Journal of Financial Stability 72 (2024) 101245

Contents lists available at ScienceDirect

Journal of Financial Stability

journal homepage: www.elsevier.com/locate/jfstabil

Government debt and stock price crash risk: International Evidence

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A R T I C L E I N F O

JEL classification:
G12
G14
G38
H63
E62

Keywords:
Government debt
Fiscal policy uncertainty
Bad news hoarding
Tax avoidance
Crash risk

A B S T R A C T

We add to the literature on the economic outcomes of government debt and argue that government debt increases crash risk via two channels: (i) hoarding bad news and (ii) tax avoidance. Based on a large international sample, our results indicate that stock crash risk is positively associated with government debt. Our conclusions are robust when we treat endogeneity issues, and our tests confirm the validity of bad news hoarding and tax avoidance as channels through which government debt influences stock price crash risk.

1. Introduction

The government debt variable has been recently raised to reduce fiscal imbalances. The rise in government debt increases interest rates, thus raising borrowing costs and reducing corporate borrowing. The intuition behind this strategy is that investors replace high-quality corporate debt with long-term government bonds when interest rates increase (Dissanayake et al., 2022). Several studies have documented this phenomenon, known as the crowding-out effect. Government debt is the ratio of government debt over GDP, which measures government debt level. For instance, Demirci et al. (2019) use a sample from 40 countries to show that government debt negatively correlates with corporate leverage. Using a US sample, Graham et al. (2014) show that government debt crowds out corporate leverage and reduces a firm's ability to finance its investments. Issuing government debt also leads to uncertainty about the restoration of fiscal balance. Indeed, a government may increase taxes to restore a balanced budget. Croce et al. (2020) show that fiscal policy uncertainty associated with high government debt level is priced and find that government debt increases the cost of equity of highly innovative firms in the US. Huang et al. (2020) highlight that government debt and investment in fixed assets are negatively related in China. Fan et al. (2022) demonstrate a negative relationship between the number of patents, research and development expenses, and government debt for Chinese firms. They also show that the adverse effects of government debt on innovation are more pronounced in financially constrained firms (i.e., small and low cash flow firms). Dissanayake et al. (2022) show that the likelihood of acquiring target firms is negatively related to government debt in the US. The authors also demonstrate that this relationship is stronger in credit-worthy firms and when fiscal policy uncertainty is high.

We augment this literature strand by examining the impact of government debt on the distribution of stock returns. Specifically, we focus on an important characteristic of the distribution of stock returns: crash risk. Following recent related studies (e.g., Kim et al., 2011; Ben_Nasr and Ghouma 2018; Balachandran et al., 2020; Hu et al., 2020), we define crash risk as large and sudden decrease in stock prices due to the hoarding of bad news by managers to protect their careers and compensation (e.g., Jin and Myers, 2006) for instance. At a certain point, hiding the bad news is no longer possible or is associated with a high cost. Finally, when the public learns of the bad news, prices crash. Crash risk is an important research topic because it affects stock returns (e.g., Conrad et al., 2013) and stock return volatility since it helps

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https://doi.org/10.1016/j.jfs.2024.101245
Received 20 July 2023; Received in revised form 26 January 2024; Accepted 8 February 2024
Available online 16 February 2024

Table 1
Sample distribution by country. This table presents the distribution of our sample of 187,991 firm-year observations used in our multivariate regression by country.

Country	Number of firms		Number of observations	
	N	%	N	%
Argentina	54	0.26%	319	0.17%
Australia	1128	5.44%	9038	4.81%
Austria	46	0.22%	527	0.28%
Bangladesh	26	0.13%	67	0.04%
Belgium	68	0.33%	735	0.39%
Brazil	204	0.98%	1889	1.00%
Bulgaria	11	0.05%	56	0.03%
Canada	296	1.43%	3255	1.73%
China, People'	78	0.38%	810	0.43%
Colombia	29	0.14%	238	0.13%
Croatia	59	0.28%	399	0.21%
Czech Republic	9	0.04%	71	0.04%
Denmark	82	0.40%	755	0.40%
Egypt	121	0.58%	783	0.42%
Finland	83	0.40%	771	0.41%
France	431	2.08%	4469	2.38%
Germany	403	1.94%	3840	2.04%
Ghana	15	0.07%	46	0.02%
Greece	153	0.74%	1572	0.84%
Hong Kong	129	0.62%	1208	0.64%
Hungary	19	0.09%	200	0.11%
Iceland	10	0.05%	60	0.03%
India	2029	9.78%	16016	8.52%
Indonesia	173	0.83%	1250	0.66%
Ireland	67	0.32%	755	0.40%
Italy	169	0.81%	1648	0.88%
Japan	2788	13.44%	36954	19.66%
Jordan	88	0.42%	743	0.40%
Kazakhstan	6	0.03%	21	0.01%
Kenya	31	0.15%	196	0.10%
Korea, Republic	1283	6.18%	8471	4.51%
Lebanon	3	0.01%	18	0.01%
Lithuania	21	0.10%	156	0.08%
Luxembourg	30	0.14%	211	0.11%
Malaysia	623	3.00%	6110	3.25%
Mexico	89	0.43%	892	0.47%
Morocco	46	0.22%	374	0.20%
Netherlands	106	0.51%	1245	0.66%
New Zealand	66	0.32%	573	0.30%
Nigeria	60	0.29%	226	0.12%
Norway	94	0.45%	833	0.44%
Pakistan	176	0.85%	1535	0.82%
Peru	74	0.36%	505	0.27%
Philippines	123	0.59%	1179	0.63%
Poland	303	1.46%	2050	1.09%
Portugal	28	0.13%	227	0.12%
Qatar	16	0.08%	139	0.07%
Romania	58	0.28%	343	0.18%
Russia	181	0.87%	905	0.48%
Saudi Arabia	93	0.45%	686	0.36%
Serbia	33	0.16%	50	0.03%
Singapore	433	2.09%	4226	2.25%
Slovenia	17	0.08%	126	0.07%
South Africa	177	0.85%	1913	1.02%
Spain	97	0.47%	808	0.43%
Sri Lanka	130	0.63%	1050	0.56%
Sweden	297	1.43%	2361	1.26%
Switzerland	140	0.67%	1720	0.91%
Taiwan	1291	6.22%	12261	6.52%
Thailand	412	1.99%	3481	1.85%
Tunisia	38	0.18%	259	0.14%
Turkey	220	1.06%	2127	1.13%
Ukraine	23	0.11%	68	0.04%
United Arab Emirates	40	0.19%	301	0.16%
United Kingdom	796	3.84%	8641	4.60%
United States	3749	18.07%	30673	16.32%
Venezuela	4	0.02%	6	0.00%
Vietnam	576	2.78%	2551	1.36%
Total	20751	100%	187991	100.00%

predict option prices (Zaman et al., 2021).

