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Does high external debt predict lower economic growth? Role of sovereign spreads and institutional quality

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ABSTRACT

There has been a lengthy debate regarding the relationship between external borrowing and macroeconomic fragility. This paper investigates the predictive power of external debt as an indicator for economic growth to examine the argument that there is a dynamic relationship between external debt and growth. We conduct a panel regression using data from low- and middle-income countries (LMCs) between 1970 and 2018. The results indicate that an increase in total, long-term, or external public debt consistently predicts slowdowns in short- and medium-run growth. Limited evidence on non-linear external debt-growth relationship highlights the fact that external borrowing, especially by the public sector, significantly contributes to macroeconomic fragility. Proxy vector autoregressive (PVAR) estimation also confirms the dynamic causal effect of external sovereign debt expansion on economic slowdowns. Further evidence suggests that even the countries have high borrowing costs, better institutional quality can help mitigate the negative impact of external borrowing on growth.

1. Introduction

The historical debt crisis in many low- and middle-income countries (LMCs) has attracted much attention with regard to macroeconomic fragility. As suggested by the literature, the positive impact of foreign debt financing is restricted to a certain level. When debt reaches a certain level, an increase in the debt burden leads to poor economic performance (Alesina and Tabellini, 1989; Cerra et al., 2008). While the literature emphasizes the high risk of debt overhangs and economic fragility in LMCs (Poirson et al., 2002; Reinhart and Rogoff, 2010; Doğan and Bilgili, 2014; Navarro-Ortiz and Sapena, 2020), conclusive evidence on how growth prospects are related to external debt accumulation is currently lacking. One reason is that the debt overhang and debt irrelevance zone have large country-specific characteristics (Cordella et al., 2010; Égert, 2015; Eberhardt and Presbitero, 2015; Chudik et al., 2017; Chiu and Lee, 2017). To resolve this debate, our paper investigates the external debt–growth relationship in LMCs from a predictive perspective and explores the underlying dynamic causality.

Our paper begins by examining the predictive power of external debt as an indicator for economic growth[1] using data for 80 LMCs from 1970 to 2018. The evidence on the 1- to 5-year external debt–growth relationship suggests that an increase in external debt is consistently associated with depressed economic performance in the future. This means that the economic fragility driven by external debt expansion is sustained from the short to medium run. Ever-larger disequilibria may occur if no correction is implemented. Further evidence suggests that the negative external debt–growth relationship is mainly driven by the public component of debt (i.e., public or publicly guaranteed external debt). In contrast, there is little contribution of the private component of debt (i.e., private or privately non-guaranteed external debt). This finding emphasizes the importance of government borrowing to financial fragility (Caballero and Krishnamurthy, 2009; Boissay, 2011).[2] Our results are robust to a host of checks, including controlling for additional prediction variables, estimating using non-overlapping samples, and employing alternative specifications such as generalized method of moments (GMM) estimation, double fixed effects, and the inclusion of year trends.

We then explore non-linear patterns in the external debt–growth predictive relationship. We demonstrate that there is not any significant evidence supporting an optimal external debt level in LMCs. Regardless of a low or high external debt level, countries with higher external debt

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[1] We examine both total gross and disaggregate external debt, including long-term, short-term, long-term public, long-term private, long-term publicly guaranteed, and long-term private non-guaranteed components.

[2] For example, Gourinchas and Jeanne (2013) and Aguiar and Amador (2011) demonstrated that the negative correlation between growth and capital flows is mostly driven by public capital flows, while private inflows appear to be positively correlated with productivity fundamentals.

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growth consistently experience less economic growth. This finding suggests that even if there is a threshold for the optimal debt level, most countries have exceeded it and have become excessively indebted.

Next, to explore whether the negative correlation reflects a causal effect, we investigate the dynamic structure of external debt using a proxy vector autoregressive (PVAR) framework. Considering that public entities serve as the main drivers of external debt fluctuation, we specifically focus on the public component of external debt. According to the debt overhang theory, a high debt level is positively associated with a larger foreign borrowing spread. Our finding is consistent with this argument. We demonstrate that external sovereign debt expansion driven by exogenous foreign credit shocks has a dynamic, causal effect on future gross domestic product (GDP) slowdowns. Some may cast doubt on the validity of the spread instrument; after all, it is difficult to claim that a financial variable is independent of the debt level and other economic variables under traders' rational expectations. Note that our paper's primary spread instrument is the residual form, which is obtained from a regression of the spread indicator on all of the independent variables of the VAR system. We believe that the residual-form spread is able to overcome any potential endogeneity concerns.

Lastly, we investigate the joint impact of institutional quality and external borrowing costs on a country's response to external debt expansion. Intuitively, better institutions are considered a source of comparative advantage among countries to reduce friction and improve economic efficiency. The evidence supports this argument. The triple regression results suggest that the marginal effect (ME) of external public debt expansion on subsequent growth is a function of institutional quality and sovereign foreign spreads. Countries with healthier institutional quality tend to benefit from external debt expansion, even when they are in a high-interest rate environment.

Our paper contributes to several strands of the literature. First, our paper adds to the literature on the relationship between external debt and economic growth. Theoretically, countries that rely on foreign debt capital foster growth, as a greater capital supply permits them to invest more than they can save domestically (Agénor and Montiel, 2015). However, a high debt burden can also lead to less desirable consequences, as suggested by the debt overhang theory.[3] In addition, increases in the debt burden imply that a higher default risk might become a concern for creditors. Due to the fear of losses, creditors might require a higher borrowing cost premium and discourage capital flows, leading to future growth slowdowns. Recent empirical studies have suggested a non-linear pattern in the relationship between debt and growth (Drine and Nabi, 2010; Reinhart and Rogoff, 2010; Égert, 2015; Demirci et al., 2019). However, as previously noted, the debt threshold level depends on country-specific characteristics, and existing studies have not provided a general view of the debt overhang risks among LMCs (Law et al., 2021). By investigating the direct relationship between external debt expansion and future growth, our paper provides a general depiction of the state of external debt conditions across LMCs.

Second, our paper contributes to the literature on debt-driven economic fragility. The rationale for the negative debt–growth relationship is related to credit shocks on business cycle fluctuations. This requires specific attention to the medium-run impact of debt expansion on economic growth. Mian et al. (2017) noted that from 3 to 5 years after a debt shock, the resultant decline in GDP is great enough to bring an economy to a level lower than its starting point. However, existing studies on the negative impact of external debt expansion on growth in LMCs mostly focus on the short run (Poirson et al., 2004; Pattillo and Ricci, 2011), which only pin down recent or ongoing developments. Short-run forecasts do not provide sufficient information regarding the underlying growth trends (Carnot et al., 2011). In contrast, our paper focuses on the external debt–growth relationship from both the short- and medium-run perspectives and examines what happens when the trends are prolonged. In addition, our paper contributes to the literature on the causal effect of external borrowing and economic decline. Rather than use the conventional cross-sectional instrumental method, our paper focuses on the dynamic structural relationship using a proxy VAR context. This enables us to understand the sources and impact of foreign debt flows by avoiding the endogeneity concerns caused by the cross-sectional correlation between financial and economic variables.[4]

Third, our paper is related to studies emphasizing the importance of institutions in promoting foreign capital financing and economic performance. Theoretically, institutions have a wide range of structural characteristics. Quality institutions, such as quality contract enforcement, property rights, shareholder protection, and the like, are deemed sources of comparative advantage between countries for their ability to reduce friction between various interest groups and maintain economic stability (Gopinath et al., 2014). Therefore, countries with better institutional quality and less distortionary policies tend to have better economic performance and more wealth creation (Acemoglu et al., 2001, 2014; Butkiewicz and Yanikkaya, 2006; Fatás and Mihov, 2013). In terms of capital flows and debt regulation, countries with high-quality institutions are considered to have more tools to maintain credibility. Therefore, they can prevent debt overhang difficulties and thus mitigate the adverse outcomes precipitated by debt expansion. Many previous studies have recognized the catalyzing effects of institutions on foreign aid and debt financing (Kathavate and Mallik, 2012; Ramzan and Ahmad, 2014; Qayyum et al., 2014; Fazio et al., 2018; Maruta et al., 2019; Nemlioglu and Mallick, 2020). Our paper supplements this stream of the literature by emphasizing the joint impact of institutional quality and foreign borrowing costs on countries' economic performance through foreign capital flows.

The remainder of this paper is structured as follows. Section 2 describes the data and summarizes the key variables. Section 3 presents the primary results and presents robustness checks. In Section 4, we examine fundamental shocks that cause surges in external sovereign debt. Section 5 discusses the joint impact of institutional quality and interest rate spreads on subsequent economic growth. Section 6 concludes.

2. Data sources and summary statistics

2.1. Data sources

Information on country–year external debt is retrieved from the latest version of the World Bank's International Debt Statistics (IDS) dataset. The IDS provides seven categories of external debt stocks, including total gross (*TtD*), short-term (*ShD*), long-term (*LgD*), long-term issued by the public sector (*PuD*), long-term issued by the private sector (*PrD*), publicly guaranteed (*GuD*), and private non-guaranteed external debt (*NgD*). National account and spread data are taken from the World Bank's World Development Indicators database. We use a small set of control variables. Net foreign debt is calculated as the ratio of the sum of the current account deficit to GDP over the period of analysis. The measure of trade openness, *Openness,* is calculated as the ratio of the sum of import and export value to GDP.

