likely to mitigate these risks since it increases the likelihood of more sustainable fiscal policy, for example in the form of a more robust medium-term fiscal framework. As a result, a more stable political environment is likely to reduce the impact of climate shocks and other shocks on fiscal sustainability. In addition, political stability is conducive to more careful, rational, and cost-effective government planning in response to potential climate shocks, which will help preserve fiscal space.

Financial development is also expected to mitigate climate-related fiscal risks. In particular, in a financially well-developed economy, firms and households will have access to insurance and other financial instruments that protect them from the negative effects of climate shocks. This, in turn, reduces the need for large fiscal outlays and thus mitigates the negative effect on fiscal space. Furthermore, financial development increases the amount of credit available to firms and households to help them cushion the impact of potential climate shocks.

An additional, indirect, channel through which climate risk may adversely affect fiscal space is via its impact on economic uncertainty. There is growing consensus that climate change poses a serious risk to humanity, a consensus that is buttressed by real-world climate events such as record-high temperatures hitting the world in 2024. Nevertheless, there remains significant uncertainty about the future trajectory of climate change as well as its impact on economic activity. Intuitively, political stability and financial development can mitigate the adverse impact of uncertainty on the economy. Political stability prevents political uncertainty from exacerbating economic uncertainty and thus enables economic agents to respond better to the latter. Financial development provides economic agents with various financial instruments, for example hedging instruments such as futures contracts, to protect themselves against economic uncertainty. Therefore, both political

stability and financial development can help mitigate the negative economic effects of uncertainty associated with climate change.

To empirically examine the role of political stability and financial development on the climate–fiscal nexus, we perform a cross-country analysis. That is, we investigate whether politically more stable and financially more developed economies are less vulnerable to climate-related fiscal risks. To do so, we use a large global sample of 199 economies for the period from 1990 to 2022. Our empirical analysis is based on panel local projections, and two measures of fiscal space—namely, sovereign bond yields and ratings on foreign currency long-term sovereign debt. The two measures are widely used in the literature, and they reflect the financial markets' assessment of an economy's fiscal space.

Our empirical analysis involves a two-stage estimation. In the first stage, we investigate the relationship between climate vulnerability and fiscal space. We find that climate vulnerability adversely affects fiscal space and that the effects are most pronounced for those economies that are most vulnerable to climate change. The analysis of the first stage confirms the findings of the existing literature, although our country sample is substantially larger than that of other studies. In the second stage, we empirically investigate the role of political stability and financial development in mitigating the negative spillovers of climate exposure to fiscal space. This is the main original contribution of our paper to the literature. We also assess whether the adverse effect of climate risk on fiscal space is nonlinear in the sense that the effect depends on fiscal space. That is, we analyze whether the effect depends on the extent to which an economy is fiscally constrained.

Our review of the literature yields only one major study that is somewhat related to our paper—namely, You et al. (2014). In this, the authors empirically investigate the link between democracy, financial openness, and global carbon dioxide (CO_2) emissions. They also examine whether the impact of independent variables on CO_2 emissions varies throughout the CO_2 emission distribution. That is, they analyze whether the impact of these variables on CO_2 emissions depends on a country's CO_2 emissions level. Their cross-country empirical analysis covers a global sample of 98 advanced and developing economies and spans the period from 1995 to 2005. The authors find that, among the economies that emit the most, more democracy reduces CO_2 emissions but greater financial openness does not.

Our paper is fundamentally different, notwithstanding some superficial similarities. First, our political variable is not democracy but political stability, defined as absence of domestic and external conflict. Second, we look at climate risks, which refer to the potential negative impact of climate change, instead of CO_2 emissions. Climate risk is a much broader concept than CO_2 emissions, which represent a specific component of the global environmental crisis. A deeper difference is that, in our paper, climate risk is an independent rather than a dependent variable. Finally, our key variable of interest is fiscal space rather than climate risk. More precisely, we examine the extent to which political stability moderates the adverse effects of climate risk on fiscal space. In light of the huge

challenge that climate change poses for fiscal sustainability, our paper helps us identify the factors that render the challenge more manageable. We also look at nonlinearities but in terms of fiscal space rather than climate risk. Specifically, we test whether the impact of fiscal space on climate risk depends on the extent to which an economy is fiscally constrained.

Overall, we find political stability reduces the adverse spillover effects of climate risks on fiscal space. More precisely, our evidence indicates that climate risks are associated with lower-bond-risk-premium lower and higher sovereign ratings in economies that suffer less from both external and internal conflict. In addition, we find that financial development weakens the link between climate risks and fiscal space. Financially more developed economies do not experience a climate-related bond risk premium or a persistent deterioration of sovereign ratings owing to climate vulnerability. Finally, we identify asymmetric effects in the sense that the most fiscally constrained economies are subject to the largest climate-related risk premia. To sum up, we find that financial development and political stability can serve as important buffers against the adverse fiscal impacts of climate change.

The rest of the paper is structured as follows: Section 2 reviews the literature; Section 3 outlines the data and methodology; Section 4 reports and discusses the empirical findings; and Section 5 concludes.

2. Literature Review

In this paper, we investigate the global challenge of climate risks and climate change, focusing on its impact on fiscal space. Previous studies show that climate change is not just an environmental issue. It also has a significant and adverse impact on economic growth (Oppenheimer et al. 2004; Tol et al. 2004; Mendelson, Dinar, and William 2006; Diffenbaugh and Burke 2019; Dasgupta, Emmerling, and Shayegh 2023) and exacerbates inequality in developing economies (Cappelli, Costantini, and Consoli 2021; Dasgupta, Emmerling, and Shayegh 2023). Given that developing economies are the most vulnerable to climate change, strategic resource allocation is imperative to enhance their resilience (Paglialunga, Coveri, and Zanfei 2022). This includes implementing adaptation policies and risk reduction measures and expanding access to precautionary tools and health services (Paglialunga, Coveri, and Zanfei 2022; Cevik and Tovar Jalles 2023). Furthermore, redistribution and the introduction of social safety nets must be ensured in the affected economies (Cevik and Tovar Jalles 2023).

Climate change insurance funds, investments in economic development, and cross-national compensation for low-latitude economies more prone to climate change shocks promote economic resilience in developing economies against climate vulnerabilities (Mendelson, Dinar, and William 2006). To better adapt to and mitigate the socioeconomic impact of climate change and rising temperatures, economies must possess a high adaptive capacity (Tol et al. 2004), a diversified economy (Dissart 2003), political stability (Dell, Jones, and Olken 2012), and strong institutional leadership (Pike, Dawley, and Tomaney 2010). Unfortunately, these attributes are often lacking in developing

economies, owing to financial constraints and adverse geographical conditions. Additionally, these economies tend to have more limited fiscal space, meaning their governments are less capable of assisting those affected by climate change shocks (Cevik and Tovar Jalles 2023).

One strand of literature examines the asymmetric effects of climate vulnerability and resilience on sovereign risk and public finance. For example, Beirne, Renzhi, and Volz (2021) gauge the impact of climate vulnerability and resilience on sovereign borrowing costs using a panel dataset from 40 advanced and emerging economies. Their findings suggest that climate vulnerability significantly influences sovereign borrowing costs more so than do resilience factors, with bond yields increasing progressively for highly climate-vulnerable economies. Cevik and Tovar Jalles (2022) expand this discourse by analyzing data from 98 advanced and developing economies between 1995 and 2017. They find that both climate vulnerability and resilience affect government borrowing costs, with the impact more pronounced in developing economies owing to their weaker adaptive capacities and higher sovereign risk costs.

In a similar vein, Boitan and Marchewka-Bartkowiak (2022) analyze the impact of various climate change metrics—performance, exposure to extreme events, vulnerability, readiness, and climate debt— on government borrowing costs in European Union economies from 2000 to 2020. They find that economies with higher climate vulnerability and lower capacity to manage climate disasters face higher sovereign risk premia, underscoring the importance of effective climate disaster management in maintaining favorable borrowing conditions. Zenios (2022) addresses the broader implications of climate risks for fiscal stability, particularly in advanced economies. He argues that climate risks to fiscal stability remain unanswered, providing evidence of divergent climate risks across advanced economies. Moreover, his findings delineate the transmission channels through which climate change impacts public finance, emphasizing the need for comprehensive risk management strategies.

Carattini, Heutel, and Melkadze (2023) delve into the impact of macroeconomic stability on climate risk. In particular, they examine whether ambitious climate policies can induce macroeconomic instability and propose efficient climate and macroprudential policies to manage these risks over the long run and across business cycles. Their findings suggest well-designed climate policies can mitigate long-term fiscal risks without destabilizing the economy.

Other studies have highlighted additional factors in the ramifications of climate risk. For instance, Cevika and Tovar Jalles (2023) explore the social dimension of climate vulnerability by examining the link between climate risk and economic inequality. Their study reveals that a 1% increase in climate change vulnerability results in a 1.5% increase in inequality, as measured by the Gini coefficient. Yang, Caporin, and Jiménez-Martin (2024) contribute to the discourse by investigating climate transition risk spillovers among six major financial markets from 2013 to 2021. They identify the United States as the primary net contributor to climate transition risk, and the People’s Republic of China (PRC) and Japan as net risk recipients. Their study highlights that climate risk spillovers

vary over time and depend on the types of climate transition risk shocks. More broadly, their evidence underscores the interconnectedness of global financial markets in the context of climate transition risks.

Overall, notwithstanding the above literature on the impact of climate risk and resilience on sovereign risk and borrowing, there is a dearth of empirical research that explicitly analyzes the link between climate risk and fiscal space and, going further, the factors that moderate that link. This is a huge gap in the literature, since climate risks pose an enormous threat to fiscal space and fiscal sustainability. Only Zenios (2022) has attempted to explore the climate–fiscal relationship, albeit through a descriptive analysis limited to advanced economies.

Filling this big gap more systematically and rigorously is our main contribution to the literature. To do so, we empirically examine the impact of climate risk on fiscal space for around 200 economies. Furthermore, we empirically assess the role of political stability and financial development in buffering the adverse effects of climate vulnerability on fiscal space. As discussed in the previous section, You et al. (2014) examine the link between democracy, financial openness, and CO_2 emissions. However, they look at how democracy and financial openness, which are broadly related to our key independent variables of political development and financial stability, affect CO_2 emissions across the CO_2 distribution across economies. In contrast, we delve into how political and financial factors moderate the adverse impact of climate risk on fiscal openness. While their primary variable of interest is CO_2 emissions, our primary variable is fiscal space, since we are ultimately interested in what happens to fiscal space in the face of climate change, moderated by political and financial factors. By shedding new light on how these factors influence the relationship between climate risk and fiscal space, our study contributes to a more complete and accurate understanding of that relationship.

3. Methodology and Data

3.1. Data

We construct a database for a large sample of 199 economies over the period 1990–2022 (see Appendixes A and B). In Table 1, our main explained variables that measure fiscal space are bond yields and foreign currency long-term sovereign debt ratings. The bond variable in this study reflects the yields on government bonds. The variable is based on the J.P. Morgan (JPM) Emerging Market Bond Index (EMBI), complemented by the International Monetary Fund (IMF) International Finance Statistics (IFS) database. The maturity of the included bonds is at least 2.5 years. To improve distributional characteristics, the variable is transformed by 100*x/(x+100), and subsequently winsorized. Our second variable is an annual average of foreign currency long-term sovereign debt ratings by Moody's, Standard & Poor's, and Fitch Ratings, which are available in Bloomberg daily.

We collect the data from Kose et al. (2022). We may recall that they assign 1 to the worst rating and 21 to the best one, and then take a simple average of three ratings. The variable that will be considered in this study as the impulse variable is the Notre Dame Global Adaptation Initiative (ND-GAIN) overall vulnerability score, which is multiplied by 100. This vulnerability score measures "*the propensity or predisposition of human societies to be negatively impacted by climate hazards.*" A higher value corresponds to a higher vulnerability to climate risks. Figures 1 and 2 present heat plots for the lowest and the highest quartiles, respectively.