Government debt may affect stock price crash risk for two main reasons. First, high government debt level may be associated with bad news hoarding. Indeed, higher levels of a country's government debt relative to GDP have been shown to be associated with an increase in interest rates (e.g., Laubach, 2009) and, hence, borrowing costs, which may lead to a decline in stock prices. Consistent with this view, Pástor and Veronesi (2012); 2013 report evidence suggesting that government policy uncertainty is associated with an increase in the stock risk premium, which results in higher cost equity financing and lower stock prices. In the same vein, Croce et al. (2020) argue that investors interpret periods with high government debt level as bad times, requiring higher stock returns. Wisniewski and Jackson (2021) show that stock prices are negatively related to government debt level. They also demonstrate that an increase in interest rates is the channel through which a high government debt level leads to a decrease in stock prices. The decline in stock prices may adversely affect managers' stock price-based compensation and careers. Anticipating a decline in stock price, managers may withhold negative news to protect their compensation (Yung and Root, 2019), careers, and reputation (e.g., Jin and Myers, 2006). At a certain point, hiding the bad news is no longer possible or is associated with a high cost. The public will learn of the bad news, which leads prices to crash.

Second, government debt level may affect stock price crash risk through tax avoidance. A high government debt level may increase fiscal policy uncertainty since it raises doubts regarding future tax rates and government spending. Indeed, the government may increase tax rates or decrease spending to cover a budget deficit (Wisniewski and Jackson, 2021). Croce et al. (2020) show that tax policy uncertainty stemming from government debt issuance increases the cost of equity and reduces research and development expenses, especially for highly innovative firms. Liu (2023) found that fiscal policy uncertainty is the channel through which high government debt level leads to an increase in excess stock returns (i.e., equity risk premium) in the US. Similarly, Dissanayake et al. (2022) report evidence suggesting that fiscal policy (tax policy and government spending) uncertainty is a mechanism through which high government debt leads to a lower likelihood of acquiring target firms in the US. We agree that managers may interpret high government debt level as an indicator of high future corporate taxes, increasing their incentives to engage in tax avoidance. Withholding negative news is easier in firms that aggressively avoid taxes since they are better equipped to hide bad information. Consistent with this view, Kim et al. (2011) show that information asymmetry stemming from tax avoidance activities is associated with suppressing negative information and, hence, with stock price crash risk. Our findings are also consistent with the conjecture that government debt is positively related to tax policy uncertainty, which increases tax avoidance and facilitates the hoarding of bad news, increasing the likelihood of stock price crash risk.

To examine the impact of government debt level on stock price crash risk, we use a sample of 187,991 firm-year observations from 68 countries from 1992 to 2017. We show that a higher level of government debt relative to GDP is associated with higher crash risk at both the market and firm levels. We use a two-way mediation analysis to validate our channels. Income smoothing and tax avoidance mediate the relationship between government debt level and stock price crash risk. Our results remain qualitatively unchanged when we use the instrumental variable, entropy balancing, and change regression approaches to address endogeneity issues. Our results hold up to several robustness tests and alternative crash risk proxies. We also perform several cross-sectional tests. We show that the positive relationship between government debt level and stock price is more pronounced in countries with low government debt ratings. We also show that the adverse effects of government debt level on stock price crash risk are less pronounced in larger and more liquid stock markets, financially open countries, and highly competitive industries.

Our paper makes several contributions to the literature. First, it

Table 2
Statistical descriptions. Descriptions of our variables are presented in this table. The full sample includes 187,991 firm-year observations from 68 countries over the period 1992–2017.

Variable	Number of observations	Mean	Median	Standard deviation	1st quartile	3rd quartile
N_SKEW_t	187,991	−0.142	−0.169	1.117	−0.901	0.552
D_UVOL_t	187,991	−0.084	−0.091	0.429	−0.358	0.175
$GOVDEBT\_GDP_{t-1}$	187,991	0.879	0.688	0.620	0.408	1.048
N_SKEW_{t-1}	187,991	−0.137	−0.161	1.205	−0.874	0.541
$FIRM\_SIZE_{t-1}$	187,991	12.253	12.122	2.203	10.757	13.694
$LEVER_{t-1}$	187,991	0.119	0.067	0.145	0.001	0.189
MTB_{t-1}	187,991	1.983	1.313	2.626	0.733	2.383
$RTOA_{t-1}$	187,991	−0.017	0.030	0.286	−0.002	0.068
AQ_{t-1}	187,991	0.570	0.095	2.339	0.039	0.258
RET_AVG_{t-1}	187,991	−0.001	−0.001	0.012	−0.006	0.006
RET_STDEV_{t-1}	187,991	0.064	0.054	0.039	0.038	0.079
$TURNOVER_{t-1}$	187,991	−0.055	0.000	2.475	−0.006	0.006
LAW_ORDER_{t-1}	187,991	4.644	5.000	0.936	4.000	5.000
LN_GDPC_{t-1}	187,991	9.789	10.475	1.296	8.947	10.704
$GDPG_{t-1}$	187,991	3.207	2.651	3.292	1.485	5.061
$INFL_{t-1}$	187,991	0.030	0.021	0.103	0.007	0.038
$LN\_EXCH\_RATE_{t-1}$	187,991	0.012	0.000	0.085	-0.030	0.047
$INCOME\_SMOOTHING_{t-1}$	174,368	0.302	0.478	0.614	-0.159	0.848
$TAX\_AVOIDANCE_{t-1}$	142,971	-0.254	-0.258	0.182	-0.362	-0.114

contributes to the growing literature on the effect of government debt on (i) corporate leverage (e.g., Demirci et al., 2019; Lugo and Piccillo, 2019), (ii) investment in fixed assets (e.g., Graham et al., 2014; Huang et al., 2020), (iii) innovation (e.g. Fan et al., 2022) and (iv) M&As (e.g. Dissanayake et al., 2022). We augment this strand of literature by studying the effect of government debt on stock price crash risk. Second, we contribute to the literature that examines the effect of macroeconomic factors on stock price crash risk, which is limited to the best of our knowledge. Li et al. (2018) show that political uncertainty induced by national elections increases managers' incentives to withhold bad news, increasing stock price crash risk. In this paper, we shed new light on the mechanisms behind the impact of fiscal policy uncertainty stemming from high government debt level on stock prices. We show that income smoothing and tax avoidance are two channels through which fiscal policy uncertainty stemming from high government debt level leads to higher stock price crash risk.

2. Research design

2.1. Sample

We gather data on (i) government debt over GDP from several sources, including the International Monetary Fund (IMF) and World Development Indicators (WDIs). We exclude firm-year observations from countries that experienced sovereign debt default or restructuring, in line with Demirci et al. (2019). We use all listed firms in DataStream to collect weekly stock returns. We remove firms from countries with missing government data from 1992 to 2017. We remove observations having a book value of equity with a negative value, firms having less than 26 weeks of stock return data in a given year, and observations with missing crash risk data, in line with Kim et al. (2011). We exclude finance (i.e., industries with sic-codes between 6000 and 6999) and utility (i.e., industries with sic-codes between 4900 and 4999) firm-year observations.[1] We also collect financial data from Worldscope and macroeconomic control variables from the WDIs, IMF, the Bank for International Settlements (BIS), Chinn and Ito (2006), Baker et al. (2016), and Worldwide Governance Indicators (WGI). We merge the government data with the calculated crash risk proxies and financial and macroeconomic data. We further exclude observations with missing financial and macroeconomic data. We winsorise the data at the 1% and 99% levels. Over the period between 1992 and 2017, a total of 187,991 firm-year observations were collected across 68 countries. Table 1 presents the distribution of our sample firm-year observations by country. As we can see, the USA has the largest number of firms (i.e., 18.07%), and Japan has the second largest number of firms (13.44%). As for the number of firm-year observations, Japan has the largest proportion of firm-year observations (i.e., 19.66%), and the USA has the second largest proportion of firm-year observations (i.e., 16.32%).