Additionally, we include heterogeneity analysis related to financial regime changes across countries. We use three measures—financial repression (*IRC*), financial openness (*Kaopen*), and financial development (*FinDev*)—as proxies for financial regimes. *IRC* is an index of "interest

[3] Krugman (1988) defined a debt overhang as a situation in which expected repayments on debt fall short of their contractual values. Once a country's external debt is so heavy that a large portion of output accrues to foreign lenders, incentives for investment will become depressed since returns are expected to be "taxed away" by foreign creditors.

[4] Studies have suggested that capital flows into developing economies could be a source of economic instability because excessive liquidity might contribute to domestic imbalances or disrupt the domestic financial cycle (Schularick and Taylor, 2012; Obstfeld, 2012).

rate controls" obtained from Jafarov et al. (2019). It assumes four possible numerical values ranging from 0 (representing the strictest controls on interest rates) to 3 (describing a situation in which banks are essentially free to set their own interest rates). A higher *IRC* index represents a lower degree of interest rate control and a higher degree of financial liberalization. The measure for financial openness, *Kaopen,* is the updated Chinn–Ito index, which measures a country's degree of capital account openness (Chinn and Ito, 2008). The index includes annual data for 182 economies for the 1970–2018 period. The measure of financial development, *FinDev,* is the ratio of total assets and liabilities to GDP, and the source is the World Bank.

We measure institutional quality (*Quality*) using the Economic Freedom of the World index from the Fraser Institute. *Quality* is a comprehensive index for economic freedom based on a large number of indicators and survey data supplied by the World Bank. This index is compiled by the average of five sub-indexes measuring the size of the government, legal system and property rights, monetary policy soundness, freedom to trade internationally, and the strictness and efficiency of regulations. The values range from 1 to 10. A change in the index captures the extent of the reform that takes place during that period.[5]

Countries are required to have records for all seven categories of external debt to be included in the sample. Thus, the final merged sample occupies two-thirds LMCs during the 1970–2018 period.[6] The sample for the primary specification consists of 1978 observations after taking a 3-year period lag difference. For robustness, we compute the 1- to 5-year log growth of the variables.

2.2. Summary statistics

The summary statistics in Table 1 show that countries, on average, have a less satisfactory growth pattern. The standard deviation of 3-year GDP growth is about 30%, while the average log growth approaches 0. Regarding the several components of external debt, two observations should be mentioned. First, the increase in short-term and private external debt has relatively greater fluctuations than the long-term and public components of debt. The standard deviation of the former is about four times the latter, indicating that the insignificant coefficients on short-term and private external debt are not driven by the plain variation in the independent variables or estimation bias. External borrowing by the private sector has little predictive power for future economic performance. Second, public and publicly guaranteed external debt have similar growth trend properties.

Table A2 in the appendix presents the contemporaneous correlation matrix for the external debt predictors and controlling variables. The simple correlation reveals a strong link between variations in total external debt and GDP growth. Long-term and external public debt show a similar correlation, while movement in short-term and private external debt is scarcely correlated with economic growth.

3. Predicting GDP growth with lagged external debt growth

3.1. Scatter plots of external debt growth and economic growth

Before using an econometric model for analysis, scatter plots of each type of external debt growth and economic growth are drawn for the whole sample. The data are fitted with the lines. The results are shown in Fig. 1. These results indicate a prominent negative relationship between growth in total (public, publicly) external debt and GDP growth, as there is a noticeable negative slope in Fig. 1a (b and d). In comparison, there is a less evident relationship between private (private non-guaranteed) external debt and GDP growth, as the slope is flat in Fig. 1c (e).

3.2. Primary results

We start by assessing the linear predictive ability of several external debt measures regarding GDP growth across a wide range (from the annual growth rate to the 5-year growth rate). Consider a single-equation specification of the following type:

$$\Delta_k y_{i,t+1} = \alpha_i + \beta_{k,c}\Delta_k d^c_{i,t-1} + X'_{i,t-1}\Gamma + \varepsilon_{i,t}, \quad (1)$$

where $\Delta_k y_{i,t+1}$ is the GDP growth rate over a k-year (k=1, 2, 3, 4, 5) period from year t + 1 to year t + k + 1; $\Delta_k d^c_{i,t-1}$ are predictors measured by the log growth of several external debt components, $c = TtD, ShD, LgD, PuD, PrD, GuD, NgD$; and $\varepsilon_{i,t}$ is the zero-mean disturbance term. $X'_{i,t-1}$ is the control vector.[7] The inclusion of lagged GDP growth measures ensures that the estimation is not driven by some spurious mean reversion of GDP growth. Our interest is in the estimate coefficients on the external debt predictors, $\beta_{k,c}$. Following Mian et al. (2017), the primary specification includes country fixed effects but excludes year fixed effects. We use dually clustered standard errors on country and year to account for within-country correlation and contemporaneous cross-country correlation in the error term. This estimate on standard errors is especially used for accounting within-country correlation induced by overlapping observations. The covariance statistics are adjusted for the number of fixed effects, and the standard errors are reported in parentheses.

Table 2 reports the estimate of $\beta_{k,c}$ in Equation (1) using an overlapping sample in a compact format. It can be seen that total gross external debt has significant predictability for future GDP growth over the short to medium run. The predictability is considerable. For instance, in Column 3, a 1% increase in total external debt growth is associated with 0.094% slowdown in GDP growth during the subsequent 3 years. The long-term public component of external debt seems to be the main underlying driver, as increases in long-term, public, and publicly guaranteed external debt present similar significant negative predictive power for future GDP growth (Rows 3, 4, and 6). In contrast, the short-term and private components (Rows 2, 5, and 7) have little predictive ability. Such differences highlight the importance of public external borrowing in driving the adverse effects of overall external debt on the macroeconomy. Owing to space constraints, we report only the results for k = 3 in the following analysis.

The evidence above is consistent with previous studies on debt-induced economic fragility. While much of the empirical literature investigates the thresholds and negative relationship between external debt expansion and growth performance, in most studies, short-run growth performance is related to changes in the debt level. Since the debt overhang and debt irrelevance zone tend to have large country-specific characteristics (Égert, 2015; Eberhardt and Presbitero, 2015; Chudik et al., 2017; Chiu and Lee, 2017), conclusive evidence on how growth prospects relate to external debt accumulation is lacking. Our paper complements these studies by directly investigating the predictive effect of external debt expansion on GDP growth. Our evidence suggests that regardless of the heterogeneous feature of debt thresholds, most LMCs have entered the debt overhang zone. These findings provide a general scene for understanding the state of external debt conditions in LMCs.

3.3. Robustness checks of the predictive relationship

To ensure that our results are not driven by spurious estimation, we perform a set of robustness tests. First, to show that our debt measures are

[5] Note that data for Quality are available at 1970, 1975, 1980, 1985, 1990, 1995, and 2000–2017.

[6] The IDS dataset provides external debt information for 120 LMCs. Our final merged sample covers 80 LMCs. Table A1 in the appendix presents the country list.

[7] The primary regression (Table 2) only controls for country fixed effects and three 1-year period log GDP growth. In the following robustness analysis, additional controls are added.

Table 1
Variable definitions and summary statistics.

Variable	Definition	Source	Obs.	Mean	Std. Dev.	Min.	Max.
$\Delta_3 d^{TtD}$	Log growth of total external debt over 3 years (nominal U.S. dollars)	World Bank	1978	0.004	0.28	−1.789	2.238
$\Delta_3 d^{ShD}$	Log growth of short-term external debt over 3 years (nominal U.S. dollars)	World Bank	1978	−0.007	1.511	−13.567	16.082
$\Delta_3 d^{LgD}$	Log growth of long-term external debt over 3 years (nominal U.S. dollars)	World Bank	1978	0.003	0.295	−2.302	2.051
$\Delta_3 d^{PuD}$	Log growth of external public debt over 3 years (nominal U.S. dollars)	World Bank	1978	0.002	0.306	−2.787	2.809
$\Delta_3 d^{PrD}$	Log growth of private external debt over 3 years (nominal U.S. dollars)	World Bank	1978	0.009	1.245	−18.756	15.418
$\Delta_3 d^{GuD}$	Log growth of publicly guaranteed external debt over 3 years (nominal U.S. dollars)	World Bank	1978	0.002	0.306	−2.787	2.799
$\Delta_3 d^{NgD}$	Log growth of total external debt over 3 years (nominal U.S. dollars)	World Bank	1978	0.007	1.297	−18.756	15.418
NFD/ GDP	Net foreign debt-to-GDP ratio measured by the current account deficit (nominal U.S. dollars)	World Bank	1944	0.056	0.108	−0.423	0.538
Spread	Difference between interest rates on new external public debt commitment relative to 10-year U.S. government bond yields	World Bank	1978	−0.02	0.023	−0.124	0.044
Quality	Index of economic freedom from the Fraser Institute	Fraser Institute*	1135	6.339	0.938	2.644	8.055
Exchange	Nominal exchange rate (end of period), national currency units per U.S. dollar	Jafarov et al. (2019)	1590	0.406	1.781	0	22.718
IRC	Index of interest rate control	Jafarov et al. (2019)	1590	1.962	1.227	0	3
Kaopen	Chinn–Ito index, which measures a country's degree of capital account openness	Updated Chinn–Ito dataset (2008)	1926	−0.306	1.314	−1.917	2.347
FinDev	Financial development, measured by the ratio of total financial assets and liabilities to GDP (nominal U.S. dollars)	World Bank	1715	1.236	0.303	0.063	2.007
Capital/ GDP	Gross capital formation-to-GDP ratio (nominal U.S. dollars)	World Bank	1891	0.236	0.08	0.015	0.894
Openness	The ratio of imports and exports of goods and services to GDP (nominal U.S. dollars)	World Bank	1944	0.652	0.303	0.063	2.007