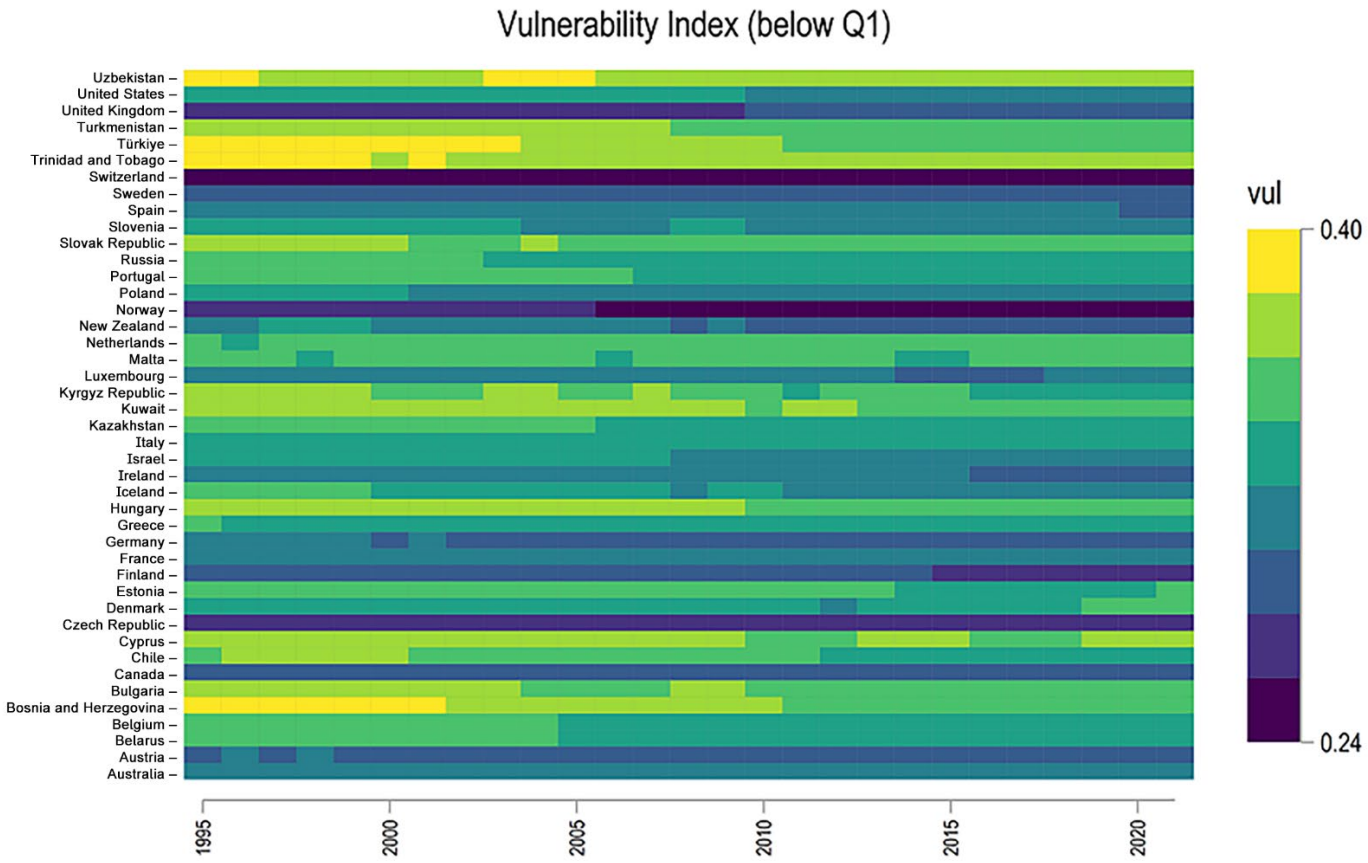
Following Beirne, Renzhi, and Volz (2021) and Kling et al. (2020), the control variables include domestic variables like current account balance, government debt and deficit, and Consumer Price Index (CPI) inflation. Besides, the controls variables include the world MSCI index, US bond yields and the Chicago Board Options Exchange (CBOE)'s Volatility Index (VIX). These controls allow us to control for the main variables that influence our two fiscal space variables at the domestic and the global level.

Table 1: Descriptive Statistics for Involved Variables

Variable	Count	Mean	First Quartile	Median	Third Quartile	Standard Deviation	Minimum	Maximum
Climate risk vulnerability variable								
ND-GAIN overall vulnerability	4,968	0.44	0.37	0.43	0.52	0.10	0.24	0.70
Fiscal space variable								
Government bonds, yield %	2,180	6.35	4.05	5.47	7.60	3.88	0.44	23.31
Sovereign debt rating, index	3,560	12.6	8	12	17.30	5.23	1	21
Domestic control								
Current account balance	5,312	-2.51	-7.03	-2.79	1.43	13.70	-240.5	311.7
Government net lending/borrowing	5,487	-2.51	-4.74	-2.38	-0.03	13.05	-557.5	125.1
General government gross debt	5,092	56.47	29.5	47.01	70.82	45.14	0	600.1
CPI % year on year	4,004	0.59	0.14	0.31	0.65	1.05	-1.22	8.93
Banking crises dummy	5,544	0.02	0	0	0	0.14	0	1
Currency crises dummy	5,544	0.02	0	0	0	0.15	0	1
Debt crises dummy	5,544	0.01	0	0	0	0.07	0	1
Global control								
MSCI world index	4,995	0.59	0.028	0.92	1.40	1.36	-4.30	3.184
US government bonds, yield %	4,995	3.95	2.48	4.10	5.33	1.47	1.78	6.587
VIX	6,567	19.66	15.39	17.80	24.20	5.83	11.09	32.70

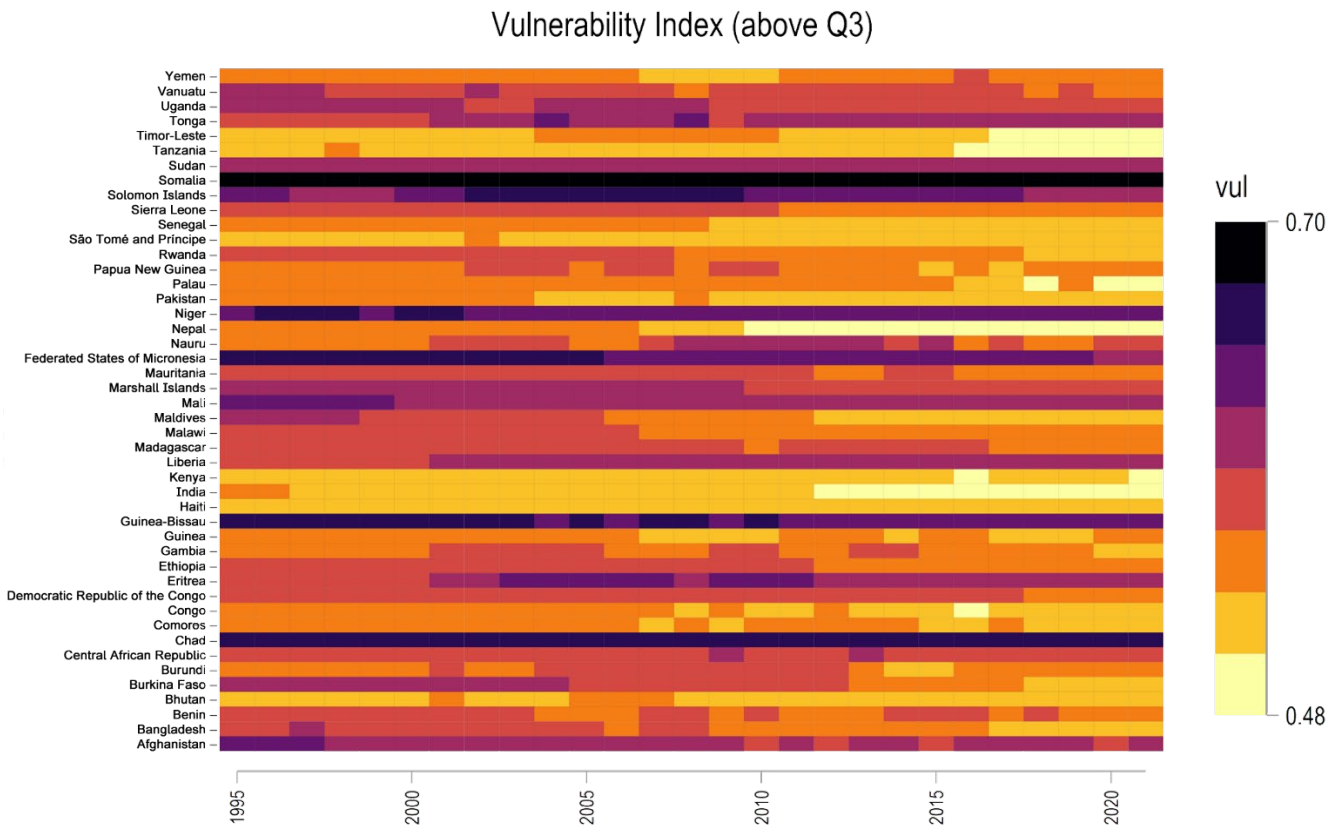
CPI = Consumer Price Index, ND-GAIN = Notre Dame Global Adaptation Initiative, US = United States, VIX = Chicago Board Options Exchange Volatility Index.
Source: Authors' calculations. See Appendix A for more details.

Figure 1: Heat Plot for Low Vulnerability Score



vul = vulnerability index.
Source: Authors' calculations, using ND-GAIN.

Figure 2: Heat Plot for High Vulnerability Score



vul = vulnerability index.
Source: Authors' calculations, using ND-GAIN.

In Figure 1, we compute the mean value of the vulnerability score for each country. Then, we keep the economies with a mean value below the first quartile for the vulnerability score. We observe that the first quartile for the vulnerability score does not comprise only advanced economies. In this list, we find economies that are not affected by elevated temperatures thanks to their geographic position, economies that are not dependent on importations for their energy consumption, and economies that have already invested in infrastructure.

Along with the presence of more advanced economies, we find several economies that do not belong to the group of the more advanced economies in terms of economic development. These economies have a low vulnerability score (i.e., a higher resilience to climate risks) thanks to excellent scores in some sub-categories of the ND-GAIN overall vulnerability score. For example, Russia has excellent scores in the infrastructure sub-category thanks to widespread electricity access, complete autonomy *vis-à-vis* energy imports, and limited impact of the projected change in sea levels. Other economies, such as Kazakhstan, Turkmenistan, and Uzbekistan, have similar infrastructure profiles to that of Russia. The other sub-categories show higher vulnerability in these economies. For example, Russia has a high score (i.e., a lower resilience to climate risks) in agricultural

capacity, owing to low capacity to acquire and deploy the most recent and ecological agricultural technologies.

In Figure 2, we observe economies that have a higher vulnerability (above the third quartile). These are economies that tend to be at the lower stages of economic and institutional development. They also tend to have less developed domestic financial markets. Relative to the group of economies presented in Figure 1, this group of economies is more homogenous. We find in particular economies in sub-Saharan Africa and South Asia. In these economies, paved road coverage, electricity access, and access to reliable drinking water remain scarce. For example, Afghanistan[1] and Chad have very high vulnerability scores in both agricultural capacity and medical staff coverage.

In Table 2, we compare fundamental and institutional characteristics for different levels of vulnerability to climate risks. We split our sample between economies with high (i.e., above the third quartile for ND-GAIN overall vulnerability) and low vulnerability. The group of highly vulnerable observations displays several important differences when compared with the group of observations for lower levels of vulnerability. In particular, vulnerable economies have significantly lower ND-GAIN overall readiness.

In addition, they have significantly lower fiscal space. Yields on bonds and bills are higher, as are public and external deficits. They have significantly more consumer price inflation. Occurrence of crises is significantly lower, but this owes to limited financial and trade integration. In addition, they are more dependent on fuel imports, and they export less fuel. The level of *de jure* financial openness is significantly lower. They tend to have more flexible exchange rates. More importantly, they have a significantly lower level of financial institution development. For the institutional variables, they have significantly lower scores in almost all dimensions (i.e., higher institutional risks). In particular, they tend to have significantly lower scores on religious and ethnic tensions and internal and external conflicts. Finally, they tend to be less investable economies compared with other emerging economies.

[1] ADB placed its regular assistance to Afghanistan on hold effective 15 August 2021.