2.2. Variables and empirical model

2.2.1. Stock price crash risk proxies

We regress weekly stock returns for firm i at week t on the current, one week ago, two weeks ago, one week ahead, and two weeks ahead market returns at week t to account for the non-synchronicity in trading, in line with Dimson (1979) and Kim et al. (2011). We estimate this regression for each firm-year, in line with Liang et al. (2020). Then we calculate the residuals (ξi,t). Our proxy for the returns specific to the firm is (1+ξi,t). Our first proxy for crash risk (N_SKEW) is the negative skewness of (1+ξi,t). A higher value for N_SKEW indicates a higher likelihood of a stock price crash. We calculate 'down-to-up volatility' as the standard deviation of (1+ξi,t) in weeks during which (1+ξi,t) has a lower level than the sample's annual average divided by the standard deviation of (1+ξi,t) during weeks in which (1+ξi,t) is higher than the sample annual average. Our second measure (D_UVOL) is the logarithm of 'down-to-up volatility'.

2.2.2. Government debt

Our proxy for government debt is government debt over GDP (*GOVDEBT_GDP*), in line with Demirci et al. (2019).

2.2.3. Model

The following model is used to examine the impact of government debt on stock crash risk:

$$CRASH\_R_{i,t} = \theta_0 + \theta_1 GOVDEBT\_GDP_{i,t-1} + \theta_2 CONTROLS_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

where CRASH_R is either N_SKEW or D_UVOL. CONTROLS include the following variables: $N\_SKEW_{i,t-1}$ is the lagged negative skewness, FIRM_SIZE is the natural logarithm of the firm's total assets in US$, LEVER is the ratio of the long-term debt over the total assets, MTB is the market-to-book ratio, RTOA is the ratio of net income over total assets,

[1] We follow the approach in Al Farooque et al. (2023) and Trinh et al. (2021).

Table 3
Correlation coefficients. Listed below are correlation coefficients between our variables. Statistically significant at the 1% level is indicated by bold type.

Variable	N_SKEW_t	D_UVOL_t	$GOVDEBT\_GDP_{t-1}$	N_SKEW_{t-1}	$FIRM\_SIZE_{t-1}$	$LEVER_{t-1}$	MTB_{t-1}	$RTOA_{t-1}$	AQ_{t-1}	RET_AVG_{t-1}	RET_STDEV_{t-1}	$TURNOVER_{t-1}$	LAW_ORDER_{t-1}	LN_GDPC_{t-1}	$GDPG_{t-1}$	$INFL_{t-1}$	$\Delta EXCH\_RATE_{t-1}$	$INCOME\_SMOOTHING_{t-1}$
D_UVOL_t	**0.841**																	
$GOVDEBT\_GDP_{t-1}$	**0.039**	**0.053**																
N_SKEW_{t-1}	**0.055**	**0.031**	**0.043**															
$FIRM\_SIZE_{t-1}$	**0.019**	**0.112**	**0.177**	**0.008**														
$LEVER_{t-1}$	**−0.013**	**0.030**	−0.004	**−0.006**	**0.234**													
MTB_{t-1}	**0.020**	**0.047**	**−0.070**	**−0.053**	**0.045**	−0.003												
$RTOA_{t-1}$	**−0.008**	**0.010**	**0.016**	**−0.042**	**0.242**	0.002	**0.013**											
AQ_{t-1}	**−0.021**	**−0.011**	**−0.041**	**−0.015**	**−0.062**	**−0.025**	**0.035**	−0.054										
RET_AVG_{t-1}	**−0.021**	**0.076**	**0.010**	**−0.594**	**0.142**	**0.043**	**0.110**	0.105	0.025									
RET_STDEV_{t-1}	**0.018**	**−0.025**	**−0.121**	**0.097**	**−0.407**	**−0.025**	**−0.026**	−0.283	0.061	−0.259								
$TURNOVER_{t-1}$	**0.015**	**0.015**	**0.011**	**−0.076**	**0.014**	0.004	**0.016**	0.008	−0.001	0.104	0.027							
LAW_ORDER_{t-1}	**0.011**	**0.062**	**0.202**	**0.021**	**0.094**	**0.022**	**0.040**	−0.064	0.050	0.026	0.040	0.004						
LN_GDPC_{t-1}	**0.038**	**0.125**	**0.349**	**0.045**	**0.206**	**0.038**	**0.052**	−0.087	0.007	0.059	0.001	0.004	0.597					
$GDPG_{t-1}$	**0.016**	**−0.057**	**−0.418**	**−0.056**	**−0.172**	**−0.046**	**0.010**	0.058	0.013	−0.022	−0.034	0.006	−0.207	−0.610				
$INFL_{t-1}$	**−0.015**	**−0.024**	**−0.128**	0.003	−0.051	0.003	**−0.008**	0.010	0.005	−0.029	0.025	−0.006	−0.197	−0.197	0.106			
$\Delta EXCH\_RATE_{t-1}$	**-0.018**	**-0.026**	0.002	**0.048**	-0.001	0.002	**-0.026**	**0.021**	**-0.047**	**-0.104**	**-0.023**	0.005	**-0.153**	**-0.100**	**0.050**	**0.089**		
$INCOME\_SMOOTHING_{t-1}$	**0.002**	-0.007	**0.032**	0.003	**0.054**	**0.026**	**-0.060**	**0.120**	**-0.019**	**-0.009**	**-0.074**	0.001	**-0.047**	**-0.065**	**0.021**	**0.032**	**0.015**	
$TAX\_AVOIDANCE_{t-1}$	**0.015**	0.003	-0.145	0.002	**-0.150**	**-0.024**	**0.018**	**-0.061**	-0.004	**-0.024**	**0.088**	-0.003	**-0.075**	**-0.065**	**0.075**	**0.079**	**0.014**	-0.031

Table 4
Main results. This table presents the results of regressing *N_SKEW* and *D_UVOL* on the ratio of government debt over GDP (*GOVDEBT_GDP*) as well as the control variables and country, industry, and year dummies. Below each estimate are the z-statistics. 10% significance level is indicated by *, 5% significance level is indicated by **, and 1% significance level is indicated by ***.