Notes: *See https://www.fraserinstitute.org/studies/economic-freedom.

not simply a proxy for other prediction variables, we include additional controls into the primary regression, including changes in net foreign debt, trade openness, institutional quality, and the exchange rate over the 3-year period. These variables are potential factors influencing external debt–growth nexus in theoretical models. Additionally, to exclude the private sector's impacts on public debt financing, we also include growth in private and non-guaranteed external debt controls.

Table 3 reports the regression results for the 3-year growth period. We can see that even with the inclusion of additional controls, the qualitative results do not change. The predictive power of growth in total, long-term, public, and publicly guaranteed external debt on economic growth remains significantly negative, which indicates that our primary results are not driven by these additional factors. We can also observe a significant negative correlation between net foreign debt and future GDP growth, which indicates that an increase in a country's net foreign position has an adverse effect on economic growth. Columns 4 shows that a rise in private external debt growth has little predictive ability for subsequent GDP growth, once the external public debt measure is considered. This is also the case for private non-guaranteed external debt in Columns 6. Consistent with previous findings, our results highlight the expansion of public external financing as a critical predictor of an economic slowdown.

We then check the robustness of the predictability of several components of external debt using alternative specifications.[8] Columns 1 and 5 in Table 4 perform a robustness check by using only non-overlapping years for the left-hand side variable to ensure that our findings are not driven by repeat observations. The estimated coefficients and standard errors are similar. Considering the combination of country fixed effects and lagged dependent variables as controls could introduce a potential "Nickell bias" problem; Columns 2 and 6 use the Arellano and Bond (1991) GMM estimator for the same non-overlapping sample. Following Mian et al. (2017), we instrument the public and publicly guaranteed external debt predictors with their corresponding lag items. The results obtained using the AB–GMM estimator are similar to previous estimates. As another check, Columns 3 and 7 report estimates with the inclusion of a time trend, and Columns 4 and 8 report estimates with the inclusion of year fixed effects, respectively. The significantly negative coefficients of our predictors remain. The inclusion of year fixed effects reduces the absolute value of the coefficients, but the estimate remains statistically significant, mostly at the 5% level.

3.4. Heterogeneity of the external debt–growth nexus

Previous studies have suggested thresholds in the relationship between external debt level and economic growth (Poirson et al., 2004; Pattillo and Ricci, 2011). This means there may exist an optimal debt level above which the negative effects of growth in external debt become stronger. To address this issue, we divide the countries into five groups according to their external debt-to-GDP ratio for each type (total, public, and publicly guaranteed) of external debt and conduct the primary regression. However, the results in Table 5 do not support this conjecture. We do not find a change in the sign of coefficients on the total, public, and publicly external debt predictors in Panels A, B, and C. Regardless of a low or high level of external debt burden, the negative predictive relationship between lagged growth of external debt and subsequent GDP growth consistently holds up, although some appropriate intervals might exist within which the adverse effect is alleviated. These findings indicate a weak or extremely low threshold for the external debt level in LMCs, consistent with Reinhart and Rogoff's (2010) argument.

Country-specific financial characteristics are also a crucial factor for foreign financing and capital accumulation. To examine whether financial regimes matter to our observed external debt–growth nexus, we use three measures: financial repression, *IRC,* financial openness, *Kaopen,* and financial development, *FinDev*, as a proxy for financial regimes and compare estimates from subsamples divided by the medium of each measure.

The results in Table 6 suggest that financial openness and development actually matter the external debt–growth nexus, but financial repression does not. These impacts are concentrated mainly on external public borrowing in countries in which the financial system is poor. The significantly negative economic effect of external public borrowing is mainly concentrated in countries in which the financial system is characterized by a low level of openness and development (Columns 1 in Panel B and C).

[8] For space considerations, we report only the results for public and publicly guaranteed external debt. Estimations for total external debt are presented in Table A3 in the Appendix.

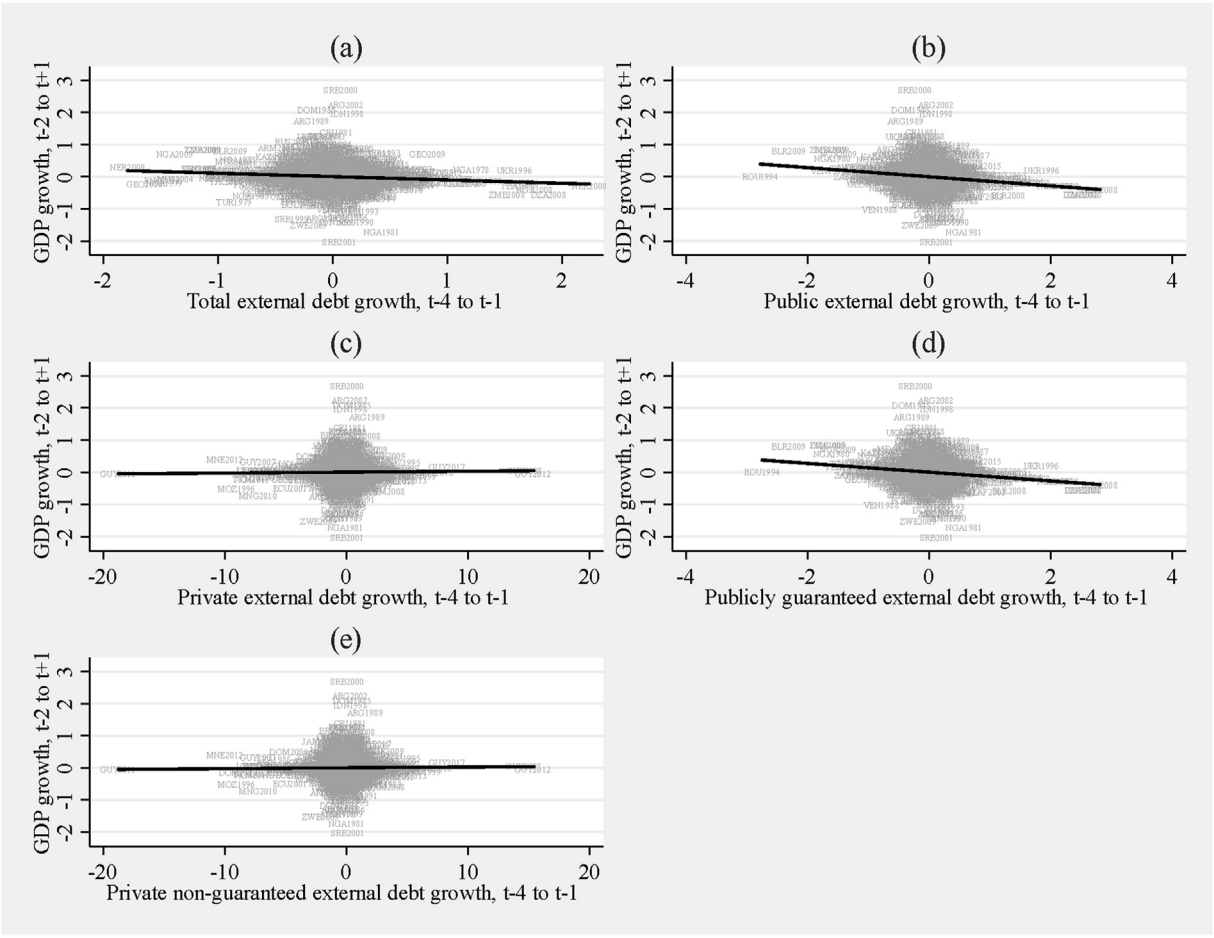

Fig. 1. Correlation of lagged growth of external public debt and GDP growth. *Notes*: This figure plots the relationship between GDP growth from t–2 to t + 1 and the expansion of external debt from t–4 to t −1. Each point refers to year t. Fig. 1(a) shows the correlation between growth in total external debt and GDP growth. Fig. 1(b) shows the partial correlation between public external debt and GDP growth controlling for variations in private external debt. Similarly, Fig. 1(d) shows the partial correlation between publicly guaranteed external debt and GDP growth controlling for variations in private non-guaranteed external debt. Fig. 1 (c) shows the partial correlation between private external debt and GDP growth controlling for variations in public external debt. Similarly, Fig. 1 (e) shows the partial correlation between private non-guaranteed external debt and GDP growth controlling for variations in publicly guaranteed external debt.