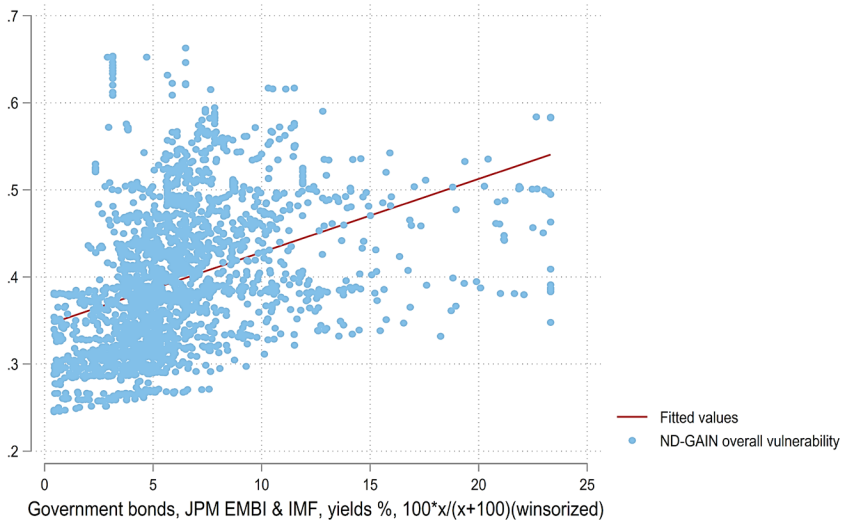
Table 2: Comparing Fundamentals and Institutional Features for Different Levels of Vulnerability

	VUL High (Above Q3 of VUL)	VUL Low (Below Q3 of VUL)	Total	Test
	1,196 (25.0%)	3,588 (75.0%)	4,784 (100.0%)	
ND-GAIN overall vulnerability	0.57 (0.04) 0.07	0.40 (0.06) 0.16	0.44 (0.10) 0.22	<0.001
ND-GAIN overall readiness	0.31 (0.07) 0.22	0.43 (0.13) 0.31	0.40 (0.13) 0.33	<0.001
Government bonds, yield %	7.67 (3.55) 0.46	5.93 (3.63) 0.61	6.08 (3.66) 0.60	<0.001
Treasury Bills, yield %	9.83 (6.34) 0.65	6.36 (6.03) 0.95	7.01 (6.24) 0.89	<0.001
Foreign currency sovereign debt ratings	7.30 (1.38) 0.19	12.64 (5.14) 0.41	12.23 (5.15) 0.42	<0.001
Current account balance, % of GDP	-4.40 (22.94) -5.22	-1.97 (10.03) -5.10	-2.49 (13.92) -5.58	<0.001
CPI inflation, year on year %	0.63 (0.70) 1.11	0.47 (0.88) 1.85	0.50 (0.85) 1.68	<0.001
General government gross debt, % of GDP	62.53 (63.99) 1.02	54.41 (36.90) 0.68	56.33 (44.94) 0.80	<0.001
Government net lending/borrowing, % of GDP	-1.95 (7.83) -4.02	-2.12 (5.77) -2.73	-2.07 (6.33) -3.05	0.440
Laeven-Valencia dummy: banking crisis	0.00 (0.04) 22.85	0.02 (0.13) 7.66	0.01 (0.11) 8.74	<0.001
Laeven-Valencia dummy: currency crisis	0.01 (0.10) 9.70	0.02 (0.15) 6.65	0.02 (0.14) 7.16	0.018
Laeven-Valencia dummy: debt crisis	0.00 (0.03) 32.33	0.01 (0.09) 10.66	0.01 (0.08) 12.17	0.008
Total reserves minus gold, % of GDP	14.84 (14.53) 0.98	17.91 (18.52) 1.03	17.27 (17.82) 1.03	<0.001
Fuel exports on total exports	9.71 (22.81) 2.35	17.89 (27.16) 1.52	16.58 (26.67) 1.61	<0.001
Fuel imports on total imports	16.41 (8.77) 0.53	13.54 (8.42) 0.62	14.07 (8.56) 0.61	<0.001
Chinn-Ito index, normalized	0.34 (0.32) 0.94	0.57 (0.37) 0.65	0.52 (0.37) 0.72	<0.001
Exchange rate stability index	0.57 (0.28) 0.48	0.62 (0.31) 0.50	0.61 (0.31) 0.50	<0.001
Financial institution index	0.18 (0.07) 0.41	0.45 (0.21) 0.48	0.38 (0.22) 0.57	<0.001
Financial market index	0.03 (0.08) 2.48	0.26 (0.26) 1.03	0.20 (0.25) 1.24	<0.001
ICRG index: external conflict	9.11 (1.64) 0.18	10.10 (1.32) 0.13	9.92 (1.44) 0.14	<0.001
ICRG index: corruption	1.95 (0.78) 0.40	2.91 (1.22) 0.42	2.74 (1.21) 0.44	<0.001
ICRG index: bureaucracy quality	1.22 (0.81) 0.66	2.44 (1.03) 0.42	2.22 (1.10) 0.49	<0.001
ICRG index: democratic accountability	3.19 (1.32) 0.41	4.22 (1.65) 0.39	4.03 (1.64) 0.41	<0.001
ICRG index: ethnic tensions	3.08 (1.06) 0.34	4.24 (1.19) 0.28	4.03 (1.25) 0.31	<0.001
ICRG index: government stability	8.09 (1.66) 0.21	8.17 (1.58) 0.19	8.16 (1.60) 0.20	0.258
ICRG index: internal conflict	7.76 (1.62) 0.21	9.48 (1.64) 0.17	9.17 (1.76) 0.19	<0.001
ICRG index: law and order	2.80 (0.98) 0.35	3.98 (1.29) 0.32	3.77 (1.32) 0.35	<0.001
ICRG index: military in politics	2.08 (1.32) 0.64	4.24 (1.56) 0.37	3.85 (1.73) 0.45	<0.001
ICRG index: religious tensions	3.67 (1.34) 0.36	4.78 (1.21) 0.25	4.58 (1.30) 0.28	<0.001
ICRG index: socioeconomic conditions	3.23 (1.38) 0.43	6.22 (2.28) 0.37	5.68 (2.43) 0.43	<0.001
ICRG index: investment profile	6.68 (1.77) 0.27	8.65 (2.11) 0.24	8.30 (2.19) 0.26	<0.001
Personal remittances, received, % of GDP	4.49 (6.09) 1.36	4.03 (6.89) 1.71	4.13 (6.72) 1.63	0.062
Military expenditures, % of GDP	0.02 (0.03) 1.38	0.02 (0.02) 0.81	0.02 (0.02) 0.95	0.745

CPI = Consumer Price Index, GDP = gross domestic product, ICRG = International Country Risk Guide, ND-GAIN = Notre Dame Global Adaptation Initiative, VUL = ND-GAIN overall vulnerability.
Note: In the top row of this table, we have the number of observations and the frequency in percent in parenthesis. For the variable in the rows under the top row, we have the mean, followed by the standard deviation in parenthesis and the coefficient of variation. Finally, we have the p-value from a pooled t-test for equality of means in the last column. We use the *de jure* Chinn-Ito index for financial openness for comparability with previous works.
Source: Authors' calculations.

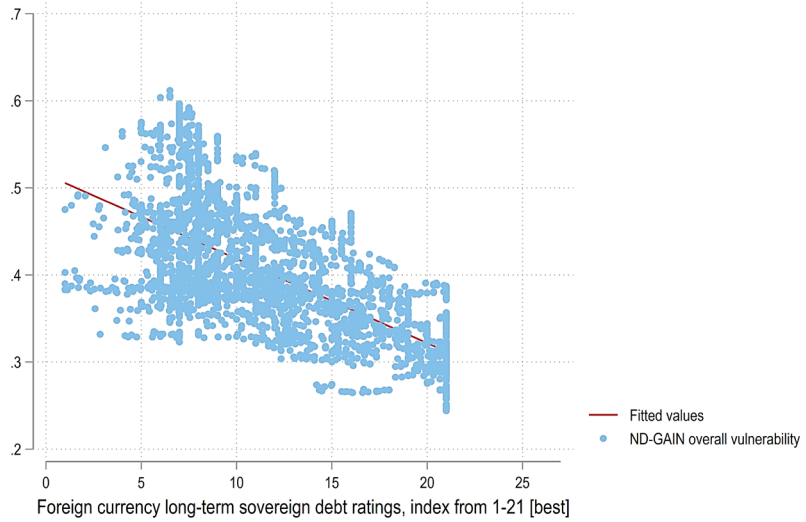
In Figures 3 and 4, we plot the correlation between our two fiscal space variables and the vulnerability score. We observe that this graphical evidence points toward a positive correlation between climate vulnerability risks and bonds yields and a negative correlation between climate vulnerability risks and sovereign ratings. These observations are in alignment with empirical findings in the related literature (e.g., Beirne, Renzhi, and Volz 2021; Cevik and Tovar Jalles 2022).

Figure 3: Scatter Plot for Vulnerability Score and Bond Yields



IMF = International Monetary Fund, JPM EMBI = J.P. Morgan Emerging Market Bond Index, ND-GAIN = Notre Dame Global Adaptation Initiative.
Source: Authors' calculations.

Figure 4: Scatter Plot for Vulnerability Score and Sovereign Ratings



ND-GAIN = Notre Dame Global Adaptation Initiative.
Source: Authors' calculations.

3.2. Methodology

We use the local projections (LP) approach (Jordà 2005; Jordà and Taylor 2024) to empirically examine the effects of vulnerability shocks on two measures of fiscal space.[2] The LP approach presents several advantages, including enabling (i) the estimation of impulse responses directly at each horizon, with no cross-period restrictions, (ii) a simple inference for impulse response coefficients, (iii) ease of application to nonlinear frameworks, and (iv) ease of scaling to panel data. Regarding our research question, all features of the LP approach will help us provide dynamic evidence on the impact of vulnerability shocks on fiscal space variables. We can formulate the LP approach as follows:

$$\begin{aligned} y_{i,t+h} &= b_h S_{i,t} + \gamma_h y_{i,t-1} + \alpha' \mathbf{z}_{i,t-1} + v_{i,t+h} \\ \mathrm{IRF}(h) &= \hat{b}_h \end{aligned} \tag{1}$$

where y is the dependent variable of interest, h is the time horizon, S is the impulse variable (a unit shock on the vulnerability score), $\mathbf{z}$ is a vector of control variables, IRF denotes the impulse response function, and v is the error term. In our case, the dependent variable will be either government bond yields or sovereign ratings (Kose et al. 2022). The control variables will be based on Beirne, Renzhi, and Volz (2021) and include domestic factors: current account balance, consumer price inflation, government debt, and deficit; and global factors: US bond yields, the MSCI world index, and the VIX. In order to improve identification, we also control for three types of crises (banking, current, and debt), drawn from Laeven and Valencia (2020).

4. Empirical Results

4.1. Panel Local Projection Regressions

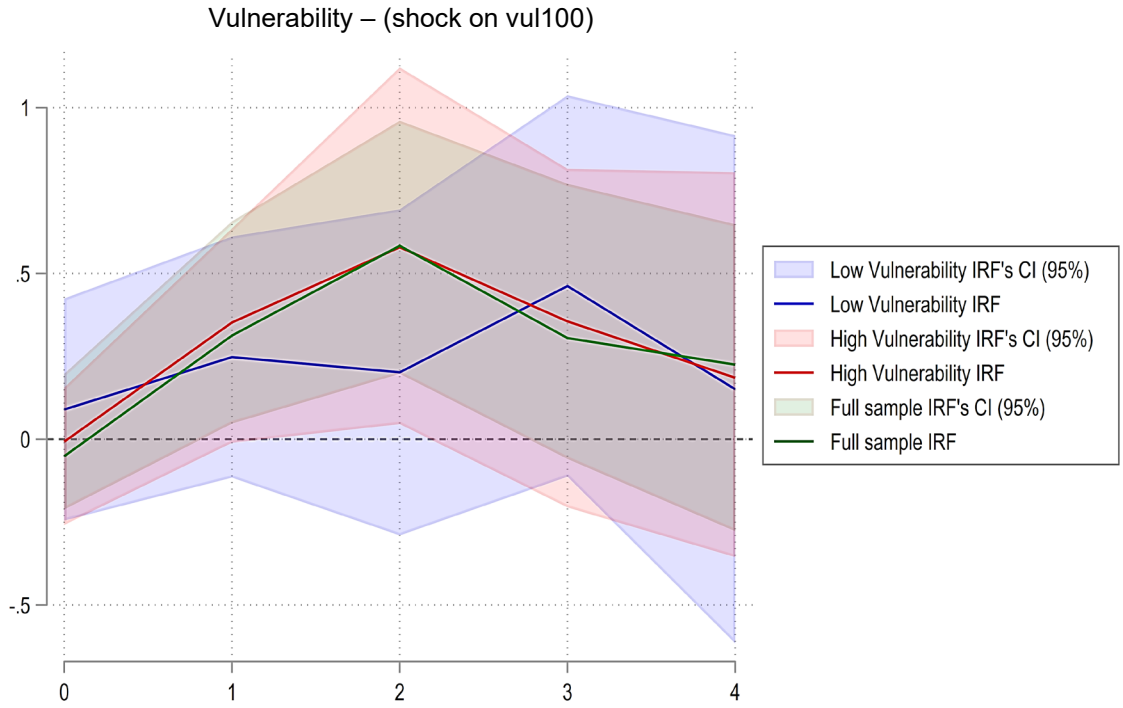
In Figure 5, our baseline case across all economies indicates a statistically significant premium on sovereign bond yields as a result of climate risk vulnerability, reflecting the surplus return demanded by investors for holding that debt. Further, we split the sample between low and high climate risk vulnerability depending on the value of the vulnerability score. For the less climate-vulnerable economies, a statistically significant effect is not found. This is in line with economic intuition—i.e., low levels of climate exposure will not lead to climate-related premia on sovereign bonds. For economies that are highly exposed to climate change, the impact on bond yields is significant, as expected. Interestingly, the effect is broadly in line with that for the panel as a whole in terms of magnitude, suggesting the economies that are highly vulnerable to climate change may be driving the overall results.

[2] We implement the Stata package of Ugarte Ruiz (2023) to estimate the panel LP results.

In Figure 6, we perform the same baseline analysis for sovereign ratings, our second measure of fiscal space. We find a consistent result to that carried out on bond yields, whereby a climate vulnerability shock will lead to a persistent decrease in the sovereign ratings for the full sample and the highly climate-vulnerable economies. For the less vulnerable economies, we do not observe such a persistent deterioration in sovereign ratings, as expected.