Variables	(1) N_SKEW_t	(2) D_UVOL_t
$GOVDEBT\_GDP_{t-1}$	0.195***	0.031***
	(27.568)	(3.977)
N_SKEW_{t-1}	0.060***	0.030***
	(19.037)	(24.226)
$FIRM\_SIZE_{t-1}$	0.019***	0.017***
	(11.291)	(25.121)
$LEVER_{t-1}$	-0.083***	-0.009
	(−4.309)	(−1.138)
MTB_{t-1}	0.006***	0.003***
	(5.406)	(6.956)
$RTOA_{t-1}$	-0.058***	0.005
	(−5.713)	(1.193)
AQ_{t-1}	0.000	0.000
	(0.414)	(0.175)
RET_AVG_{t-1}	1.763***	3.307***
	(5.628)	(25.293)
RET_STDEV_{t-1}	1.676***	0.338***
	(18.195)	(8.657)
$TURNOVER_{t-1}$	0.002***	0.000**
	(3.475)	(2.541)
LAW_ORDER_{t-1}	-0.015***	0.003
	(−2.615)	(0.746)
LN_GDPC_{t-1}	-0.075***	0.012***
	(−12.650)	(3.084)
$GDPG_{t-1}$	0.006***	0.001
	(4.020)	(1.430)
$INFL_{t-1}$	-0.035	0.005
	(−1.550)	(0.445)
$\Delta EXCH\_RATE_{t-1}$	-0.218***	-0.026*
	(−5.741)	(−1.691)
Country fixed effects	Yes	Yes
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Constant	0.192**	-0.425***
	(2.562)	(−11.353)
Observations	187,991	187,991
R-squared	0.094	0.072

AQ is the absolute value of Ball and Shivakumar (2005) measure of abnormal accruals, RET_AVG is the yearly average of $(1+\xi_{i,t})$; weekly returns' standard deviation during the year is RET_STDEV, TURNOVER is the change between the average monthly turnover at the beginning and end of the year, LAW_ORDER is the law-and-order index from ICRG, LN_GDPC is the natural logarithm of GDP per capita, GDPG is the growth in GDP per capita, INFL is the inflation rate calculated as the percentage change in the consumer price index, and ΔEXCH_RATE is the yearly change of the country's exchange rate that is denoted in local currency units per US dollar. $\varepsilon_{i,t}$ is the error term. We include dummy variables for each to control for enduring effects due to country, industry, and year. We report summary statistics in Table 2, define our variables, and provide their sources in the Appendix. Table 3 reports the correlation coefficients between our variables. We report a positive and significant correlation at the 1% level between GOVDEBT_GDP and both N_SKEW and D_UVOL. This result provides initial evidence for our prediction. It implies that government debt is associated with a high likelihood of bad news hoarding, which, when accumulated, leads to a crash in stock prices.

3. Results

3.1. Main evidence

Table 4 reports the results of our basic regressions. Model 1 indicates that the positive coefficient for GOVDEBT_GDP is significant at 1%. It is

Table 5

Channel tests—Income Smoothing. In Model (1), we regress *INCOME_SMOOTHING* on *GOVDEBT_GDP* and control variables. Models (2) and (4) are our basic regressions. In Model (3), we regress *N_SKEW* on *GOVDEBT_GDP, INCOME_SMOOTHING*, and control variables. In Model (5), we regress *D_UVOL* on *GOVDEBT_GDP, INCOME_SMOOTHING*, and control variables. Below each estimate are the z-statistics. 10% significance level is indicated by *, 5% significance level is indicated by **, and 1% significance level is indicated by ***.

Variables	(1)	(2)	(3)	(4)	(5)
	INCOME_SMOOTHING	*N_SKEW*	*N_SKEW*	*D_UVOL*	*D_UVOL*
$GOVDEBT\_GDP_{t-1}$	0.085***	0.195***	0.069***	0.031***	0.029***
	(12.130)	(27.568)	(14.111)	(3.977)	(4.467)
$INCOME\_SMOOTHING_{t-1}$			0.010**		0.006***
			(2.349)		(3.545)
N_SKEW_{t-1}	-0.001	0.060***	0.058***	0.030***	0.031***
	(−0.780)	(19.037)	(17.956)	(24.226)	(25.345)
$FIRM\_SIZE_{t-1}$	0.008***	0.019***	0.014***	0.017***	0.037***
	(4.774)	(11.291)	(9.154)	(25.121)	(29.269)
$LEVER_{t-1}$	0.129***	-0.083***	-0.174***	-0.009	-0.016**
	(6.775)	(−4.309)	(−9.089)	(−1.138)	(−2.161)
MTB_{t-1}	-0.011***	0.006***	0.009***	0.003***	0.004***
	(−12.079)	(5.406)	(8.383)	(6.956)	(9.444)
$RTOA_{t-1}$	0.195***	-0.058***	-0.019*	0.005	0.005
	(21.524)	(−5.713)	(−1.897)	(1.193)	(1.246)
AQ_{t-1}	0.001	0.000	-0.007***	0.000	-0.003***
	(0.796)	(0.414)	(−6.165)	(0.175)	(−5.918)
RET_AVG_{t-1}	-0.481**	1.763***	1.722***	3.307***	3.817***
	(−2.344)	(5.628)	(5.635)	(25.293)	(30.567)
RET_STDEV_{t-1}	-0.453***	1.676***	1.119***	0.338***	0.294***
	(−6.355)	(18.195)	(13.117)	(8.657)	(8.396)
$TURNOVER_{t-1}$	0.000	0.002***	0.003***	0.000**	0.001***
	(0.362)	(3.475)	(8.867)	(2.541)	(6.025)
LAW_ORDER_{t-1}	-0.010	-0.015***	-0.066***	0.003	0.021***
	(−1.520)	(−2.615)	(−15.603)	(0.746)	(4.668)
LN_GDPC_{t-1}	-0.054***	-0.075***	0.069***	0.012***	0.021***
	(−9.165)	(−12.650)	(19.421)	(3.084)	(5.021)
$GDPG_{t-1}$	-0.000	0.006***	0.029***	0.001	0.010***
	(−0.018)	(4.020)	(26.499)	(1.430)	(22.090)
$INFL_{t-1}$	0.116	-0.035	-1.062***	0.005	-0.290***
	(1.261)	(−1.550)	(−10.030)	(0.445)	(−5.262)
$\Delta EXCH\_RATE_{t-1}$	-0.030	-0.218***	-0.512***	-0.026*	-0.100***
	(−1.363)	(−5.741)	(−13.313)	(−1.691)	(−6.881)
Country fixed effects	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES
Constant	0.491	0.192**	0.491	-0.425***	-0.451***
	(1.435)	(2.562)	(1.435)	(−11.353)	(−8.361)
Observations	174,368	187,991	174,368	187,991	174,368
R-squared	0.036	0.094	0.036	0.072	0.048
Sobel Z		3.129***		3.114***	

also economically highly significant. Indeed, increasing GOVDEBT_GDP by one standard deviation increases N_SKEW by 85.14%.[2] Similarly, we find that the coefficient for GOVDEBT_GDP is positive and significant at the 1% level in the D_UVOL regression. As can be seen in Model 2, when GOVDEBT_GDP increases by one standard deviation, D_UVOL increases by 22.88%.[3] These findings are consistent with our hypothesis and support the view that a higher government debt level relative to GDP, which is associated with higher interest rates, hence lower stock prices. Managers worried about their compensation, career, and reputation may engage in negative news hoarding. When accumulated, bad news reaches a point where the cost of hiding it becomes higher than the benefit of concealing it. The news is then revealed to the public, which leads stock prices to crash. Our findings are also consistent with the conjecture that government debt is positively related to tax policy uncertainty, which increases tax avoidance and facilitates the hoarding of bad news, increasing the likelihood of stock price crash risk.

As for the control variables, we report several significant coefficients that are consistent with the prior literature's findings. For instance, we find that FIRM_SIZE, MTB, RET_AVG, RET_STDEV, and TURNOVER are positive and highly significant at the 1% level, suggesting that larger firms and firms with higher growth opportunities, stock returns, stock returns volatility, and stock turnover are more likely to experience a stock price crash. Additionally, we find that the coefficients for LEVER, RTOA, LAW_ORDER, LN_GDPC, and ΔEXCH_RATE are negative and significant at the 1% level in Model 1, suggesting that highly levered and profitable firms and firms from countries with a high and law order index and countries with a high exchange rate change are less likely to experience stock price crashes.