4. Shocks to borrowing costs drive external public debt fluctuations

The robust evidence above suggests that public foreign borrowing could be a primary driver for future poor economic performance. To conduct causality analysis, we now adopt a newly developed proxy VAR method to identify the structural effects of external sovereign debt expansion on subsequent economic downturns. Following Mian et al. (2017), we use residual-form sovereign foreign spreads as an instrument to identify exogenous shocks to external public debt fluctuations.

4.1. Proxy VAR strategy

The proxy VAR method proxies latent shocks using an instrument that is correlated with the residuals of the interest rate variable but is uncorrelated with the residuals of others. Let $\boldsymbol{Y}_{it}$ be a vector of economic variables containing the level of log GDP, y_{it}, the log of the private external debt-to-GDP ratio, D_{it}^{PrD}, the log of the external public debt-to-GDP ratio, D_{it}^{PuD}, $\boldsymbol{Y}_{it} = (y_{it}, D_{it}^{PuD}, D_{it}^{PrD})$.[9] The general structural form of the panel VAR we are considering is given by as follows:

$$\mathrm{A}\boldsymbol{Y}_{it} = \alpha_i + \sum_{j=1}^{p} c_j \boldsymbol{Y}_{it-j} + \varepsilon_{it} \tag{2}$$

where α_i is a vector of country fixed effects and ε_{it} is an n × 1 vector of structural shocks with $\mathrm{E}[\varepsilon_{it}\varepsilon_{it}^{'}] = I$, $\mathrm{E}[\varepsilon_t\varepsilon_s^{'}] = 0$ for s ≠ t, and I is the identity matrix. We set p = 5 based on the Bayesian Information Criterion. Multiplying each side of Equation (2) by $\boldsymbol{A}^{-1}$ yields the reduced-form representation:

$$\boldsymbol{Y}_{it} = \delta_i + \sum_{j=1}^{p} b_j \boldsymbol{Y}_{it-j} + u_{it} \tag{3}$$

where $\mathbf{S} = \boldsymbol{A}^{-1}$, $b_i = Sc_i$, $\delta_i = S\alpha_i$, and $u_{it} = S\varepsilon_{it}$ is the vector of reduced-form shocks with covariance matrix $\mathrm{E}[u_{it}u_{it}^{'}] = SS^{'} = \boldsymbol{\Sigma}$. Matrix $\mathbf{S}$ maps the structural shocks into the reduced-form residuals. Formally, let $Y_{it}^2 \in \boldsymbol{Y}_{it}$ be D_{it}^{PuD}; specifically, the variable in the structural representation (2) with exogenous variation due to the associated interest rate spread shock, ε_{it}^2. The identification of exogenous shocks to external public debt amounts to identifying the second column of $\mathbf{S} = (s^{(1)}, s^{(2)}, s^{(3)})^{'}$, in which $s^{(2)}$ corresponds to the impact on each element of the reduced residuals, u_{it}. Mertens and Ravn (2013) noted that the conventional timing restriction is problematic when there are financial variables in the VAR system, as the potential assumption that innovation has no

[9] For robustness, we also estimate the PVAR system with $\boldsymbol{Y}_{it} = (y_{it}, D_{it}^{GuD}, D_{it}^{NgD})$.

Table 2
Predictive impact of external debt on GDP growth.

	(1)	(2)	(3)	(4)	(5)
	$\Delta_1 y_{i,t+1}$	$\Delta_2 y_{i,t+1}$	$\Delta_3 y_{i,t+1}$	$\Delta_4 y_{i,t+1}$	$\Delta_5 y_{i,t+1}$
$\Delta_k d^{TtD}_{i,t-1}$	−0.0348	−0.0967**	−0.0941**	−0.0503*	−0.0115
	(0.042)	(0.042)	(0.041)	(0.029)	(0.019)
$\Delta_k d^{ShD}_{i,t-1}$	0.00715*	0.00231	0.00468	0.00484	0.00288
	−0.004	−0.004	−0.005	−0.004	−0.003
$\Delta_k d^{LgD}_{i,t-1}$	−0.0577*	−0.107***	−0.120***	−0.0870***	−0.0410*
	(0.033)	(0.035)	(0.035)	(0.028)	(0.021)
$\Delta_k d^{PuD}_{i,t-1}$	−0.0802**	−0.108***	−0.124***	−0.0953***	−0.0513**
	(0.036)	(0.037)	(0.033)	(0.026)	(0.020)
$\Delta_k d^{PrD}_{i,t-1}$	0.0086	0.00286	0.0005	0.00312	0.00118
	(0.007)	(0.005)	(0.005)	(0.005)	(0.003)
$\Delta_k d^{GuD}_{i,t-1}$	−0.0787**	−0.104***	−0.120***	−0.0925***	−0.0488**
	(0.037)	(0.036)	(0.032)	(0.026)	(0.020)
$\Delta_k d^{NgD}_{i,t-1}$	0.00215	0.00152	0.00179	0.00116	0.00155
	(0.008)	(0.005)	(0.005)	(0.004)	(0.004)

Notes: This table presents a compact form of the estimated coefficients on the predictors from the basic specification $\Delta_k y_{i,t+1} = \alpha_i + \beta_{k,c}\Delta_k d^c_{i,t-1} + X'_{i,t-1}\Gamma + \varepsilon_{i,t}$, where k = (1, 2, 3, 4, 5), c = (*TtD, ShD, LgD, PuD, PrD, GuD, NgD*), $X'_{i,t-1}$ includes country fixed effects and three 1-year period log GDP growth. In each column, the dependent variable, $\Delta_k y_{i,t+1}$, represents log GDP growth from year t + 1–k to t + 1. Standard errors in all columns are dually clustered on country and year and presented in parentheses. *, **, and *** indicate significance at the levels of 10%, 5%, and 1%, respectively.

contemporaneous impact on financial variables is generally impossible. Therefore, obtaining covariance restrictions from external instruments is necessary.

An external instrument, Z_{it}, is valid to identify a credit shock if $E[Z_{it}\epsilon^2_{it}] \neq 0$ and $E[Z_{it}\epsilon^j_{it}] = 0, j = 1, 3$. The first is the relevance condition, which requires that the instrument be contemporaneously correlated with a structural shock in the interest rate. The second is the exogeneity condition, which requires that the instrument be contemporaneously uncorrelated with other shocks. If the external instrument satisfies these two conditions, it can be used to identify the shock, ϵ^2_{it}. In the analysis below, we define two instrumental proxies to identify external public debt expansion. One is a sovereign spread indicator, *Spread_Ind*, which equals 1 if the standardized external sovereign spread is above the sample median. The residual spread indicator, *Spread_Ind Res*, is the estimated residual from a regression of *Spread_Ind* on the VAR independent variables. The empirical evidence provided by Banerji et al. (2014) suggests that variations in sovereign spreads are mainly driven by external shocks, indicating that the sovereign spread could be a potential instrument for causal identification. Someone could cast doubts on the validity of the *Spread_Ind* instrument, as it is hard to claim that a financial variable is purely exogenous to economic activities. Note that the residual-form spread indicator, *Spread_Ind Res*, is still applicable. This is because, theoretically, the residuals are independent of variations in the independent variables and can eliminate the endogeneity concern caused by expectations and other factors.

The estimation procedure is as follows: First, estimates of the reduced-form residuals, $\boldsymbol{u_{it}}$, are obtained from an ordinary least squares (OLS) regression of system (3). This step isolates variation in the private external debt and GDP equation residuals driven by credit supply shocks to external public debt. Then, we employ a two-stage least squares (2SLS) regression using Z_{it} as an instrument for the estimated residuals of external public debt, $u^{(2)}_{it}$.

4.2. Shocks to foreign borrowing cost drives external public debt fluctuation

Table 7 presents the first stage regressions of the reduced-form VAR residuals on the external public debt spread instruments. The dependent variables in Panel A are residuals from $(y_{it}, D^{PuD}_{it}, D^{PrD}_{it})$ system. In Panel A, Columns 1 and 2 reveal that fluctuations in external public debt unexplained by private external debt and GDP dynamics are systematically related to the changes in interest rate spread. In Column 2, the statistically significant positive relation indicates that the exogenous external

Table 3
Robustness checks including controls.