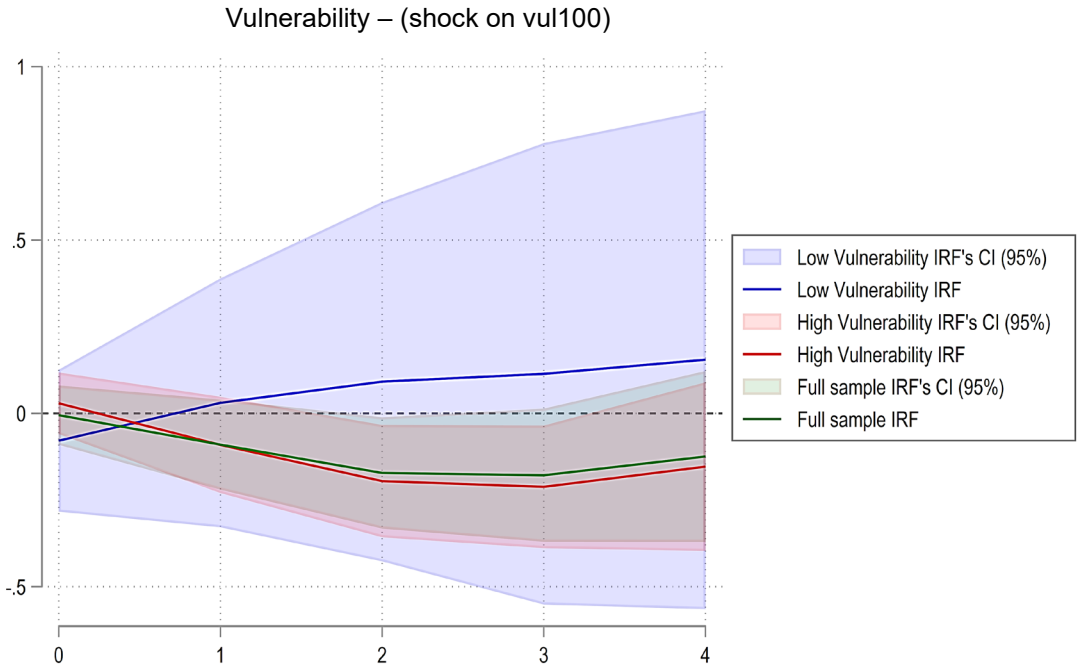
In the following subsections, we investigate the influence of institutional variables and the impact of financial development in light of the preliminary evidence in Table 2. In fact, the level of financial and institutional is significantly lower in the group of highly vulnerable economies. Thus, we go beyond the recent literature (e.g., Beirne, Renzhi, and Volz 2021; Cevik and Jalles Tovar 2022) on the fiscal space–climate nexus in the following by investigating various form of nonlinearities in the climate-related premia on sovereign bond yields and ratings thanks to interaction terms and quantile local projections.

Figure 5: Panel Local Projections for Impact of Vulnerability on Bond Yields



CI = confidence interval, IRF = impulse response function.
Note: Low/high Vulnerability is defined as below/above Q1 for vul100. The shock is a unit-shock on the vulnerability variable. Fixed effects are included, and standard errors are obtained through bootstrapping.
Source: Authors' calculations.

Figure 6: Panel Local Projections for Impact of Vulnerability on Sovereign Ratings



CI = confidence interval, IRF = impulse response function.
Note: Low/high Vulnerability is defined as below/above Q1 for vul100. The shock is a unit-shock on the vulnerability variable. Fixed effects are included, and standard errors are obtained through bootstrapping.
Source: Authors' calculations.

4.2. Interactions with Institutional Variables

In this section, we explore the role of institutional factors as a buffer for climate-related premia on sovereign bond yields and ratings—i.e., the extent to which institutional factors can alleviate the extent of climate risk impacts on the fiscal space. Our institutional variable of interest is a measure of external conflict (from the International Country Risk Guide [ICRG] database, see www.prsgroup.com). Our panel LP impulse responses in Figure 7 reveal striking results.

We find that climate-related risk premia on sovereign bonds are significantly greater for economies that score less favorably in terms of external conflict. We thus infer that high political risk (a lower score in the ICRG database) amplifies the compression on fiscal space owing to climate vulnerability by a factor of around 2 at the 1-year horizon compared with the full sample results or those with external conflict. A consistent narrative is found in the case of sovereign ratings (Figure 8).[3]

[3] In Figures C1 and C2 in Appendix C, we present the results using internal as opposed to external conflicts. The results are broadly consistent, although in the case of sovereign ratings there is a lack of statistical significance. This may be related to the measure used, which is foreign currency sovereign ratings.

4.3. Interactions with Financial Institution and Financial Conditions

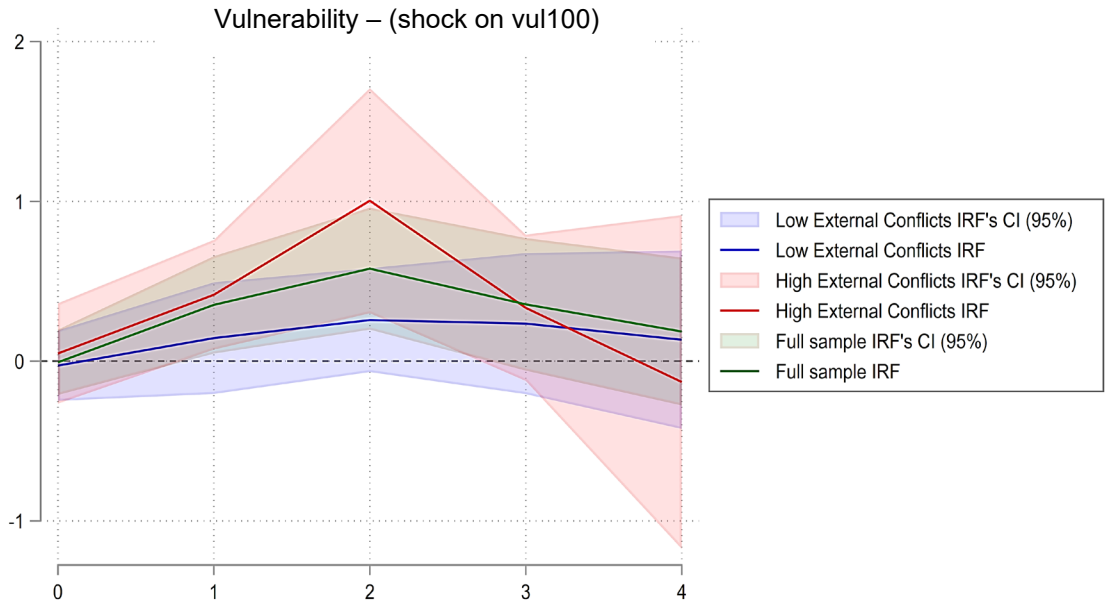
In Figure 9, we use Svirydzenka (2016)'s financial institution development index to investigate the influence of financial institution development on the impact of vulnerability shocks on fiscal space. For economies with mature financial institutions, climate vulnerability shocks do not trigger any increase in bond yields.

In Figure 10, we can see that climate vulnerability shocks do not have any significant impact on sovereign ratings for economies with elevated levels of financial institution development. On the other hand, climate vulnerability shocks provoke a persistent deterioration in sovereign ratings for economies with low financial institutions and for the full sample, underscoring the importance of sound financial institutions. The mitigating impact of enhanced financial development on the climate–fiscal nexus follows intuition, whereby there is greater depth and liquidity in local financial markets and insurance markets are better developed.

We can make some observations on this new result in the literature. Relative to the baseline results bond premia that we find in Figure 5, the upper limit of the impulse response functions for a low level of financial institution development is similar, slightly above 1% at a horizon of 2 years. So an increase of 1 in the vulnerability score implies an increase in bond yields 2 years later. Whereas for economies with a higher level of financial institution development, vulnerability shocks do not imply any increase in bond yields. This is an important result.

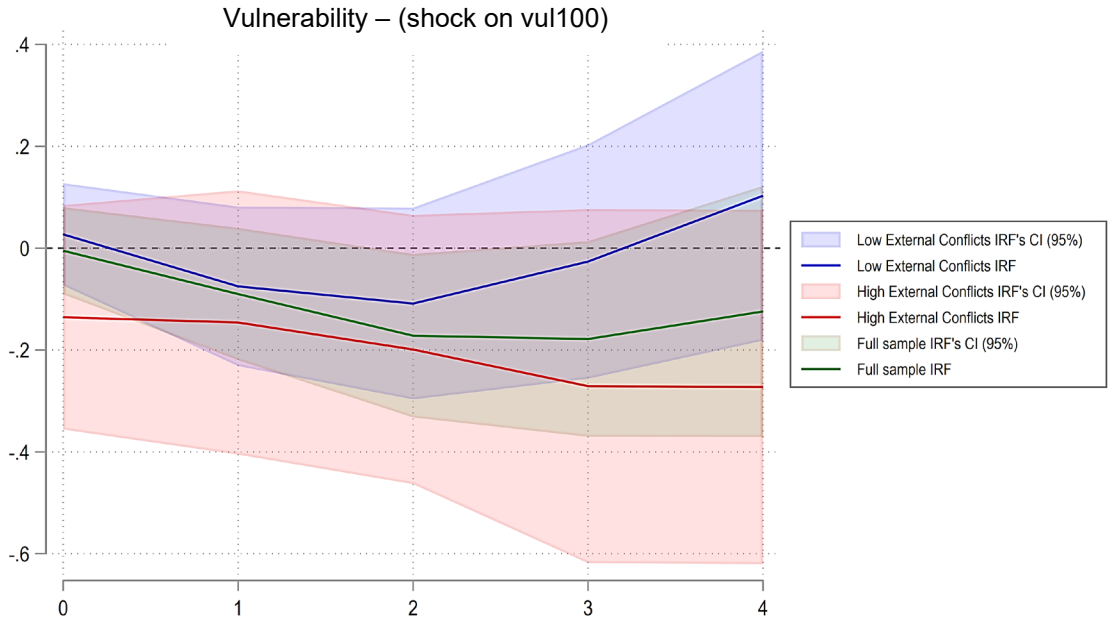
The development of sound financial institutions makes it possible to preserve fiscal space in the wake of vulnerability to climate risk shocks. In a different context, Aizenman et al. (2024) find that sound financial institutions buffer exchange rate instability. These related results may be viewed as complementary since acquiring hard currency (i.e., US dollar, euro, yen, etc.) for highly vulnerable economies is a question of utmost importance.

Figure 7: Panel Local Projections for Impact of Vulnerability on Bond Yields (External Conflicts)



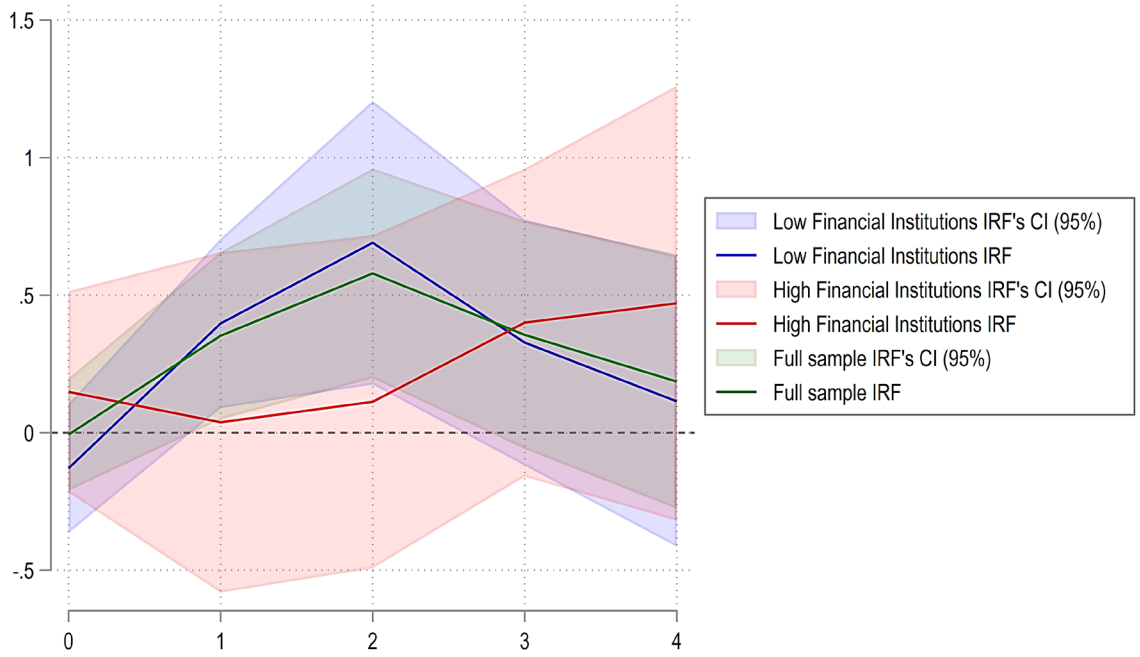
CI = confidence interval, IRF = impulse response function.
Note: Low/high External Conflicts is defined as below/above Q2 for extconf. The shock is a unit-shock on the vulnerability variable. Fixed effects are included, and standard errors are obtained through bootstrapping.
Source: Authors' calculations.