3.2. Channel tests

A long stream of literature suggests that stock price crash is due to bad new holdings. Low-quality accounting information (Hutton et al., 2009) and tax avoidance (Kim et al., 2011) are among the factors that facilitate bad news hoarding. We argue that these factors are the channels through which government debt is positively associated with stock price crash risk. Indeed, we argue that government debt is associated with high information opacity. The intuition behind this is that

[2] The absolute value of the average of *N_SKEW* is 0.142, the standard deviation of *GOVDEBT_GDP* is equal to 0.620 and the coefficient for *GOVDEBT_GDP* in Model (1) is 0.195. A one standard deviation increase in *GOVDEBT_GDP* increases *N_SKEW* by (0.620*0.195)/0.142=85.14%.

[3] The absolute value of the average of *D_UVOL* is 0.084, the standard deviation of *GOVDEBT_GDP* is equal to 0.620 and the coefficient for *GOVDEBT_GDP* in Model (2) is 0.031. A one standard deviation increase *GOVDEBT_GDP* leads to a 22.88% ((0.620*0.031)/0.084) increase in *D_UVOL*.

Table 6
Channel tests—Tax avoidance. In Model (1), we regress *TAX_AVOIDANCE* on *GOVDEBT_GDP* and control variables. Models (2) and (4) are our basic regressions. In Model (3), we regress *N_SKEW* on *GOVDEBT_GDP, TAX_AVOIDANCE*, and control variables. In Model (5), we regress *D_UVOL* on *GOVDEBT_GDP, TAX_AVOIDANCE*, and control variables. Below each estimate are the z-statistics. 10% significance level is indicated by *, 5% significance level is indicated by **, and 1% significance level is indicated by ***.

Variables	(1)	(2)	(3)	(4)	(5)
	TAX_AVOIDANCE	*N_SKEW*	*N_SKEW*	*D_UVOL*	*D_UVOL*
$GOVDEBT\_GDP_{t-1}$	0.083***	0.195***	0.116***	0.031***	0.013***
	(20.892)	(27.568)	(19.734)	(3.977)	(5.855)
$TAX\_AVOIDANCE_{t-1}$			0.082***		0.023***
			(5.092)		(3.633)
N_SKEW_{t-1}	-0.001***	0.060***	0.055***	0.030***	0.033***
	(−2.963)	(19.037)	(18.638)	(24.226)	(28.280)
$FIRM\_SIZE_{t-1}$	0.024***	0.019***	0.041***	0.017***	0.040***
	(39.265)	(11.291)	(11.579)	(25.121)	(29.542)
$LEVER_{t-1}$	-0.053***	-0.083***	-0.142***	-0.009	0.000
	(−15.050)	(−4.309)	(−6.827)	(−1.138)	(0.061)
MTB_{t-1}	0.000**	0.006***	0.004***	0.003***	0.004***
	(2.019)	(5.406)	(3.609)	(6.956)	(8.325)
$RTOA_{t-1}$	-0.051***	-0.058***	-0.015	0.005	0.010*
	(−21.387)	(−5.713)	(−1.161)	(1.193)	(1.942)
AQ_{t-1}	0.001***	0.000	-0.001	0.000	-0.000
	(4.413)	(0.414)	(−0.547)	(0.175)	(−0.077)
RET_AVG_{t-1}	-0.034	1.763***	-0.020	3.307***	4.364***
	(−0.555)	(5.628)	(−0.060)	(25.293)	(33.379)
RET_STDEV_{t-1}	0.376***	1.676***	1.405***	0.338***	0.453***
	(24.396)	(18.195)	(15.844)	(8.657)	(13.139)
$TURNOVER_{t-1}$	-0.000***	0.002***	0.003***	0.000**	-0.000
	(−4.043)	(3.475)	(9.228)	(2.541)	(−0.286)
LAW_ORDER_{t-1}	0.001	-0.015***	-0.072***	0.003	-0.015***
	(0.259)	(−2.615)	(−13.641)	(0.746)	(−7.363)
LN_GDPC_{t-1}	0.005	-0.075***	0.008*	0.012***	0.033***
	(1.474)	(−12.650)	(1.955)	(3.084)	(20.138)
$GDPG_{t-1}$	0.001**	0.006***	0.002	0.001	-0.001*
	(2.134)	(4.020)	(1.464)	(1.430)	(−1.681)
$INFL_{t-1}$	0.047**	-0.035	-0.924***	0.005	-0.003
	(2.178)	(−1.550)	(−8.664)	(0.445)	(−0.076)
$LN\_EXCH\_RATE_{t-1}$	0.003	-0.218***	-0.252***	-0.026*	-0.056***
	(0.492)	(−5.741)	(−6.343)	(−1.691)	(−3.644)
Country fixed effects	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES
Constant	-0.396***	0.192**	0.043	-0.425***	-0.410***
	(−11.613)	(2.562)	(0.634)	(−11.353)	(−15.669)
Observations	142,971	187,991	142,971	187,991	142,971
R-squared	0.101	0.094	0.092	0.072	0.069
Sobel Z		6.252***		3.873**	

government debt increases interest rates and may lead to weak stock price performance (Croce et al., 2020; Wisniewski and Jackson, 2021), which, in turn, may adversely affect managers' stock price-based compensation and careers. Anticipating a decline in stock price, managers may withhold negative news to protect their compensation, careers, and reputation (e.g., Jin and Myers, 2006). As aforementioned, bad news hoarding is not directly observable but is associated with low-quality accounting information. Following Li et al. (2023), we argue that if government debt is associated with bad news hoarding, it should result in more income smoothing. For instance, Dutta and Fan (2014) provide evidence suggesting that managers manipulate earnings to protect their compensation. We apply a mediation analysis in two steps to check whether government debt leads to earnings manipulation. First, we regress the negative correlation between the ratio of cash flow from operations over total assets and the ratio of total accruals over total assets (INCOME_SMOOTHING) against GOVDEBT_GDP and our control variables. The results of this test are reported in Model 1 in Table 5. As can be seen, GOVDEBT_GDP has a positive and significant coefficient at the 1% level. It seems that income smoothing is positively related to government debt. Models 2 and 4 in Table 5 repeat our basic regression (Models 1 and 2 in Table 4). Second, we regress N_SKEW and D_UVOL against INCOME_SMOOTHING, GOVDEBT_GDP, and the control variables. The results reported in Models 3 and 5 show that the coefficients for INCOME_SMOOTHING are positive and highly significant. We also notice that the coefficient for GOVDEBT_GDP is lower in Model 3 (5) than in Model 2 (4). The Sobel test has a Z statistic of 3.129 (3.114), significant at the 1% level when N_SKEW (D_UVOL) is used. The mediation effect of income smoothing is 24.02%(=(0.085*0.195)/0.069) of the effect of government debt when N_SKEW is used as a measure of crash risk and 9.09% (=(0.085*0.031)/0.029) of the effect of government debt when D_UVOL is used as a measure of crash risk. This finding suggests that income smoothing partially mediates the relationship between government debt and stock price crash risk.