	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta_3 y_{i,t+1}$	$\Delta_3 y_{i,t+1}$	$\Delta_3 y_{i,t+1}$	$\Delta_3 y_{i,t+1}$	$\Delta_3 y_{i,t+1}$	$\Delta_3 y_{i,t+1}$
$\Delta_3 d^{TtD}_{i,t-1}$	−0.152***					
	(0.047)					
$\Delta_3 d^{LgD}_{i,t-1}$		−0.143***				
		(0.034)				
$\Delta_3 d^{PuD}_{i,t-1}$			−0.115***	−0.115***		
			(0.034)	(0.034)		
$\Delta_3 d^{PrD}_{i,t-1}$				−0.00393		
				(0.011)		
$\Delta_3 d^{GuD}_{i,t-1}$					−0.117***	−0.116***
					(0.034)	(0.033)
$\Delta_3 d^{NgD}_{i,t-1}$						0.00572
						(0.009)
$\Delta_3 Quality_{i,t-1}$	0.0121*	0.0194	0.0187	0.0188	0.0187	0.0185
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
$\Delta_3 Exchange_{i,t-1}$	0.0130	0.0126	0.0120	0.0109	0.0118	0.0121
	(0.021)	(0.021)	(0.022)	(0.020)	(0.022)	(0.021)
$\Delta_3 NFD\_GDP_{i,t-1}$	−0.239*	−0.252*	−0.237*	−0.237*	−0.235*	−0.236*
	(0.131)	(0.134)	(0.137)	(0.136)	(0.136)	(0.137)
$\Delta_3 Openness_{i,t-1}$	−0.0704	−0.0633	−0.0710	−0.0689	−0.0713	−0.0727
	(0.081)	(0.082)	(0.088)	(0.089)	(0.088)	(0.090)
CountryFE	Yes	Yes	Yes	Yes	Yes	Yes
LDV	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.153	0.154	0.147	0.147	0.148	0.149
F	4.986	5.922	5.992	5.116	6.110	7.767
N	599	599	599	599	599	599

Notes: This table presents robustness checks including the net foreign debt-to-GDP ratio and private (private non-guaranteed) external debt as controls. In each column, the dependent variable is $\Delta_3 y_{i,t+1}$, which represents log GDP growth from year t–2 to t + 1. All regressions include country fixed effects. Standard errors in all columns are dually clustered on country and year and presented in parentheses. Reported R^2 values are from within-country variation. *, **, and *** indicate significance at the levels of 10%, 5%, and 1%, respectively.

Table 4
Robustness checks for the predictability of public (publicly guaranteed) external debt.

	Dependent variable: $\Delta_3 y_{i,t+1}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	AB–GMM	OLS	OLS	OLS	AB–GMM	OLS	OLS
$\Delta_3 d^{PuD}_{i,t-1}$	−0.112***	−0.186*	−0.123***	−0.0715***				
	(0.033)	(0.099)	(0.033)	(0.024)				
$\Delta_3 d^{GuD}_{i,t-1}$					−0.110***	−0.189*	−0.119***	−0.0672***
					(0.033)	(0.102)	(0.032)	(0.023)
$\Delta_3 d^{PrD}_{i,t-1}$	−0.00374	0.0313	0.000633	0.00354				
	(0.005)	(0.042)	(0.005)	(0.004)				
$\Delta_3 d^{NgD}_{i,t-1}$					−0.0010	0.0205	0.0017	0.00380
					(0.004)	(0.038)	(0.005)	(0.016)
Trend			0.00105				−0.00106	
			(0.001)				(0.001)	
CountryFE	Yes	No	Yes	Yes	Yes	No	Yes	Yes
LDV	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
YearFE	No	No	No	Yes	No	No	No	Yes
Sample	Non-over.	Non-over.	Full	Full	Non-over.	Non-over.	Full	Full
R^2	0.0947		0.123	0.149	0.0938	–	0.123	0.148
F	7.226		12.04	19.51	8.925	–	12.08	20.00
N	683	452	1969	1969	683	452	1969	1969

Notes: This table presents robustness checks for public and publicly guaranteed external debt with the inclusion of private external debt measures. Columns 1 and 5 perform robustness check using only non-overlapping years for the basic specification. Columns 2 and 6 use the Arellano and Bond (1991) GMM estimator for the same non-overlapping sample. Columns 3 and 7 estimate using the full sample with additional year trends. Columns 5 and 8 report estimates with the inclusion of additional year fixed effects using the full sample. In each column, the dependent variable is $\Delta_3 y_{i,t+1}$, which represents log GDP growth from year t–2 to t + 1. All regressions include country fixed effects. Standard errors are dually clustered on country and year and presented in parentheses. Reported R^2 values are from within-country variations. *, **, and *** indicate significance at the levels of 10%, 5%, and 1%, respectively.

Table 5
Group analysis for the potential impact of the external debt level.

Panel A	quintle 1	quintle 2	quintle 3	quintle 4	quintle 5
$\Delta_3 d^{TrD}_{i,t-1}$	−0.18***	−0.082	−0.084**	0.019	−0.11**
	(0.063)	(0.084)	(0.038)	(0.027)	(0.053)
F	4.72	18.2	14.8	8.1	14.5
R^2	0.093	0.17	0.1	0.083	0.14
N	453	389	426	410	384
coef_diff	–	0.1	−0.0016	0.1	−0.13
P_value	–	0.23	0.97	0.00015	0.015
Panel B	**quintle 1**	**quintle 2**	**quintle 3**	**quintle 4**	**quintle 5**
$\Delta_3 d^{PuD}_{i,t-1}$	−0.15***	−0.23***	0.022	−0.081*	−0.096**
	(0.048)	(0.067)	(0.060)	(0.042)	(0.042)
$\Delta_3 d^{PrD}_{i,t-1}$	−0.017	0.010	−0.0084	0.022	−0.0015
	(0.010)	(0.022)	(0.013)	(0.014)	(0.0053)
F	7.25	4.99	9.07	13.5	57.5
R^2	0.12	0.14	0.16	0.12	0.11
N	425	419	410	426	382
coef_diff	–	−0.087	0.26	−0.1	−0.014
p_value	–	0.19	0	0.013	0.74
Panel C	**quintle 1**	**quintle 2**	**quintle 3**	**quintle 4**	**quintle 5**
$\Delta_3 d^{GuD}_{i,t-1}$	−0.15***	−0.18***	−0.028	−0.12**	−0.094**
	(0.048)	(0.062)	(0.085)	(0.051)	(0.043)
$\Delta_3 d^{NgD}_{i,t-1}$	−0.018*	−0.00095	0.015	0.015	0.00043
	(0.0097)	(0.0098)	(0.021)	(0.015)	(0.0061)
F	7.33	9.01	28.1	4.79	46.4
R^2	0.12	0.11	0.15	0.16	0.11
N	425	440	378	413	406
coef_diff	–	−0.031	0.15	−0.091	0.025
p_value	–	0.62	0.079	0.077	0.57

Notes: To investigate the potential impact of external debt level on the predictability of our predictors, we divide countries into five groups according to their total (Panel A), public (Panel B), or publicly guaranteed (Panel C) external debt-to-GDP ratio. In each column, t statistics for the difference in the estimate coefficients are reported. All regressions include country fixed effects, and standard errors in all columns are dually clustered on country and year and presented in parentheses. *, **, and *** indicate significance at the levels of 10%, 5%, and 1%, respectively.

public debt expansion can be identified by foreign borrowing costs increase. The estimates in Columns 3–6 show that the reduced form of private external debt and GDP residuals are uncorrelated with the exogenous instruments *Spread_Ind* and *Spread_Ind Res.* This verifies the exclusion condition that the sovereign interest rate spread, as an instrument, is exogenous to other dependent variables in the VAR system.

Panel B presents robust evidence from estimating residuals from $(y_{it}, D^{GuD}_{it}, D^{NgD}_{it})$ system. Similarly, Column 2 shows that the reduced-form residuals of publicly guaranteed external debt are significantly correlated with the residual spread indicator, *Spread_Ind Res*, which verifies the relevance condition. Simultaneously, the residual spread indicator satisfies the exclusion condition, as shown in Columns 3–6.

Fig. 2 shows the dependent variables' responses to external public debt shocks proxied by the residual spread indicator, *Spread_Ind Res*. Here we primarily want to capture sovereign borrowing expansion shocks preceding the economic slowdown. Consistent with Table 7, Fig. 2 shows that sovereign foreign debt expansion is associated with a unit-positive spread shock. This expansion in external public debt leads to a sustained output slowdown in the subsequent 10 years, which is qualitatively consistent with the primary regression results in Table 3. Even in the short run, the response of output to external public debt expansion shocks is massive and hostile.

5. The joint impact of external debt, interest rate spreads, and institutional quality

Considering the crucial role of institutions and borrowing costs in foreign debt financing, we further investigate the joint impact of these two factors on the external debt–growth nexus. We conduct a panel regression in which a triple interactive term is included as follows:

$$\Delta_5 y_{it+5} = \alpha_i + \beta_1 \Delta_5 d^C_{i,t} * Quality_{it} * Spread_{it} + \beta_2 Quality_{it} * \Delta_5 d^C_{i,t} + \beta_3 Spread_{it} * \Delta_5 d^C_{i,t} + \beta_4 \Delta_5 d^C_{i,t} * Quality_{it} + \beta_5 Quality_{it} + \beta_6 \Delta_5 d^C_{i,t} + \beta_7 Spread_{it} + + \beta_8 X_{it} + \varepsilon_{i,t} \quad (5)$$

Table 6
Subsample estimation with different levels of financial repression.