Figure 8: Panel Local Projections for Impact of Vulnerability on Sovereign Ratings (External Conflicts)



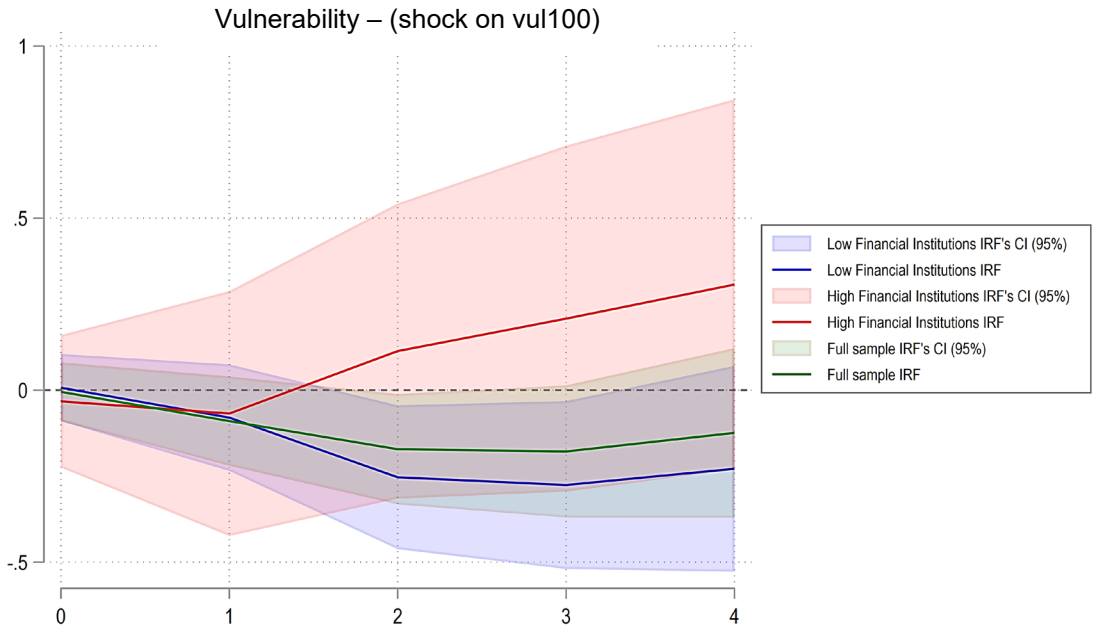
CI = confidence interval, IRF = impulse response function.
Note: Low/high External Conflicts is defined as below/above Q2 for extconf. The shock is a unit-shock on the vulnerability variable. Fixed effects are included, and standard errors are obtained through bootstrapping.
Source: Authors' calculations.

Figure 9: Panel Local Projections for Impact of Vulnerability on Bond Yields (Financial Institutions)



CI = confidence interval, IRF = impulse response function.
Note: Low/high Financial Institutions is defined as below/above Q3 for FI. The shock is a unit-shock on the vulnerability variable. Fixed effects are included, and standard errors are obtained through bootstrapping.
Source: Authors' calculations.

Figure 10: Panel Local Projections for Impact of Vulnerability on Sovereign Ratings (Financial Institutions)



CI = confidence interval, IRF = impulse response function.
Note: Low/high Financial Institutions is defined as below/above Q3 for FI. The shock is a unit-shock on the vulnerability variable. Fixed effects are included, and standard errors are obtained through bootstrapping.
Source: Authors' calculations.

4.4. Quantile Local Projections

In this section, we explore the effect of climate risk across the distribution of fiscal space. To do so, we use the approach in Jordà et al. (2022) to estimate quantile panel local projections. We first adjust the dataset to obtain a balanced panel dataset. For the bond yields, we have 32 economies observed from 2000 to 2019 with complete observations. For the sovereign ratings, we have 71 economies observed from 2000 to 2019 with complete observations. We consider the following traditional panel LP estimation function:

$$\begin{aligned} \Delta fs_{i,t+h} &= \alpha_{i,h} + \beta_h VUL_{i,t} + \delta_h x_{i,t} panel + \epsilon_{i,t}, \\ &= \omega_{i,t}\theta_{h,\tau}, \end{aligned} \qquad (2)$$

where $fs_{i,t}$ is the fiscal space variable, $\alpha_{i,h}$ is the country-fixed effects, $VUL_{i,t}$ the vulnerability variable, and $x_{i,t}$ the vector of control variables. Let $\omega_{i,t}$ collect the shock, control variables, and fixed effects. Quantile local projections are calculated based on:

$$\hat{\theta}_\tau = \arg\min_{\theta_\tau} \quad \sum_{t=1}^{T-h} \left(\tau \mathbb{1}\left(\Delta fs_{i,t+h} \geq \omega_{i,t}\theta_\tau\right)\left|\Delta fs_{i,t+h} - \omega_{i,t}\theta_\tau\right| + (1-\tau)\mathbb{1}\left(\Delta fs_{i,t+h} < \omega_{i,t}\theta_\tau\right)\left|\Delta fs_{i,t+h} - \omega_{i,t}\theta_\tau\right|\right). \tag{3}$$

where $\mathbb{1}$ (.) denotes the indicator function and $\tau \in (0,1)$ the τ^{th} quantile. The quantile of $\Delta_h fs_{it(p)+h}$ conditional on $X_{it(p)}$ is then obtained as follows:

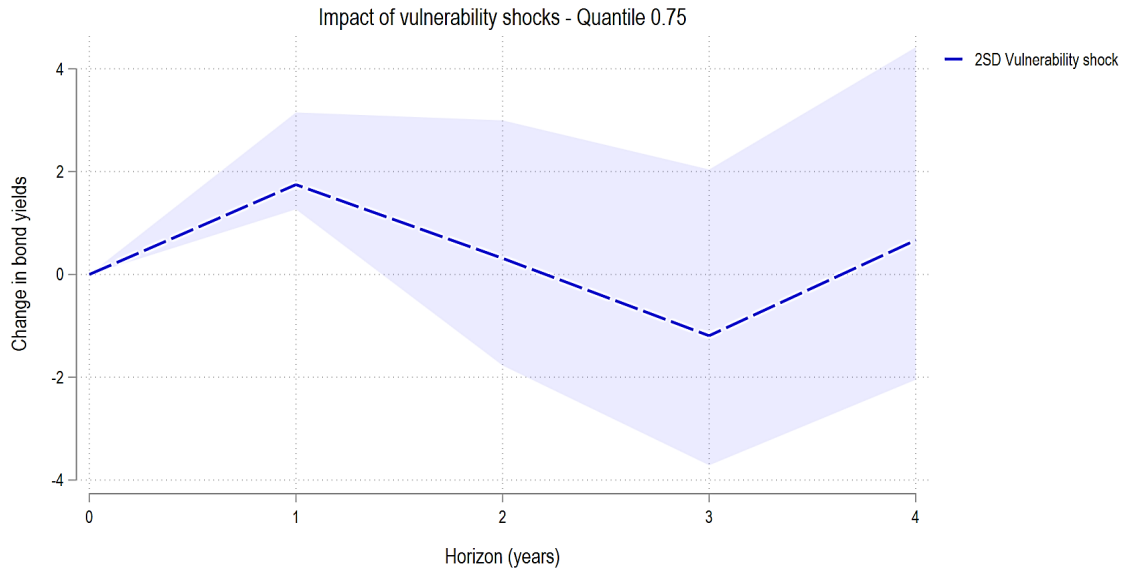
$$Q\left(\Delta_h fs \mid X_{it(p)}\right) = X_{it(p)}\theta_{h,\tau} \equiv q^h_{\tau,t}. \tag{4}$$

The results are presented in Figures 11 and 12, which confirm that the impact of vulnerability risk shocks is most evident for higher quantiles of bond yields. A similar pattern emerges for the case of sovereign ratings, thereby implying nonlinear effects and larger relative effects when fiscal space is most constrained—i.e., at the upper quantiles in the distribution for bond yields and the lower quantiles for sovereign ratings.

These results confirm the preliminary evidence that we provide in Table 2. In fact, ability to maintain low yields on government bonds and, thus, fiscal space is related to the level of financial institution development. Ability to access hard currency during episodes of financial stress is also key in preserving fiscal space and remaining attractive and credible on international financial markets. Our results, in Figure 11, are in line with the impulse response functions presented in Figure 9 for low level of financial institution development.

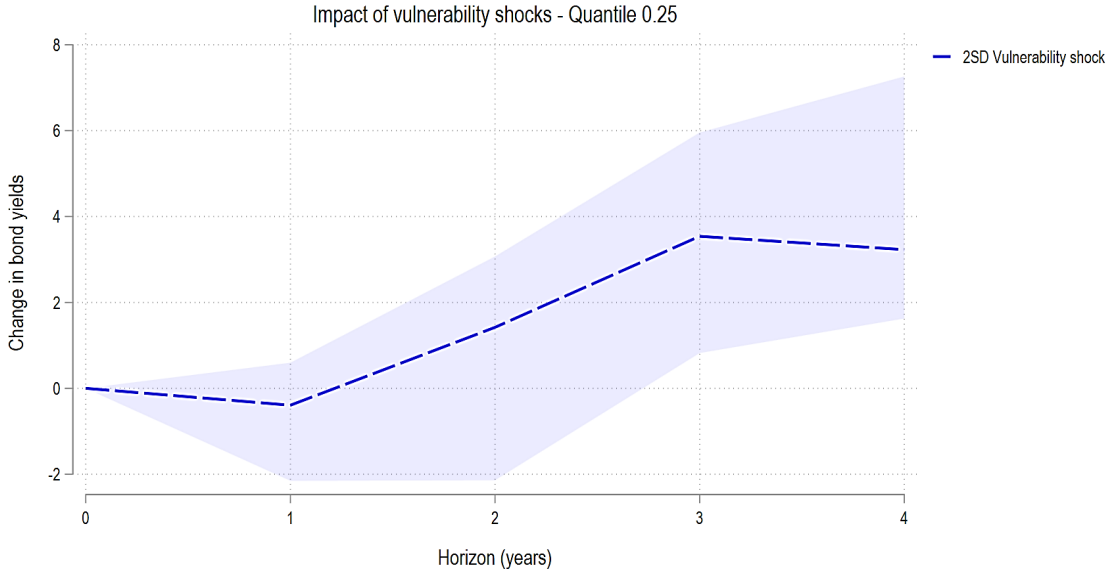
In addition, for the lower quantile of the distribution for bond yields, the bond premium is not observed after vulnerability shocks at the 2-year horizon. However, a strong change in bond yields is observed after 3 years, indicating that policymakers should remain vigilant in the wake of vulnerability shocks, even when starting from a sound fiscal position.

Figure 11: Panel Local Projections for Impact of Vulnerability on Bond Yields (Quantile 0.75)



Note: The shock is a 2-standard deviation on the vulnerability variable. Fixed effects are included, and standard errors are obtained through bootstrapping.
Source: Authors' calculations.

Figure 12: Panel Local Projections for Impact of Vulnerability on Bond Yields (Quantile 0.25)



Note: The shock is a 2-standard deviation on the vulnerability variable. Fixed effects are included, and standard errors are obtained through bootstrapping.
Source: Authors' calculations.

5. Conclusion

Climate change poses an existential threat to humans, and governments are expected to take the lead in adaptation and mitigation. As such, costly public spending on climate change adaptation and mitigation looms as one of the biggest sources of fiscal demand in the future. Therefore, climate risks entail substantial fiscal risks, especially through their adverse effects on fiscal space. Yet the empirical literature on the nexus between climate risks and fiscal space is underdeveloped. In this paper, we try to fill this big gap in the literature by carrying out a systematic and rigorous empirical analysis of the climate–fiscal nexus. In particular, we examine the role of political stability and financial development in moderating the adverse impact of climate risk on fiscal space.

For our empirical analysis, we use panel local projections to examine the role of political stability and financial development on the nexus between climate risk and fiscal space. For a sample of 199 economies over the period 1990 to 2022, we find that the negative spillovers of exposure to climate change on fiscal space are most pronounced for the economies that are most vulnerable to climate change. We also find these effects are mitigated in economies with more stable political environments and better developed financial markets. In addition, our empirical analysis yields nonlinearities in the climate risk–fiscal space nexus. More precisely, climate-related risk premia on fiscal space are larger in economies where fiscal space is most constrained—i.e., in the upper quantile of the distribution.

While fiscal consolidation is the key to mitigating the adverse effect of climate risks on fiscal space, our results suggest both political stability and financial development can contribute as well. Political stability is desirable in and of itself but our analysis generates evidence of a significant additional benefit, in the form of shielding fiscal space from climate risk. Similarly, financial development is beneficial in and of itself, but our empirical results strengthen the case for governments further promoting financial development. Overall, by shedding new light on how political stability and financial development affect the relationship between climate risk and fiscal space, our study contributes to a more complete and accurate understanding of that relationship.