Tax avoidance may also mediate the relationship between government debt and stock price crash risk. Higher government debt may increase future taxes (e.g., Park, 1997), leading managers to avoid taxes. Indeed, policy uncertainty is positively related to tax avoidance (e.g., Duong et al., 2017). Tax avoidance may facilitate hoarding bad news (e.g., Kim et al., 2011), which may lead to stock price crashes. To validate this channel, we perform a two-step mediation analysis. First, we regress tax avoidance against government debt and our control variables. We use the effective tax rate (ETR) GAAP, in line with Dyreng et al. (2017), as a tax avoidance measure. It is defined as GAAP tax expense divided by pre-tax accounting income. The proxy varies between 0 and 1. For ease of interpretation, we multiply ETR GAAP by −1, where higher values for the resulting ratio (TAX_AVOIDANCE) indicate higher tax avoidance. GOVDEBT_GDP has a positive and significant coefficient in Model 1 in Table 6, indicating that higher government debt relative to GDP is

Table 7

Instrumental variable approach. This table presents the results the instrumental variable approach. In model (1), we regress *GOVDEBT_GDP* on *MIL_GDP* and control variables. In model (2), we regress *N_SKEW* on the predicted value of *GOVDEBT_GDP* estimated using Model (1). In model (3), we regress *D_UVOL* on the predicted value of *GOVDEBT_GDP* estimated using Model (1). Below each estimate are the z-statistics. 10% significance level is indicated by *, 5% significance level is indicated by **, and 1% significance level is indicated by ***.

Variables	First stage	Second stage	
	(1)	(2)	(3)
	$GOVDEBT\_GDP_{t-1}$	N_SKEW_t	D_UVOL_t
MIL_GDP_{t-2}	0.244***		
	(78.958)		
$GOVDEBT\_GDP_{t-1}$		0.302***	0.030***
		(25.135)	(3.211)
N_SKEW_{t-1}	0.002*	0.062***	0.031***
	(1.744)	(18.750)	(24.112)
$FIRM\_SIZE_{t-1}$	0.006***	0.016***	0.016***
	(4.381)	(9.265)	(22.804)
$LEVER_{t-1}$	-0.107***	-0.052***	0.002
	(−8.783)	(−2.616)	(0.287)
MTB_{t-1}	-0.008***	0.006***	0.003***
	(−13.804)	(5.677)	(6.558)
$RTOA_{t-1}$	0.022***	-0.067***	0.000
	(5.582)	(−6.479)	(0.064)
AQ_{t-1}	-0.001***	0.001	0.000
	(−2.759)	(0.475)	(0.114)
RET_AVG_{t-1}	-1.239***	1.966***	3.555***
	(−10.696)	(5.984)	(26.899)
RET_STDEV_{t-1}	-0.652***	1.747***	0.341***
	(−14.126)	(18.092)	(8.490)
$TURNOVER_{t-1}$	0.001***	0.003***	0.000**
	(4.349)	(3.531)	(2.412)
LAW_ORDER_{t-1}	0.184***	-0.017*	0.001
	(14.149)	(−1.947)	(0.289)
LN_GDPC_{t-1}	0.122***	-0.079***	0.015***
	(11.354)	(−8.331)	(3.949)
$GDPG_{t-1}$	-0.035***	0.019***	0.003***
	(−40.304)	(11.320)	(4.232)
$INFL_{t-1}$	-0.080*	-0.008	0.012
	(−1.859)	(−0.348)	(1.112)
$\Delta EXCH\_RATE_{t-1}$	-0.088***	-0.280***	-0.045***
	(−5.588)	(−7.224)	(−2.939)
Country fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
LM statistic of Kleibergen-Paap (p-value)	818.960 (0.000)		
Wald rk F statistic of Kleibergen-Paap	1004.768		
Constant	-0.781***	0.151*	-0.462***
	(−11.621)	(1.786)	(−11.903)
Observations	174,425	174,425	174,425
R-squared	0.726	0.093	0.070

associated with increased tax avoidance. Second, we regress our crash risk proxies against TAX_AVOIDANCE and GOVDEBT_GDP, as well as the control variables. The results are reported in Models 3 and 5 in Table 6. As can be seen, the coefficients for TAX_AVOIDANCE are positive and significant at the 1% level. The coefficients for GOVDEBT_GDP are positive and statistically significant, but they are lower when compared to the coefficients for GOVDEBT_GDP in our basic models (Models 2 and 4 in Table 6). The Z-statistics of the Sobel test, which are significant and highly significant, respectively, are equal to 6.252 in the N_SKEW regression and 3.873 in the D_UVOL regression. The mediation effect of tax avoidance is 13.95% (=(0.083*0.195)/0.116) of the effect of government debt when N_SKEW is used as a measure of crash risk and 19.79% (=(0.083*0.031)/0.013) of the effect of government debt when D_UVOL is used as a measure of crash risk. We can interpret these findings as implying that tax avoidance partially mediates the relationship between government debt and stock price crash risk. As noted, the partial mediation effect of tax avoidance is stronger than the partial mediation effect of income smoothing.

Table 8

Entropy balancing. This table presents our results when estimating Eq. (1) using the entropy balanced sample. Below each estimate are the z-statistics. 10% significance level is indicated by *, 5% significance level is indicated by **, and 1% significance level is indicated by ***.

Variables	(1)	(2)
	N_SKEW_t	D_UVOL_t
$GOVDEBT\_GDP\_DUMMY_{t-1}$	0.186***	0.030***
	(13.392)	(3.625)
N_SKEW_{t-1}	0.057***	0.029***
	(7.085)	(9.422)
$FIRM\_SIZE_{t-1}$	0.024***	0.019***
	(5.765)	(12.358)
$LEVER_{t-1}$	-0.090*	-0.000
	(−1.795)	(−0.007)
MTB_{t-1}	0.002	0.003***
	(1.013)	(3.096)
$RTOA_{t-1}$	-0.051**	-0.007
	(−2.046)	(−0.680)
AQ_{t-1}	0.002	0.001
	(0.990)	(0.870)
RET_AVG_{t-1}	-0.132	3.444***
	(−0.167)	(10.215)
RET_STDEV_{t-1}	1.119***	0.222**
	(5.222)	(2.509)
$TURNOVER_{t-1}$	0.017***	0.002***
	(4.849)	(3.485)
LAW_ORDER_{t-1}	0.104***	0.014
	(4.232)	(1.535)
LN_GDPC_{t-1}	-0.170***	0.023**
	(−8.914)	(2.436)
$GDPG_{t-1}$	-0.014***	-0.008***
	(−3.154)	(−4.710)
$INFL_{t-1}$	-0.726***	-0.094
	(−2.984)	(−1.181)
$\Delta EXCH\_RATE_{t-1}$	-0.117	-0.036
	(−1.336)	(−1.156)
Country fixed effects	Yes	Yes
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Constant	0.670***	-0.612***
	(4.464)	(−7.996)
Observations	187,991	187,991
R-squared	0.086	0.066

3.3. Addressing endogeneity issues

Our results may be affected by omitted variables that determine government debt and stock price crash risk. For instance, an economic downturn may lead the government to issue debt instruments to cover deficits in the budget due to the decrease in revenues coming from taxes and the increase in social benefits such as unemployment insurance (Please refer to Demirci et al., 2019 for a detailed discussion of this issue.) Such a situation may also increase managers' incentives to hide bad news, which increases the likelihood of a stock price crash risk. We first use an instrumental variable approach to ensure that our findings are not driven by omitted variables that determine government debt and stock price crash risk. Following Demirci et al. (2019), we use the ratio of military expenses over GDP (MIL_GDP). The advantages of using this instrument include that it is determined by geopolitics and is less affected by macroeconomic conditions, for instance, unemployment. Military expenses should be positively related to government debt, suggesting that the government may issue debt to cover military expenses. Model 1 in Table 7 reports the results of the first stage. As can be seen, the coefficient for MIL_GDP is positive and statistically significant at the 1% level. In the second stage, we report our stock price crash risk proxies on the predicted value of GOVDEBT_GDP in the first stage. The predicted value of GOVDEBT_GDP in Models 2 and 3 is positive and significant at the 1% level in both the N_SKEW and D_UVOL regressions.