Panel A	(1)	(2)	(3)	(4)
	IRC			
	Low	High	Low	High
	$\Delta_3 y_{i,t+1}$	$\Delta_3 y_{i,t+1}$	$\Delta_3 y_{i,t+1}$	$\Delta_3 y_{i,t+1}$
$\Delta_3 d^{PuD}_{i,t-1}$	−0.131**	−0.118***		
	(0.055)	(0.038)		
$\Delta_3 d^{PrD}_{i,t-1}$			0.0288	−0.000301
			(0.018)	(0.008)
$\Delta_3 NFD\_GDP_{i,t-1}$	−0.138	0.0643	−0.147*	0.0274
	(0.090)	(0.111)	(0.086)	(0.130)
$\Delta_3 Openness_{i,t-1}$	0.0193	−0.0629	0.0188	−0.0707
	(0.086)	(0.070)	(0.088)	(0.071)
CountryFE	Yes	Yes	Yes	Yes
LDV	Yes	Yes	Yes	Yes
R^2	0.137	0.129	0.128	0.110
F	10.22	14.65	8.462	17.59
N	775	762	775	762
Panel B	*Kaopen*			
	Low	High	Low	High
$\Delta_3 d^{PuD}_{i,t-1}$	−0.165***	−0.0436		
	(0.036)	(0.046)		
$\Delta_3 d^{PrD}_{i,t-1}$			0.0116	0.00143
			(0.010)	(0.003)
$\Delta_3 NFD\_GDP_{i,t-1}$	−0.0597	−0.0430	−0.0949	−0.0414
	(0.085)	(0.094)	(0.098)	(0.094)
$\Delta_3 Openness_{i,t-1}$	−0.0234	−0.0499	−0.0203	−0.0504
	(0.056)	(0.046)	(0.057)	(0.047)
CountryFE	Yes	Yes	Yes	Yes
LDV	Yes	Yes	Yes	Yes
R^2	0.132	0.121	0.107	0.119
F	11.02	14.85	8.419	8.946
N	1268	598	1268	598
Panel C	*FinDev*			
	Low	High	Low	High
$\Delta_3 d^{PuD}_{i,t-1}$	−0.185***	−0.0231		
	(0.043)	(0.030)		
$\Delta_3 d^{PrD}_{i,t-1}$			0.00730	0.00156
			(0.010)	(0.005)
$\Delta_3 NFD\_GDP_{i,t-1}$	−0.0864	−0.0118	−0.171	−0.0128
	(0.099)	(0.081)	(0.131)	(0.081)
$\Delta_3 Openness_{i,t-1}$	−0.0115	−0.0551	−0.0292	−0.0553
	(0.070)	(0.056)	(0.069)	(0.056)
CountryFE	Yes	Yes	Yes	Yes
LDV	Yes	Yes	Yes	Yes
R^2	0.147	0.105	0.108	0.105
F	14.58	23.38	10.91	16.11
N	940	850	940	850

Notes: To investigate the impact of financial regimes on the external debt–growth nexus, we divide countries into two groups according to three financial regime measures: financial repression, *IRC*; financial openness, *Kaopen*; and financial development, *FinDev*. In each column, t statistics for the differences in the estimate coefficients are reported. All regressions include country fixed effects, and standard errors are dually clustered on country and year and presented in parentheses. *, **, and *** indicate significance at the levels of 10%, 5%, and 1%, respectively.

where $\Delta_5 y_{it+5}$ the 5-year log GDP growth rate; $\Delta_5 d^C_{i,t} (C = PuD, GuD)$ is the 5-year log growth of public and publicly guaranteed external debt and $Quality_{i,t}$ is the initial level of the economic freedom index for each 5-year period. A change in this index captures the extent of macroeconomic and structural reforms that occur during that time; $Spread_{it}$ is the external sovereign spread; and $X_{i,t}$ is the vector of controls that includes the growth of net foreign debt, and nominal exchange rate. We have country and year double fixed effects and estimate with robust standard errors. Here, we use the 5-year overlapping sample based on the consideration of sample limitations.[10] Our interest is on how institutional quality and foreign borrowing costs could impact the external debt–growth nexus. Given Equation (5), the ME of the public (publicly guaranteed) external debt predictors on GDP growth can be calculated as follows, which depends on the estimates of β_1, β_2, and β_3.

$$\frac{\partial \Delta_5 y_{it+5}}{\partial \Delta_5 d^C_{i,t}} = \beta_1 Quality_{it-5} * Spread_{it} + \beta_2 Quality_{it-5} + \beta_3 Spread_{it} + \beta_6 \quad (6)$$

The conditional ME (CME) on *Quality* is presented in Equation (7).

$$\text{CME: } \beta_1 * Spread_{it} + \beta_2 \quad (7)$$

The triple regression results are presented in Table 8. Note that CME is a function of *Spread*. This means for countries at any level of borrowing cost, the ME could be country-specific. For instance, given the estimated coefficients in Column 1, the average CME for a country at the 25% quartile of borrowing cost is 0.014, and the corresponding standard deviation is 0.0096. This means that for these countries with high borrowing costs, better institutions can help mitigate the negative impact of external debt on growth, as *Quality* is positively correlated with the external debt's ME on growth.[11]

To further investigate how ME varies with *Quality* and *Spread*, Fig. 3 plots the ME function (blue surface) using the estimate coefficients in Column 1. For comparison, we also plot the zero ME region (red surface). We can observe that when *Quality* and *Spread* are high, the ME of external debt on growth is above zero. That means that countries with better institutions can benefit from external public debt financing, even though their borrowing costs are high. Fig. A1 (in Appendix) further plots the ME for the case in which *Spread* equals zero. The positive linear relationship between *Quality* and ME suggests that institutional quality improvement can actually mitigate the negative external debt–growth relationship in a moderate interest rate environment.

Combined with the previous results, our paper suggests though external public debt expansion on average impedes economic growth among LMCs, quality institutions seem to prevent those from debt overhang difficulties. This finding supports the argument emphasizing the beneficial effect of good institutions in promoting foreign financing and economic performance (Fazio et al., 2018; Maruta et al., 2019; Nemlioglu and Mallick, 2020). However, other studies have suggested that the debt overhang is effective only in countries characterized by strong institutions. External debt seems to be irrelevant for countries with weak institutions (Presbitero, 2008; Jalles, 2011). Our paper complements this literature by showing that the effect of external debt on growth is associated with both institutional quality and foreign borrowing costs (Cuadra and Sapriza, 2008; Muhanji and Ojah, 2011; Lorenzoni and Wening, 2019).

6. Conclusion and policy recommendations

Rapid external debt expansion involving excessive capital inflows could cause economic fragility. This study investigates both short and medium-run external debt–growth nexus from a predictive perspective. The evidence suggests that, on average, most LMCs have entered the zone of external debt overhang, since an increase in total, long-term, and external public debt predicts a significant slowdown in subsequent

[10] It is common to choose a 5-year overlapping sample here, considering the data for *Quality* from 1970 to 2000 are only available for each 5-year period (Vamvakidis, 2007). The main reason to choose a 5-year overlapping sample is to address the issue that the EFW data are available only in 5-year intervals from 1970 to 2000.We also conduct an interactive regression using a 3-year overlapping sample (Table A4 in the Appendix) and demonstrate that the qualitative results remain.

[11] If we take the average value of *Quality*, 6.5418, and *Spread*, −0.379, the marginal effect (ME) of external debt on growth can be calculated as −0.5906 with a standard error of 0.8739.

Table 7
External sovereign spreads and public (publicly guaranteed) external debt.

Panel A	(1) $d^{PuD}Res$	(2) $d^{PuD}Res$	(3) $d^{PrD}Res$	(4) $d^{PrD}Res$	(5) *y Res*	(6) *y Res*
Spread_Ind	0.019*		0.013		0.0053	
	(0.0094)		(0.023)		(0.0089)	
Spread_Ind Res		0.024**		0.016		0.0067
		(0.010)		(0.028)		(0.0081)
R^2	0.0052	0.0067	0.00014	0.00018	0.00037	0.00047
F	3.97	5.45	0.30	0.33	0.35	0.68
N	2085	2085	2085	2085	2085	2085
Panel B	$d^{GuD}Res$	$d^{GuD}Res$	$d^{NgD}Res$	$d^{NgD}Res$	*y Res*	*y Res*
Spread_Ind	0.015		−0.0025		0.0050	
	(0.0094)		(0.019)		(0.0081)	
Spread_Ind Res		0.019**		−0.0032		0.0064
		(0.0092)		(0.022)		(0.0085)
R^2	0.0033	0.0042	0.0000076	0.0000097	0.00036	0.00046
F	2.43	4.18	0.017	0.021	0.38	0.57
N	1795	1795	1792	1792	1795	1795

Notes: This table shows the first stage regression of the reduced-form VAR residuals on external public debt spread instruments. *Spread_Ind* is the spread indicator, which equals 1 if the standardized spread is above the sample median. *Spread_Ind Res* is the residual from a regression of the external public debt spread indicator on the VAR independent variables (including country fixed effects). Standard errors in all columns are dually clustered on country and year and presented in parentheses. *, **, and *** indicate significance at the levels of 10%, 5%, and 1%, respectively.