Appendix A. Data Sources and Definitions

Variable Name	Source, Identifier
ND-GAIN overall vulnerability	https://gain.nd.edu/our-work/country-index/download-data/
ND-GAIN overall readiness	https://gain.nd.edu/our-work/country-index/download-data/
Government bonds, yields %	JPM EMBI and IMF, 100*x/(x+100) (winsorized)
Treasury Bills, yields %	JPM EMBI & IMF, 100*x/(x+100) (winsorized)
Foreign currency sovereign debt ratings	Kose et al. (2022), https://doi.org/10.1016/j.jimonfin.2022.102682, index from 1 to 21 (best)
Current account balance, % of GDP	World Bank, WDI, BN.CAB.XOKA.GD.ZS
CPI inflation, year on year %	World Bank, WDI, FP.CPI.TOTL.ZG
General government gross debt, % of GDP	IMF, WEO, GGXCNL_NGDP
Government net lending/borrowing, % of GDP	IMF, WEO, GGXWDG_NGDP
Laeven-Valencia dummy: banking crisis	Laeven & Valencia (2018), https://doi.org/10.1057/s41308-020-00107-3
Laeven-Valencia dummy: currency crisis	Laeven & Valencia (2018), https://doi.org/10.1057/s41308-020-00107-3
Laeven-Valencia dummy: debt crisis	Laeven & Valencia (2018), https://doi.org/10.1057/s41308-020-00107-3
Total reserves minus gold, % of GDP	World Bank, WDI, FI.RES.XGLD.CD, own calculations with current GDP from World Bank
Fuel exports on total exports	World Bank, WDI, TX.VAL.FUEL.ZS.UN
Fuel imports on total imports	World Bank, WDI, TM.VAL.FUEL.ZS.UN
Chinn-Ito index, normalized	Chinn & Ito (2006), https://web.pdx.edu/~ito/Chinn-Ito_website.htm
Exchange rate stability index	Aizenman et al. (2013), https://web.pdx.edu/~ito/trilemma_indexes.htm
Financial institution index	Svirydzenka (2016), IMF, FDI, FD_FI_IX
Financial market index	Svirydzenka (2016), IMF, FDI, FD_FM_IX
ICRG index: external conflict	https://www.prsgroup.com/
ICRG index: corruption	https://www.prsgroup.com/
ICRG index: democratic accountability	https://www.prsgroup.com/
ICRG index: ethnic tensions	https://www.prsgroup.com/
ICRG index: government stability	https://www.prsgroup.com/
ICRG index: internal conflict	https://www.prsgroup.com/
ICRG index: law and order	https://www.prsgroup.com/
ICRG index: military in politics	https://www.prsgroup.com/
ICRG index: religious tensions	https://www.prsgroup.com/
ICRG index: socioeconomic conditions	https://www.prsgroup.com/
ICRG index: investment profile	https://www.prsgroup.com/
Personal remittances, received, % of GDP	World Bank, BX.TRF.PWKR.DT.GD.ZS
Military expenditures, % of GDP	SIPRI Military Expenditure Database, https://www.sipri.org/databases/milex

CPI = Consumer Price Index, GDP = gross domestic product, IMF= International Monetary Fund, JPM EMBI = J.P. Morgan Emerging Market Bond Index, ND-GAIN = Notre Dame Global Adaptation Initiative, SIPRI = Stockholm International Peace Research Institute, WDI = World Development Indicators, WEO = World Economic Outlook.

Appendix B. Composition of Samples in Unbalanced Panel Regressions

Bonds Regressions

1 Angola; 2 Austria; 3 Bangladesh; 4 Belgium; 5 Belize; 6 Bolivia; 7 Botswana; 8 Brazil; 9 Bulgaria; 10 Canada; 11 Chile; 12 People's Republic of China; 13 Colombia; 14 Costa Rica; 15 Côte d'Ivoire; 16 Croatia; 17 Cyprus; 18 Czech Republic; 19 Denmark; 20 Dominican Republic; 21 Ecuador; 22 Egypt; 23 El Salvador; 24 Estonia; 25 Ethiopia; 26 Fiji; 27 Finland; 28 France; 29 Gabon; 30 Georgia; 31 Germany; 32 Ghana; 33 Greece; 34 Guatemala; 35 Honduras; 36 Hungary; 37 Iceland; 38 India; 39 Indonesia; 40 Iraq; 41 Ireland; 42 Italy; 43 Jamaica; 44 Japan; 45 Jordan; 46 Kazakhstan; 47 Republic of Korea; 48 Kyrgyz Republic; 49 Latvia; 50 Lebanon; 51 Lithuania; 52 Luxembourg; 53 Malaysia; 54 Maldives; 55 Malta; 56 Mauritius; 57 Mexico; 58 Moldova; 59 Mongolia; 60 Morocco; 61 Mozambique; 62 Myanmar[4]; 63 Namibia; 64 Nepal; 65 Netherlands; 66 Nigeria; 67 Norway; 68 Pakistan; 69 Panama; 70 Paraguay; 71 Peru; 72 Philippines; 73 Poland; 74 Portugal; 75 Romania; 76 Russia; 77 Samoa; 78 Senegal; 79 Serbia; 80 Seychelles; 81 Singapore; 82 Slovak Republic; 83 Slovenia; 84 Solomon Islands; 85 South Africa; 86 Spain; 87 Sri Lanka; 88 Sweden; 89 Switzerland; 90 Thailand; 91 Trinidad and Tobago; 92 Tunisia; 93 Türkiye; 94 United Kingdom; 95 United States; 96 Uruguay; 97 Viet Nam; 98 Zambia

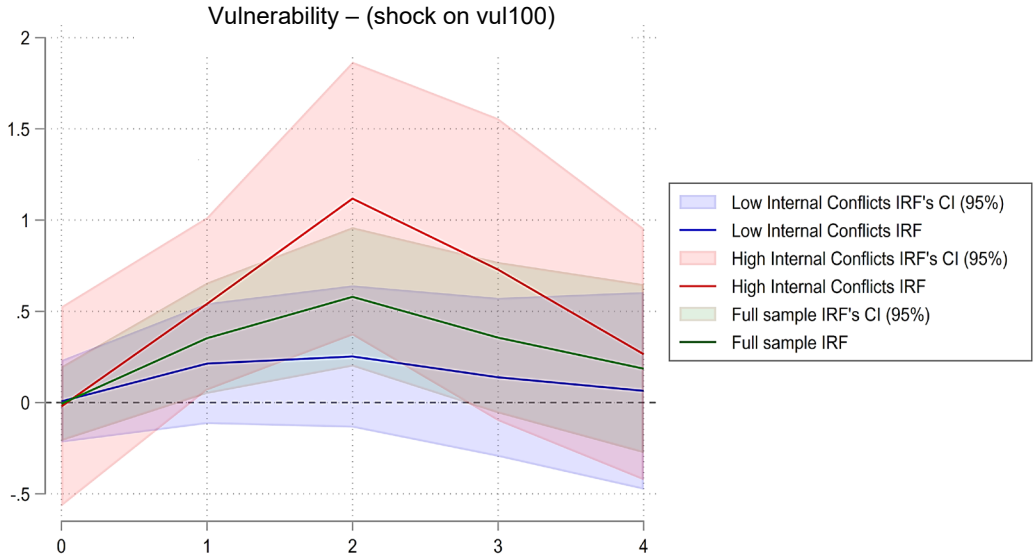
Sovereign Ratings Regressions

1 Albania; 2 Angola; 3 Austria; 4 Bahamas; 5 Bahrain; 6 Bangladesh; 7 Barbados; 8 Belgium; 9 Belize; 10 Benin; 11 Bolivia; 12 Bosnia and Herzegovina; 13 Botswana; 14 Brazil; 15 Bulgaria; 16 Burkina Faso; 17 Cambodia; 18 Cameroon; 19 Canada; 20 Cape Verde; 21 Chile; 22 People's Republic of China; 23 Colombia; 24 Republic of Congo; 25 Costa Rica; 26 Côte d'Ivoire; 27 Croatia; 28 Cyprus; 29 Czech Republic; 30 Denmark; 31 Dominican Republic; 32 Ecuador; 33 Egypt; 34 El Salvador; 35 Estonia; 36 Ethiopia; 37 Fiji; 38 Finland; 39 France; 40 Gabon; 41 Georgia; 42 Germany; 43 Ghana; 44 Greece; 45 Grenada; 46 Guatemala; 47 Honduras; 48 Hungary; 49 Iceland; 50 India; 51 Indonesia; 52 Iran; 53 Iraq; 54 Ireland; 55 Israel; 56 Italy; 57 Jamaica; 58 Japan; 59 Jordan; 60 Kazakhstan; 61 Kenya; 62 Republic of Korea; 63 Kuwait; 64 Kyrgyz Republic; 65 Latvia; 66 Lebanon; 67 Lesotho; 68 Lithuania; 69 Luxembourg; 70 Malawi; 71 Malaysia; 72 Maldives; 73 Malta; 74 Mauritius; 75 Mexico; 76 Moldova; 77 Mongolia; 78 Montenegro; 79 Morocco; 80 Mozambique; 81 Namibia; 82 Netherlands; 83 Nicaragua; 84 Nigeria; 85 North Macedonia; 86 Norway; 87 Oman; 88 Pakistan; 89 Panama; 90 Paraguay; 91 Peru; 92 Philippines; 93 Poland; 94 Portugal; 95 Qatar; 96 Romania; 97 Russia; 98 Rwanda; 99 Saudi Arabia; 100 Senegal; 101 Serbia; 102 Seychelles; 103 Singapore; 104 Slovak Republic; 105 Slovenia; 106 South Africa; 107 Spain; 108 Sri Lanka; 109 Suriname; 110 Sweden; 111 Switzerland; 112 Thailand; 113 Trinidad and Tobago; 114 Tunisia; 115 Türkiye; 116 Uganda; 117 United Kingdom; 118 United States; 119 Uruguay; 120 Viet Nam; 121 Zambia

[4] Effective 1 February 2021, ADB placed a temporary hold on sovereign project disbursements and new contracts in Myanmar.

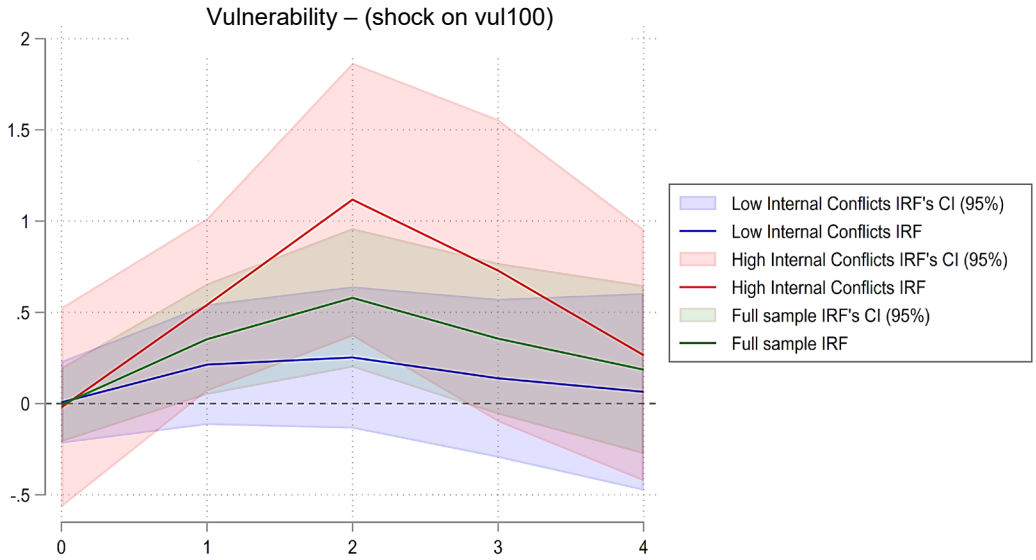
Appendix C. Nonlinearities in Impulse Responses According to Risk of Internal Conflicts

Figure C1: Panel Local Projections for Impact of Vulnerability on Bond Yields (Internal Conflicts)



CI = confidence interval, IRF = impulse response function.
Note: Low/high Internal Conflicts is defined as below/above Q1 for intconf. The shock is a unit-shock on the vulnerability variable. Fixed effects are included, and standard errors are obtained through bootstrapping.
Source: Authors' calculations.

Figure C2: Panel Local Projections for Impact of Vulnerability on Sovereign Ratings (Internal Conflicts)

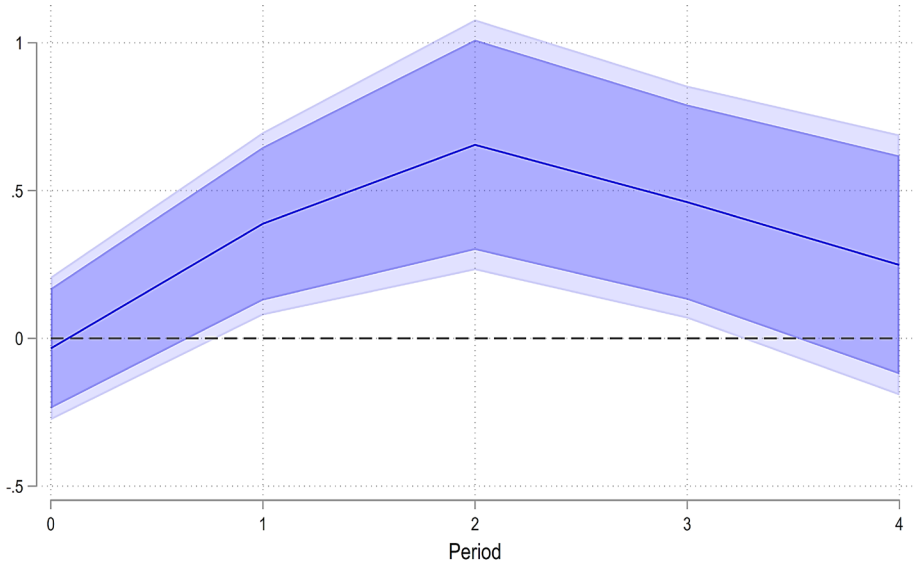


CI = confidence interval, IRF = impulse response function.
Note: Low/high Internal Conflicts is defined as below/above Q1 for intconf. The shock is a unit-shock on the vulnerability variable. Fixed effects are included, and standard errors are obtained through bootstrapping.
Source: Authors' calculations.