Table 9
Change regressions. We estimate changes in crash risk variables on changes in *GOVDEBT_GDP* and control variables. Below each estimate are the z-statistics. 10% significance level is indicated by *, 5% significance level is indicated by **, and 1% significance level is indicated by ***.

Variables	(1)	(2)
	ΔN_SKEW_t	ΔD_UVOL_t
$\Delta GOVDEBT\_GDP_{t-1}$	0.388***	0.222***
	(5.423)	(8.175)
ΔN_SKEW_{t-1}	-0.383***	-0.118***
	(−126.416)	(−85.241)
$\Delta FIRM\_SIZE_{t-1}$	0.188***	0.052***
	(15.902)	(11.333)
$\Delta LEVER_{t-1}$	-0.105**	-0.029*
	(−2.555)	(−1.719)
ΔMTB_{t-1}	0.022***	0.006***
	(13.818)	(8.417)
$\Delta RTOA_{t-1}$	-0.007	0.004
	(−0.468)	(0.634)
ΔAQ_{t-1}	-0.000	-0.001
	(−0.289)	(−1.253)
ΔRET_AVG_{t-1}	2.846***	-1.547***
	(9.201)	(−11.391)
ΔRET_STDEV_{t-1}	0.743***	0.075
	(5.579)	(1.376)
$\Delta TURNOVER_{t-1}$	0.002***	0.001**
	(2.953)	(2.501)
ΔLAW_ORDER_{t-1}	0.070***	0.006
	(3.918)	(0.848)
LN_GDPC_{t-1}	-0.267***	-0.043**
	(−6.003)	(−2.460)
$\Delta GDPG_{t-1}$	0.011***	0.003***
	(6.602)	(5.382)
$\Delta INFL_{t-1}$	0.090***	0.017
	(3.647)	(1.278)
$\Delta EXCH\_RATE_{t-1}$	-0.038	0.001
	(−1.467)	(0.069)
Country fixed effects	Yes	Yes
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Constant	0.029	0.096***
	(0.492)	(3.420)
Observations	167,634	167,634
R-squared	0.258	0.144

These findings suggest that endogeneity issues do not drive our findings.

We also use the entropy-balanced approach to deal with potential endogeneity issues. In particular, this approach addresses issues related to the non-balanced nature of firm characteristics, which may affect our results. To apply this approach, we split our sample into two sub-samples (i.e., a sub-sample of firms for which the government debt ratio is higher than the sample median government debt and a sub-sample of firms for which the government debt ratio is lower than the sample median government debt). Then we apply the entropy balancing approach, which makes the moments (i.e., mean, standard deviation, and skewness) of the control variables for the treatment (i.e., firms located in countries with above sample median government debt) and control firms (i.e., firms located in countries with below sample median government debt) equal. For the sake of brevity, the unreported descriptive statistics show that the moments of our control variables for the treatment and control groups are equal. Table 8 reports our results when we estimate Eq. (1) using the entropy-balanced sample. The coefficient of GOVDEBT_GDP is positive and significant at the 1% level, suggesting that the imbalanced firm characteristics do not affect our results.

Additionally, we use change regressions to address endogeneity issues further. We regress the change in stock price crash risk on the change in government debt and control variables. This approach helps control the time-invariant factors that may affect both crash risk and government debt. The results, reported in Table 9, show that the coefficient of ΔGOVDEBT_GDP is positive and significant at the 1% level, supporting our earlier findings and suggesting that our results are unaffected by time-invariant firm characteristics.

Table 10
Market-wide crash risk. This table presents the results of our analysis using market-wide proxies for crash risk (i.e., the country average of firm-level crash risk proxies). We regress country-level average of crash risk variables on government debt and the country-level average of firm controls. Below each estimate are the z-statistics. 10% significance level is indicated by *, 5% significance level is indicated by **, and 1% significance level is indicated by ***.

	(1)	(2)
	N_SKEW_t	D_UVOL_t
$GOVDEBT\_GDP_{t-1}$	0.230**	0.063***
	(2.317)	(2.986)
N_SKEW_{t-1}	0.087	0.010
	(1.655)	(0.483)
$FIRM\_SIZE_{t-1}$	0.052	0.021
	(1.399)	(1.551)
$LEVER_{t-1}$	-0.180	0.237
	(−0.276)	(0.650)
MTB_{t-1}	0.104***	0.045***
	(3.220)	(3.365)
$RTOA_{t-1}$	0.265	-0.087
	(0.576)	(−0.469)
AQ_{t-1}	-0.035	-0.021*
	(−1.221)	(−1.797)
RET_AVG_{t-1}	0.087	-2.241
	(0.017)	(−0.889)
RET_STDEV_{t-1}	-3.076	-1.300*
	(−1.470)	(−1.975)
$TURNOVER_{t-1}$	0.009*	-0.003
	(1.881)	(−1.297)
LAW_ORDER_{t-1}	0.058	0.010
	(1.595)	(0.792)
LN_GDPC_{t-1}	-0.023	0.008
	(−0.436)	(0.475)
$GDPG_{t-1}$	-0.000	0.001
	(−0.009)	(0.451)
$INFL_{t-1}$	0.038***	0.016***
	(2.782)	(3.025)
$\Delta EXCH\_RATE_{t-1}$	0.124	0.107
	(0.733)	(1.544)
Country fixed effects	Yes	Yes
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Constant	-0.955*	-0.394**
	(−1.729)	(−2.293)
Observations	1188	1188
R-squared	0.346	0.285

3.4. Robustness checks

Table 10 reports our analysis using a market-wide proxy of crash risk (i.e., a country average of firm-level crash risk proxies). We also use the country average of firm-level control variables. As can be seen, the coefficient for GOVDEBT_GDP is positive and highly significant in both Models 1 and 2 of Table 10, further supporting our results while using firm-level crash risk proxies. Table 11 reports our results based on alternative options for measuring firm-level stock price crash risk. First, we use a binary variable equal to one for observations with at least weekly firm-specific returns lower than 3.09 standard deviations times the sample average of weekly firm-specific returns and zero otherwise (CRASH_DUMMY). The results reported in Model 1 show that the coefficient for GOVDEBT_GDP remains positive and significant at the 1% level. Second, we use the weeks in which firm-specific returns are lower than 3.09 standard deviations times the sample average of weekly firm-specific returns in a given year (SUM_CRASH). The coefficient for GOVDEBT_GDP holds positive and significant at the 1% level in Model 2 in Table 11.