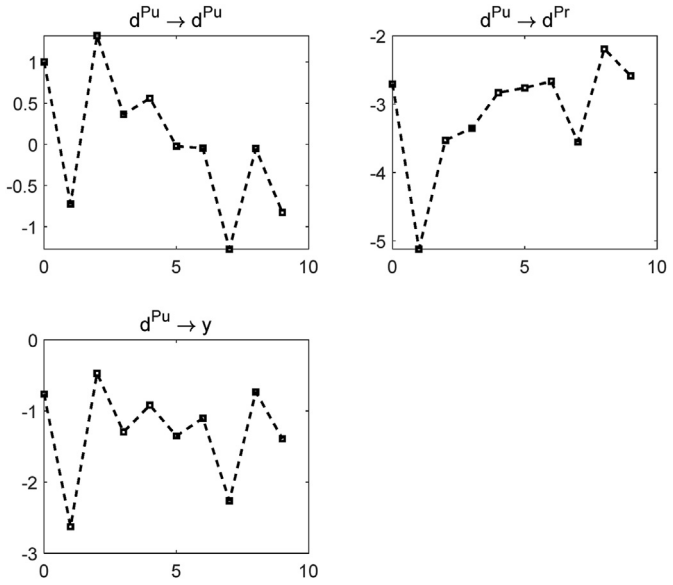

Fig. 2. Variance decomposition for the VAR system with external public debt. *Notes*: This figure shows the impulse responses to an external public debt shock identified using an indicator variable for whether the standardized public external spread is above the median as an external instrument in a proxy VAR.

economic growth. The public sector plays a more important role in driving macroeconomic instability. Then, our paper explores the causality relationship underlying the external debt–growth nexus using the newly developed proxy VAR method with sovereign foreign spreads as an instrument. We identify the dynamic causal effects of external sovereign debt expansion on subsequent economic downturns. Further, we demonstrate that countries with higher institutional quality can benefit from external debt expansion, although the spread is high.

Our results imply several policy implications with regards to external debt expansion in LMCs. First, governments in LMCs should be more prudent in using the foreign debt channel to fund domestic development, as rapid growth in external sovereign debt has a significantly depressing effect on future economic growth. Second, interest rate regulation is meaningless for those highly indebted countries in which the institutions are poor. Efficient debt regulation and growth policies should be tailored to a country's specific institutional conditions.

Table 8
Triple interaction of public (publicly guaranteed) external debt, external sovereign spreads, and institutional quality.

	(1) $\Delta_5 y_{i,t+5}$	(2) $\Delta_5 y_{i,t+5}$	(3) $\Delta_5 y_{i,t+5}$	(4) $\Delta_5 y_{i,t+5}$
$\Delta_5 d^{PuD}_{i,t} \times Quality_{i,t-5} \times Spread_{i,t}$	0.801**	0.809**		
	(0.381)	(0.380)		
$\Delta_5 d^{GuD}_{i,t} \times Quality_{i,t-5} \times Spread_{i,t}$			0.752*	0.757*
			(0.419)	(0.419)
$Quality_{i,t-5} \times \Delta_5 d^{PuD}_{i,t}$	0.021	0.022		
	(0.043)	(0.044)		
$\Delta_5 d^{PuD}_{i,t} \times Spread_{i,t}$	−3.469*	−3.235*		
	(1.787)	(1.698)		
$Quality_{i,t-5} \times \Delta_5 d^{GuD}_{i,t}$			0.012	0.012
			(0.050)	(0.051)
$\Delta_5 d^{GuD}_{i,t} \times Spread_{i,t}$			−3.213*	−2.965*
			(1.789)	(1.703)
$Quality_{i,t-5} \times Spread_{i,t}$	−1.325	−0.681	−1.350	−0.715
	(1.498)	(1.476)	(1.527)	(1.506)
$\Delta_5 d^{PuD}_{i,t}$	−0.057	−0.056		
	(0.263)	(0.266)		
$\Delta_5 d^{GuD}_{i,t}$			0.000	0.003
			(0.289)	(0.293)
$Quality_{i,t-5}$	0.049	0.050	0.049	0.051
	(0.109)	(0.114)	(0.109)	(0.114)
$Spread_{i,t}$	9.935	6.776	9.903	6.793
	(8.242)	(8.161)	(8.396)	(8.316)
$\Delta_5 NFD\_GDP_{i,t}$		0.037		0.036
		(0.112)		(0.113)
$\Delta_5 Openness_{i,t}$		0.045		0.044
		(0.060)		(0.060)
Constant	−0.343	−0.332	−0.350	−0.339
	(0.654)	(0.680)	(0.656)	(0.681)
CountryFE	Yes	Yes	Yes	Yes
YearFE	Yes	Yes	Yes	Yes
N	636	622	636	622
F	8.856	8.910	9.335	9.412
R^2	0.210	0.205	0.210	0.205

Notes: This table reports tests for the interaction impact of external debt growth, external sovereign spreads, and institutional quality on 5-year changes in log GDP. Institutional quality, $Quality_{i,t-5}$, is measured by the index of economic freedom. $Spread_{i,t}$ is the difference between the interest rates on new external public debt commitment relative to the yield of 10-year U.S. government bonds. All regressions include controls for country and year fixed effects. *, **, and *** indicate significance at the levels of 10%, 5%, and 1%, respectively.

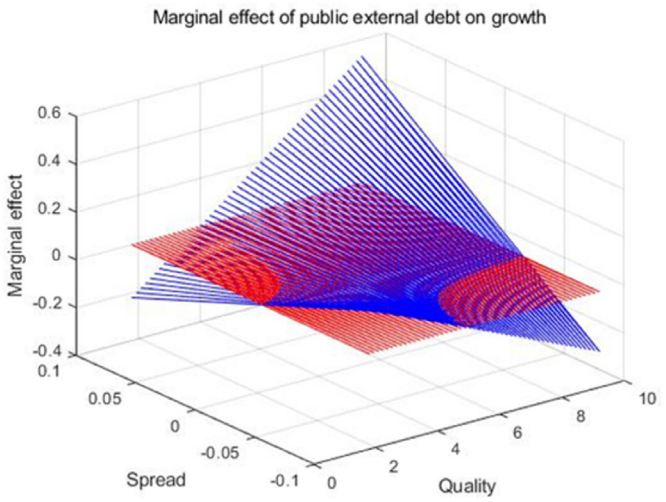

Fig. 3. Marginal effect of external public debt on growth. *Notes*: This figure shows the ME of external public debt on GDP growth. The blue surface represents the ME function, and the red surface represents the region for zero ME. It can be observed that when *Quality* and *Spread* are high, the ME of external debt on growth is greater than zero. This finding supports our argument that countries with better institutions can benefit from external public debt financing, even if borrowing costs are high. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

There are several ways in which this paper could be extended. First, another form of conducting predictive analysis on external debt would be to construct coincident or leading indicators of macroeconomic activity and taking out-of-sample forecasts. Second, in considering the spillover effects of shocks on a small group of countries, an important aspect for future research would be to address the issue of global instability related to LMCs' external debt expansion. The channels for shock transmission also deserve additional research.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix

Table A1
Country list

Group	Economy	Group	Economy	Group	Economy
Upper middle	Albania	Upper middle	Peru	Lower middle	Nicaragua
Upper middle	Argentina	Upper middle	Paraguay	Lower middle	Pakistan
Upper middle	Armenia	Upper middle	Romania	Lower middle	Philippines
Upper middle	Azerbaijan	Upper middle	Russian Federation	Lower middle	Papua New Guinea
Upper middle	Bulgaria	Upper middle	Serbia	Lower middle	Senegal
Upper middle	Bosnia and Herzegovina	Upper middle	Thailand	Lower middle	Solomon Islands
Upper middle	Belarus	Upper middle	Turkmenistan	Lower middle	El Salvador
Upper middle	Belize	Upper middle	Turkey	Lower middle	Tunisia
Upper middle	Brazil	Upper middle	Venezuela, RB	Lower middle	Ukraine
Upper middle	China	Upper middle	South Africa	Lower middle	Uzbekistan
Upper middle	Colombia	Lower middle	Angola	Lower middle	Vietnam
Upper middle	Costa Rica	Lower middle	Bangladesh	Lower middle	Zambia
Upper middle	Dominican Republic	Lower middle	Bolivia	Lower middle	Zimbabwe
Upper middle	Algeria	Lower middle	Bhutan	Low	Haiti
Upper middle	Ecuador	Lower middle	Côte d'Ivoire	Low	Madagascar
Upper middle	Fiji	Lower middle	Cameroon	Low	Mozambique
Upper middle	Georgia	Lower middle	Egypt, Arab Rep.	Low	Malawi
Upper middle	Guatemala	Lower middle	Ghana	Low	Niger
Upper middle	Guyana	Lower middle	Honduras	Low	Rwanda
Upper middle	Jamaica	Lower middle	Indonesia	Low	Tajikistan
Upper middle	Jordan	Lower middle	India	Low	Tanzania
Upper middle	Kazakhstan	Lower middle	Kenya	Low	Uganda
Upper middle	Lebanon	Lower middle	Kyrgyz Republic		
Upper middle	Sri Lanka	Lower middle	Cambodia		
Upper middle	Maldives	Lower middle	Lao PDR		
Upper middle	Mexico	Lower middle	Morocco		
Upper middle	North Macedonia	Lower middle	Moldova		
Upper middle	Montenegro	Lower middle	Mongolia		
Upper middle	Mauritius	Lower middle	Nigeria		