Appendix D. Baseline Impulse Response Functions with an Extensive Set of Controls

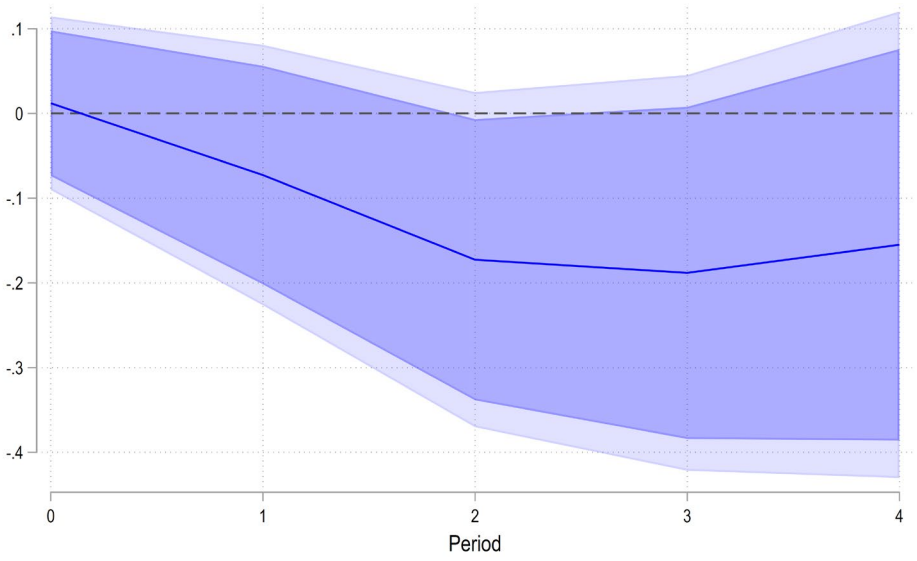
We add to four variables the original set of controls—namely, capital account openness index, exchange rate stability index, and shares in total trade of fuel imports and exports, as described in Section 2.

Figure D1: Panel Local Projections for Impact of Vulnerability on Bond Yields (Extensive Set of Controls)



Note: The shock is a unit-shock on the vulnerability variable. Fixed effects are included, and standard errors are obtained through bootstrapping. 90% and 95% confidence intervals in dark blue and light blue, respectively.
Source: Authors' calculations.

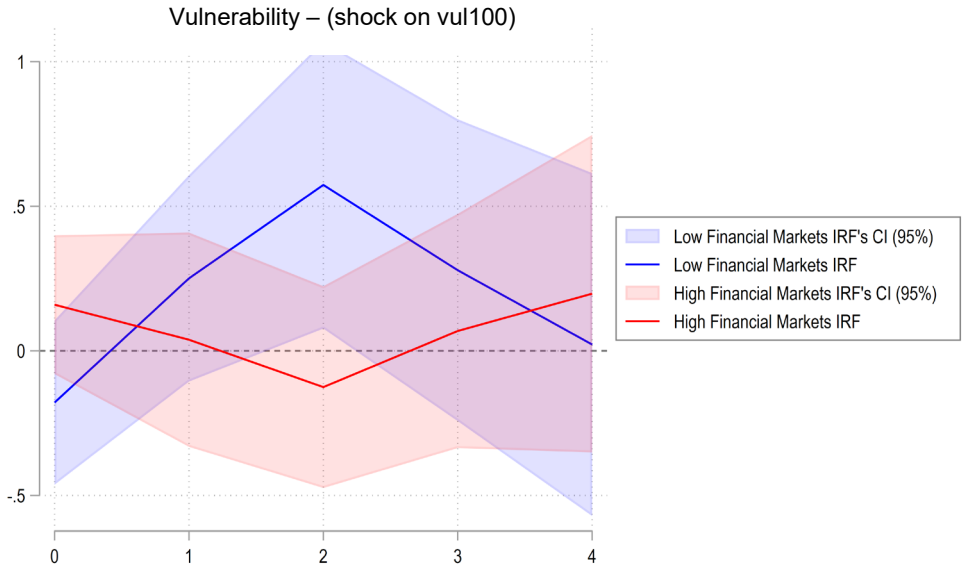
Figure D2: Panel Local Projections for Impact of Vulnerability on Sovereign Ratings (Extensive Set of Controls)



Note: The shock is a unit-shock on the vulnerability variable. Fixed effects are included, and standard errors are obtained through bootstrapping. 90% and 95% confidence intervals in dark blue and light blue, respectively.
Source: Authors' calculations.

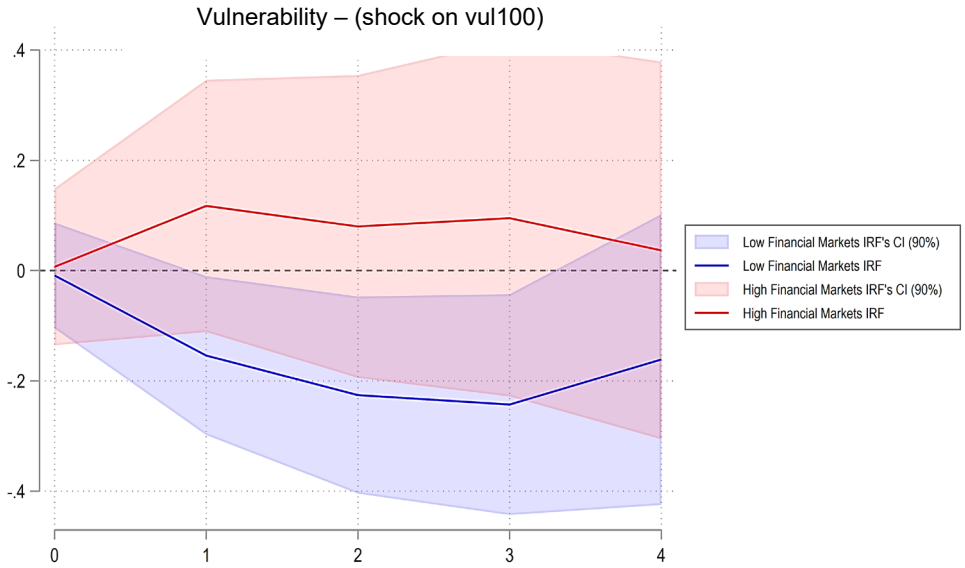
Appendix E. Impulse Response Functions with Financial Market Development Indicator

Figure E1: Panel Local Projections for Impact of Vulnerability on Bond Yields (Financial Markets)



CI = confidence interval, IRF = impulse response function.
Note: Low/high Financial Markets is defined as below/above Q3 for FM. The shock is a unit-shock on the vulnerability variable. Fixed effects are included, and standard errors are obtained through bootstrapping.
Source: Authors' calculations.

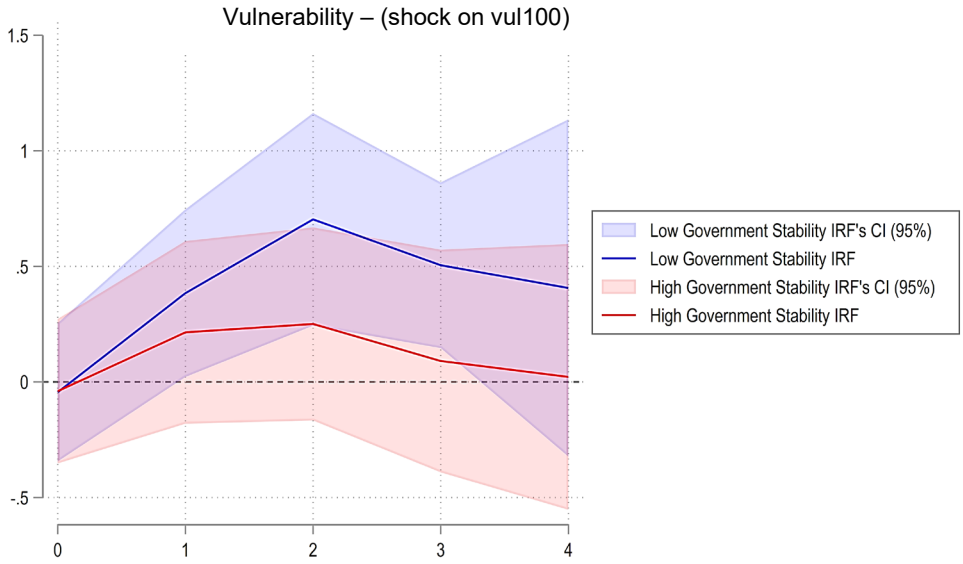
Figure E2: Panel Local Projections for Impact of Vulnerability on Sovereign Ratings (Financial Markets)



CI = confidence interval, IRF = impulse response function.
Note: Low/high Financial Markets is defined as below/above Q3 for FM. The shock is a unit-shock on the vulnerability variable. Fixed effects are included, and standard errors are obtained through bootstrapping.
Source: Authors' calculations.

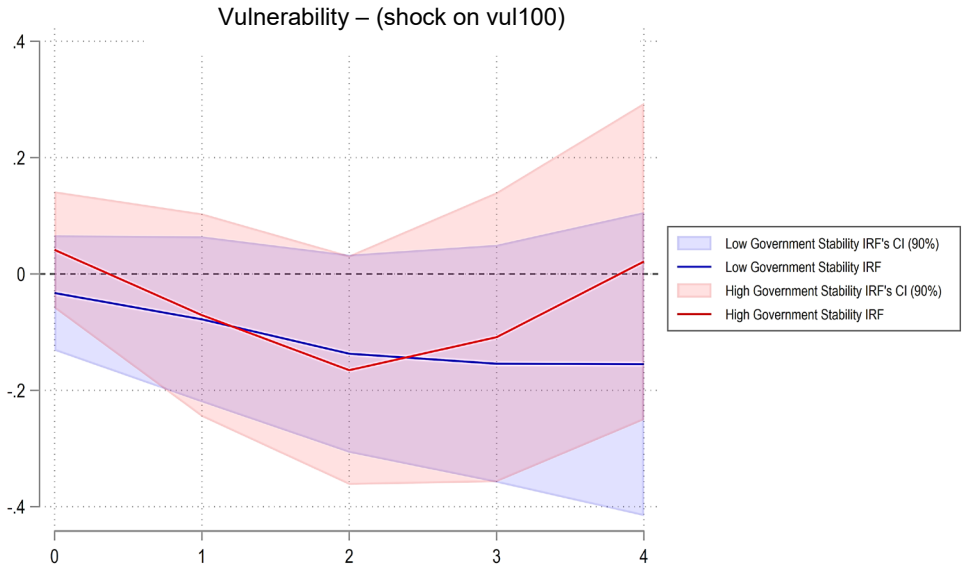
Appendix F. Nonlinearities in Impulse Responses According to Government Stability

Figure F1: Panel Local Projections for Impact of Vulnerability on Bond Yields (Government Stability)



CI = confidence interval, IRF = impulse response function.
Note: Low/high Government Stability is defined as below/above Q3 for govstab. The shock is a unit-shock on the vulnerability variable. Fixed effects are included, and standard errors are obtained through bootstrapping.
Source: Authors' calculations.

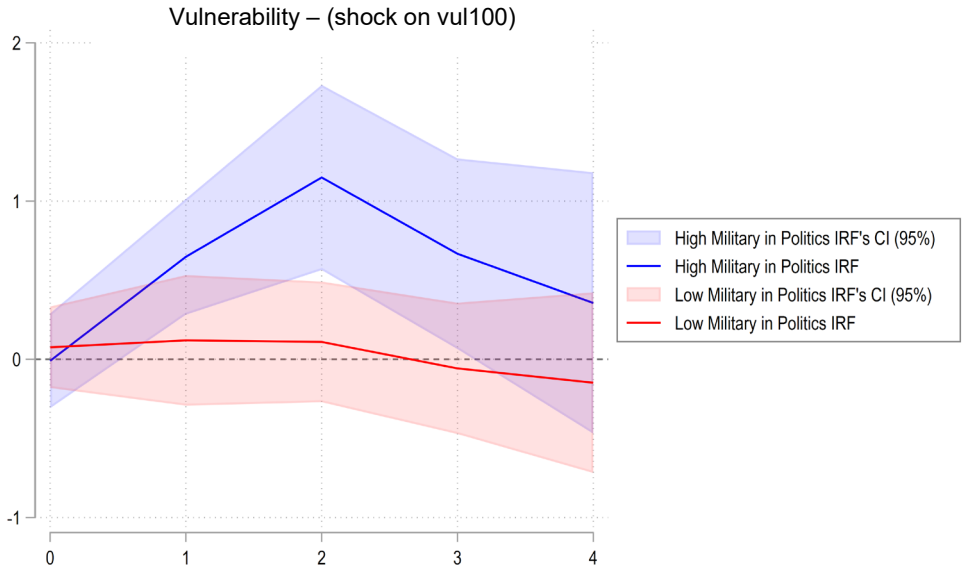
Figure F2: Panel Local Projections for Impact of Vulnerability on Sovereign Ratings (Government Stability)



CI = confidence interval, IRF = impulse response function.
Note: Low/high Government Stability is defined as below/above Q3 for govstab. The shock is a unit-shock on the vulnerability variable. Fixed effects are included, and standard errors are obtained through bootstrapping.
Source: Authors' calculations.