Table A2
Correlation matrix

	$\Delta_3 d^{TtD}$	$\Delta_3 d^{ShD}$	$\Delta_3 d^{LgD}$	$\Delta_3 d^{PuD}$	$\Delta_3 d^{PrD}$	$\Delta_3 d^{GuD}$	$\Delta_3 d^{NgD}$	*NFD_GDP*	*Openness*	*Quality*	*Exchange*	*IRC*	*Kaopen*	*FinDev*	*Spread*
$\Delta_3 d^{TtD}$	1														
$\Delta_3 d^{ShD}$	0.363***	1													
$\Delta_3 d^{LgD}$	0.814***	0.0370	1												
$\Delta_3 d^{PuD}$	0.645***	0.062***	0.771***	1											
$\Delta_3 d^{PrD}$	0.283***	0.0200	0.302***	−0.050**	1										
$\Delta_3 d^{GuD}$	0.646***	0.061***	0.773***	0.997***	−0.045**	1									
$\Delta_3 d^{NgD}$	0.262***	0.0180	0.277***	−0.062***	0.942***	−0.063*	1								
NFD_GDP	0.0060	0.0010	−0.0010	−0.0010	0.0110	0.00100	0.0090	1							
Openness	0.0100	0	0.0070	0.0050	0.0110	0.00500	0.0110	0.301***	1						
Quality	−0.0150	−0.0290	0.010	0.0080	0.0070	0.0130	0.0020	0.256***	0.353***	1					
Exchange	0.0010	0.0050	−0.0010	−0.0010	−0.0050	−0.00100	−0.0040	−0.138***	0.123***	0.0550	1				
IRC	0.0070	0.0080	0.0040	0.0050	−0.0020	0.00500	−0.0100	0.114***	0.293***	0.513***	0.091***	1			
Kaopen	−0.0040	−0.0050	−0.0010	−0.0010	0.0080	−0.00200	0.0040	0.143***	0.197***	0.561***	0.058**	0.358***	1		
FinDev	−0.0160	0.0080	−0.0330	−0.0050	−0.0080	−0.00500	−0.0080	0.065***	0.176***	0.147***	0.0270	0.420***	0.099*	1	
Spread	0.0090	0.0060	0.0070	0.0180	−0.0040	0.0190	−0.0080	−0.0290	0.130***	0.347***	0.085***	0.368***	0.253*	0.051**	1

Table A3
Robustness checks for the predictability of total and long-term external debt

	Dependent variable: $\Delta_3 y_{i,t+1}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	AB–GMM	OLS	OLS	OLS	AB–GMM	OLS	OLS
$\Delta_3 d^{TtD}_{i,t-1}$	−0.0825**	−0.272***	−0.0939**	−0.0329				
	(0.039)	(0.092)	(0.040)	(0.025)				
$\Delta_3 d^{LgD}_{i,t-1}$					−0.130***	−0.303***	−0.120***	−0.0625**
					(0.042)	(0.097)	(0.035)	(0.025)
Trend			0.00104				0.00105	
			(0.001)				(0.001)	
CountryFE	Yes	No	Yes	Yes	Yes	No	Yes	Yes
LDV	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
YearFE	No	No	No	Yes	No	No	No	Yes
Sample	Non-over.	Non-over.	Full	Full	Non-over.	Non-over.	Full	Full
R^2	0.0855	–	0.115	0.144	0.0962	–	0.121	0.147
N	683	452	1969	1969	683	452	1969	1969

Notes: This table presents robustness checks for total and long-term external debt with inclusion of private external debt measures. Columns 1 and 5 perform robustness checks using only non-overlapping years for the basic specification. Columns 2 and 6 use the Arellano and Bond (1991) GMM estimator for the same non-overlapping sample. Columns 3 and 7 estimate using the full sample with additional year trends. Columns 5 and 8 report estimates with the inclusion of additional year fixed effects using the full sample. In each column, the dependent variable is $\Delta_3 y_{i,t+1}$, which represents log GDP growth from year t–2 to t + 1. All regressions include country fixed effects. Standard errors in all columns are dually clustered on country and year and presented in parentheses. *, **, and *** indicate significance at the levels of 10%, 5%, and 1%, respectively.

Table A4
Triple interaction of public (publicly guaranteed) external debt, external sovereign spreads, and institutional quality

	(1)	(2)	(3)	(4)
	$\Delta_3 y_{i,t+1}$	$\Delta_3 y_{i,t+1}$	$\Delta_3 y_{i,t+1}$	$\Delta_3 y_{i,t+1}$
$\Delta_3 d^{PuD}_{i,t} \times Quality_{i,t-3} \times Spread_{i,t}$	2.533*	2.387*		
	(1.438)	(1.386)		
$\Delta_3 d^{GuD}_{i,t} \times Quality_{i,t-3} \times Spread_{i,t}$			2.681*	2.518*
			(1.427)	(1.377)
$Quality_{i,t-3} \times \Delta_3 d^{PuD}_{i,t}$	0.104***	0.111***		
	(0.037)	(0.035)		
$\Delta_3 d^{PuD}_{i,t} \times Spread_{i,t}$	−14.156	−13.678		
	(8.768)	(8.458)		
$Quality_{i,t-3} \times \Delta_3 d^{GuD}_{i,t}$			0.101***	0.107***
			(0.035)	(0.033)
$\Delta_3 d^{GuD}_{i,t} \times Spread_{i,t}$			−14.937*	−14.357*
			(8.693)	(8.395)
$Quality_{i,t-3} \times Spread_{i,t}$	0.763	0.596	0.779	0.616
	(0.618)	(0.562)	(0.613)	(0.558)
$\Delta_3 d^{PuD}_{i,t}$	−0.697***	−0.743***		
	(0.244)	(0.224)		
$\Delta_3 d^{GuD}_{i,t}$			−0.674***	−0.718***
			(0.230)	(0.211)
$Quality_{i,t-3}$	−0.029	−0.032	−0.028	−0.031
	(0.037)	(0.037)	(0.037)	(0.037)
$Spread_{i,t}$	−4.688	−3.851	−4.798	−3.979
	(3.955)	(3.601)	(3.925)	(3.573)
$\Delta_3 NFD\_GDP_{i,t}$		−0.385*		−0.381*
		(0.211)		(0.212)
$\Delta_3 Openness_{i,t}$		−0.167		−0.167
		(0.110)		(0.110)
Constant	0.173	0.205	0.165	0.198
	(0.199)	(0.199)	(0.198)	(0.198)
CountryFE	Yes	Yes	Yes	Yes
YearFE	Yes	Yes	Yes	Yes
N	970	951	970	951
F	13.025	23.202	13.086	23.441
R^2	0.264	0.276	0.263	0.275

Notes: This table reports the tests for the interaction impact of external debt growth, external sovereign spreads, and institutional quality on 3-year changes in log GDP. Institutional quality, $Quality_{i,t-3}$, is measured by the index of economic freedom. $Spread_{i,t}$ is the difference between the interest rates on new external public debt commitments relative to 10-year U.S. government bond yields. All regressions include controls for country and year fixed effects. *, **, and *** indicate significance at the levels of 10%, 5%, and 1%, respectively.

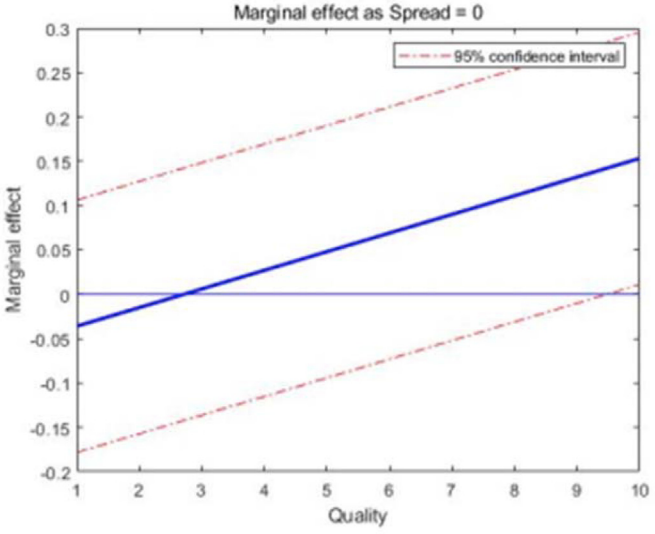

Fig. A1. Marginal effect of external public debt on growth when *Spread* = 0. *Notes:* This figure plots the ME function for the case in which *Spread* equals zero. The figure shows that the ME of external debt on growth is a positive function of institutional quality, which indicates that institutional quality improvement can mitigate the negative effect of external debt on growth.

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