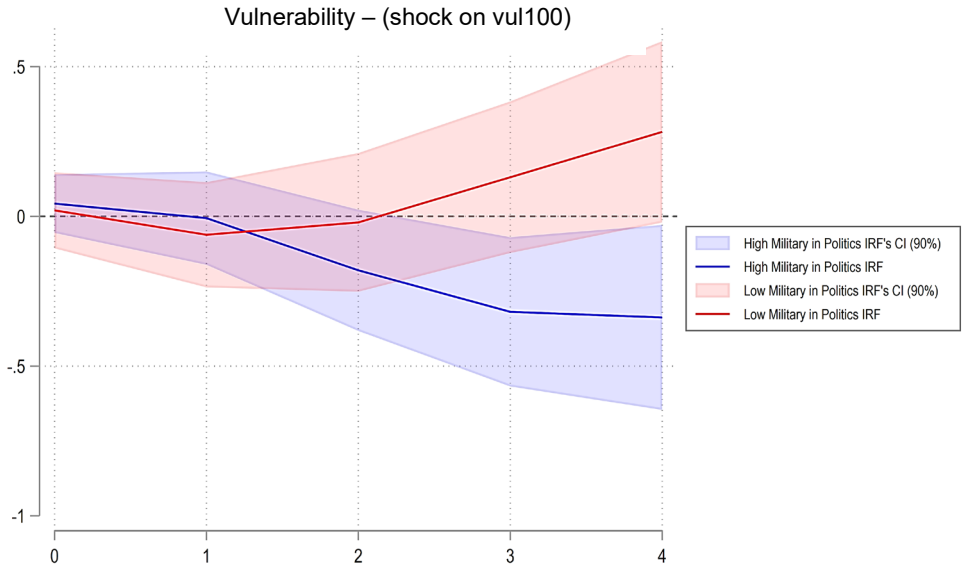
Appendix G. Nonlinearities in Impulse Responses According to Involvement of Military in Politics

Figure G1: Panel Local Projections for Impact of Vulnerability on Bond Yields (Military in Politics)



CI = confidence interval, IRF = impulse response function.
Note: Low/high Military in Politics is defined as below/above Q3 for milpol. The shock is a unit-shock on the vulnerability variable. Fixed effects are included, and standard errors are obtained through bootstrapping.
Source: Authors' calculations.

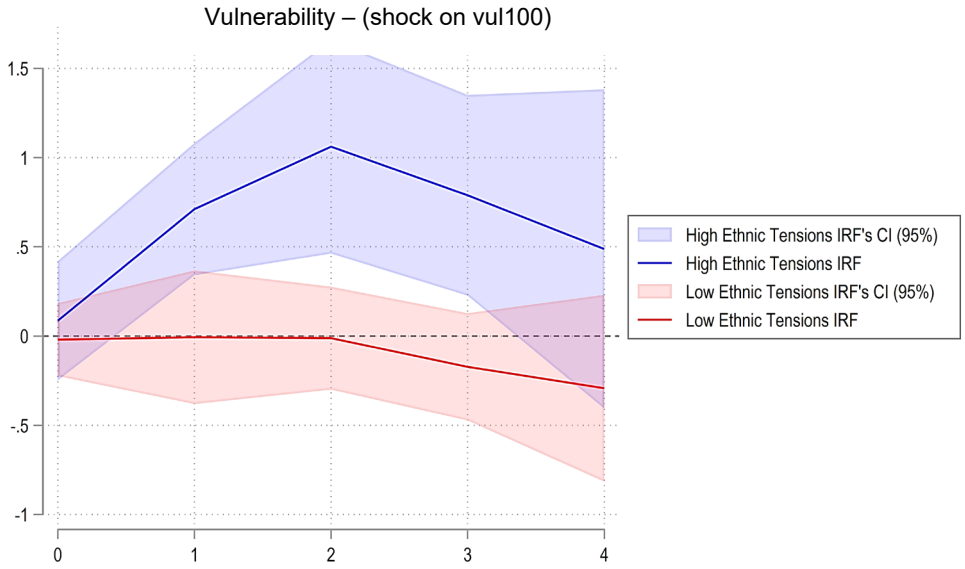
Figure G2: Panel Local Projections for Impact of Vulnerability on Sovereign Ratings (Military in Politics)



CI = confidence interval, IRF = impulse response function.
Note: Low/high Military in Politics is defined as below/above Q3 for milpol. The shock is a unit-shock on the vulnerability variable. Fixed effects are included, and standard errors are obtained through bootstrapping.
Source: Authors' calculations.

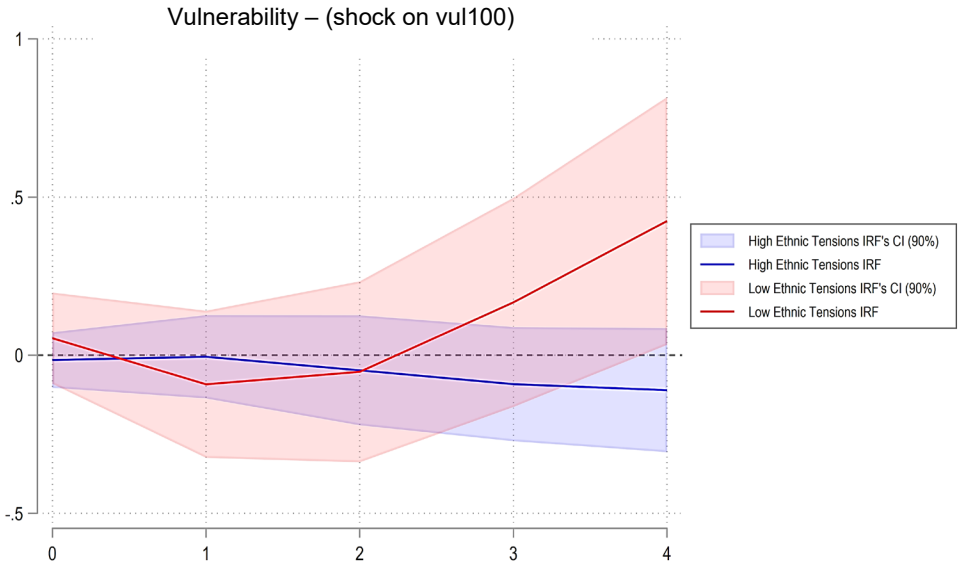
Appendix H. Nonlinearities in Impulse Responses According to Risk of Ethnic Tensions

Figure H1: Panel Local Projections for Impact of Vulnerability on Bond Yields (Ethnic Tensions)



CI = confidence interval, IRF = impulse response function.
Note: Low/high Ethnic Tensions is defined as below/above Q3 for ethnictens. The shock is a unit-shock on the vulnerability variable. Fixed effects are included, and standard errors are obtained through bootstrapping.
Source: Authors' calculations.

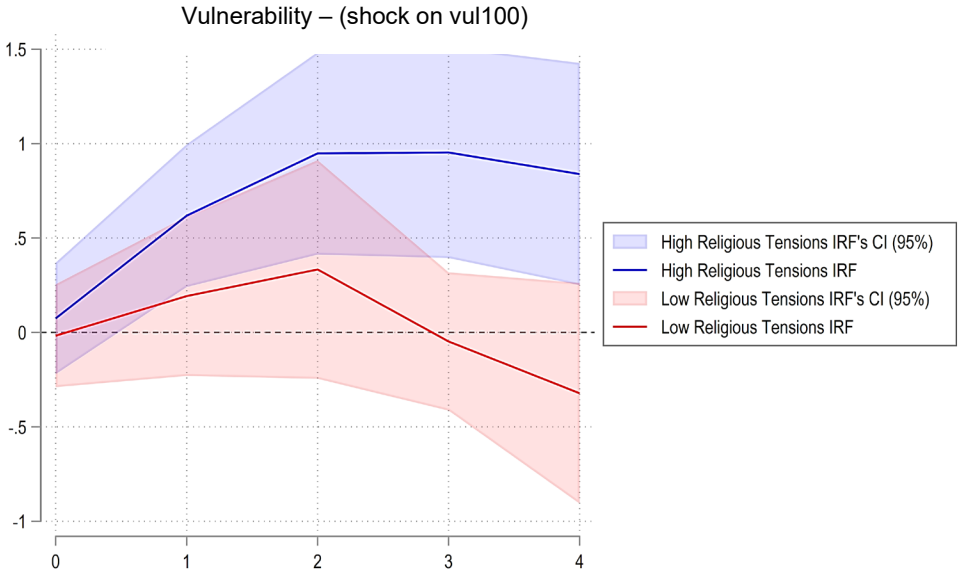
Figure H2: Panel Local Projections for Impact of Vulnerability on Sovereign Rates (Ethnic Tensions)



CI = confidence interval, IRF = impulse response function.
Note: Low/high Ethnic Tensions is defined as below/above Q3 for ethnictens. The shock is a unit-shock on the vulnerability variable. Fixed effects are included, and standard errors are obtained through bootstrapping.
Source: Authors' calculations.

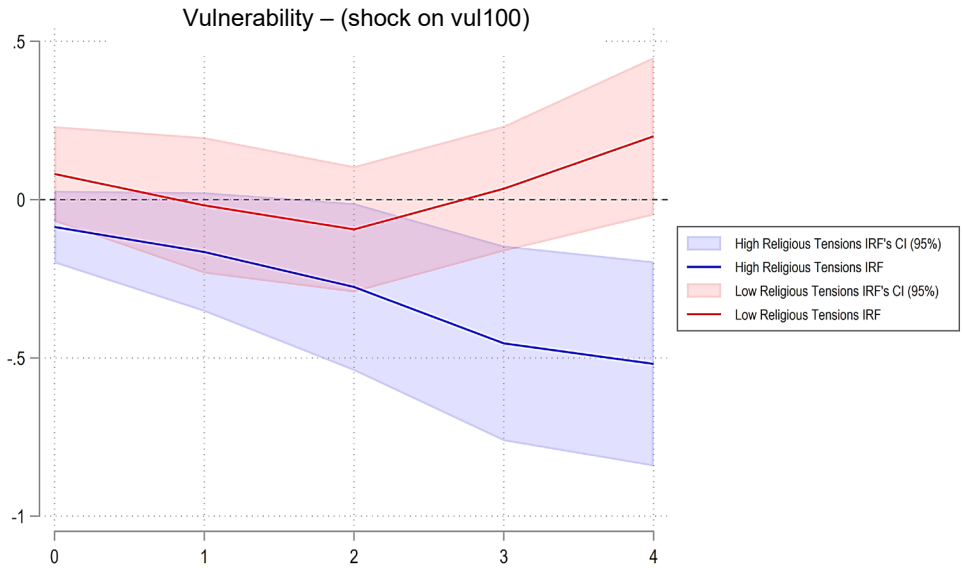
Appendix I. Nonlinearities in Impulse Responses According to Risk of Religious Tensions

Figure I1: Panel Local Projections for Impact of Vulnerability on Bond Yields (Religious Tensions)



CI = confidence interval, IRF = impulse response function.
Note: Low/high Religious Tensions is defined as below/above Q3 for reltensions. The shock is a unit-shock on the vulnerability variable. Fixed effects are included, and standard errors are obtained through bootstrapping.
Source: Authors' calculations.

Figure I2: Panel Local Projections for Impact of Vulnerability on Sovereign Rates (Religious Tensions)



CI = confidence interval, IRF = impulse response function.
Note: Low/high Religious Tensions is defined as below/above Q3 for reltensions. The shock is a unit-shock on the vulnerability variable. Fixed effects are included, and standard errors are obtained through bootstrapping.
Source: Authors' calculations.

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Impact of Climate Risk on Fiscal Space

Do Political Stability and Financial Development Matter?

This paper explores how climate risks adversely affect fiscal space using panel local projections covering 199 economies spanning from 1990 to 2022. The findings highlight the impact on economies most vulnerable to climate change. The results suggest that factors such as political stability and financial development have the potential to alleviate these effects. It reveals that the influence of climate risk on fiscal capacity is more significant in situations of limited fiscal space. Implementing fiscal consolidation emerges as a crucial factor in mitigating the negative impact of climate risks on fiscal capacity, with political stability and financial development also playing pivotal roles.

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