Table 12 summarises the results of the sensitivity tests. First, we report our results for the sub-sample of firms that belong to Organisation

Table 11
Alternative firm-level crash risk proxies. This table reports our results based on alternative measures for quantifying firm-level stock price crash risk. Model (1) reports our results when we use *CRASH_DUMMY* as a proxy for crash risk. Model (2) reports our results when we use *SUM_CRASH* as a proxy for crash risk. Below each estimate are the z-statistics. 10% significance level is indicated by *, 5% significance level is indicated by **, and 1% significance level is indicated by ***.

Variables	(1)	(2)
	$CRASH\_DUMMY_t$	SUM_CRASH_t
$GOVDEBT\_GDP_{t-1}$	0.289***	0.031***
	(3.995)	(4.333)
N_SKEW_{t-1}	0.100***	0.021***
	(14.715)	(8.791)
$FIRM\_SIZE_{t-1}$	-0.050***	-0.009***
	(−12.490)	(−12.129)
$LEVER_{t-1}$	0.049	0.016*
	(1.070)	(1.668)
MTB_{t-1}	0.003	0.001**
	(1.130)	(2.085)
$RTOA_{t-1}$	0.126***	0.022***
	(5.247)	(5.198)
AQ_{t-1}	0.001	0.000
	(0.403)	(0.942)
RET_AVG_{t-1}	8.903***	1.546***
	(11.886)	(9.542)
RET_STDEV_{t-1}	0.636***	0.171***
	(3.003)	(4.307)
$TURNOVER_{t-1}$	0.001	0.000
	(1.124)	(0.872)
LAW_ORDER_{t-1}	-0.034	-0.003
	(−1.199)	(−0.788)
LN_GDPC_{t-1}	0.234***	0.036***
	(4.976)	(5.682)
$GDPG_{t-1}$	0.014***	0.003***
	(3.851)	(3.291)
$INFL_{t-1}$	0.138	0.001
	(1.393)	(0.302)
$\Delta EXCH\_RATE_{t-1}$	-0.498***	-0.078***
	(−5.303)	(−4.752)
Country fixed effects	Yes	Yes
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Constant	-8.215***	-0.151**
	(−14.895)	(−2.311)
Observations	187,991	187,991
R-squared	0.082	0.056

of Economic Development (OECD) countries. The coefficients for GOVDEBT_GDP in Models 1 and 2 remain positive and significant at the 1% level, further corroborating our earlier findings. Second, we remove firm-year observations after the 2007—2008 financial crisis to ensure that this crisis does not affect our findings. For Models 3 and 4, GOVDEBT_GDP loads positively and is highly significant, meaning the financial crisis did not impact our findings. Third, we cluster the standard errors by country, which accounts for the cross-country differences. As can be seen in Models 5 and 6, our results remain qualitatively unchanged. Models 7 and 8 report our results when we exclude the US, which accounts for the second-largest number of observations in our sample. Finally, Models 9 and 10 exclude Japan, which accounts for our sample's largest number of observations. The results of these models suggest that the positive and significant relation between GOVDEBT_GDP and crash risk holds when we exclude large countries.

3.5. Cross-sectional tests

We agree that a high government debt relative to GDP is associated with higher interest rates and lower stock prices. Consequently, managers are incentivized to withhold negative information to protect their compensation packages and reputations. If this channel is valid, we expect that the positive relationship between government debt level and stock price crash risk holds for countries with risky government debt. To test this conjecture, we split our sub-sample into two sub-samples: countries with safe government debt and countries with risky debt. To do so, we split our sample into the sub-sample of countries with high government debt rating (i.e., countries with a government debt rating of BBB and above) and the sub-sample of countries with low government debt rating (i.e., countries with a government debt rating of BBB and below). We collect data on Standard and Poor's government debt rating (GOVDEBT_RATING) from Capital IQ. This data is available starting from 2006, which reduces our sample size. The results based on firm-level crash risk proxies are reported in Panel A of Table 13. As can be seen, the positive coefficient for GOVDEBT_GDP is statistically higher for the sub-sample of firms with low government debt (Models 2 and 4), suggesting that the positive effect of government debt on stock price crash risk is stronger in countries with low government debt rating. The results of the market-based proxies of crash risk are reported in Panel B of Table 13. The coefficient for GOVDEBT_GDP is also higher for the sub-sample of countries with low government debt ratings, further supporting our earlier findings.

We perform cross-sectional tests based on fiscal policy uncertainty proxies to further validate the tax avoidance channel. If the tax avoidance holds, we expect that the relationship between government debt and stock price crash risk will be more pronounced in firms exposed to high fiscal policy uncertainty. We use the overall economic policy uncertainty (OVERALL_EPU) index from Baker et al. (2016) as a proxy for policy uncertainty, including fiscal policy uncertainty. Indeed, the index, which covers 22 countries, is based on news and covers fiscal policy uncertainty (i.e., taxes, government spending, national security, and entitlement programs) and other policy uncertainty, such as monetary policy, trade policy, and foreign exchange policy. The higher the index, the higher the policy uncertainty. The fiscal policy uncertainty (FPU) index is only available for four countries (Greece, South Korea, Japan, and the USA), which reduces our sample size. We first present the results of adding GOVDEBT_GDP*OVERALL_EPU and OVERALL_EPU to our basic models. The results reported in Models 1 and 2 in Table 14 show that GOVDEBT_GDP*OVERALL_EPU is positive and significant at the 1% level, suggesting that the association between government debt and stock price crash risk is stronger l in firms that are exposed to high policy uncertainty. In Models 3 and 4 in Table 14, we also report our results when we use the FPU index as a direct measure of fiscal policy uncertainty. As can be seen, the coefficient for GOVDEBT_GDP*FPU is positive and significant at the 1% level, suggesting that the association between government debt and stock price crash risk is stronger in firms that are more exposed to fiscal policy uncertainty.

Further, we examine whether the effect of government debt on crash risk is stronger under weak corporate governance. Entrenched managers can more easily hide bad news when corporate governance is weak. Product market competition is associated with fewer agency problems (Boubaker et al., 2018) and promotes corporate transparency (Darrough and Stoughton, 1990). Therefore, we expect that entrenched managers are less likely to hide negative news in more competitive (i.e., less concentrated) industries. This leads us to predict a less (more) pronounced effect of government debt on stock price crash risk in more (less) competitive industries. We measure industry concentration by the square of the industry's sales over total sales (HHI_2). We define industries at the two-digit standard industrial classification (SIC) code here. A higher HHI_2 indicates more industry concentration and lower product market competition. The results of the interaction terms between product market competition and government debt appear in Models 1 and 2 in Table 15. GOVDEBT_GDP*HHI_2 has a positive and statistically significant coefficient. In highly concentrated industries (i.e., industries with a lower degree of competition), the relationship between government debt and stock price crash risk is stronger.

We also examine the role of additional factors that may affect the relationship between government debt and stock price crash risk. First, we examine whether stock market development moderates this

Table 12

Sensitivity tests. The results of additional tests are reported in this table. Models (1) and (2) report the results for the sub-sample of OECD countries. Models (3) and (4) report our results while removing firm-year observations for the period after the 2007–2008 financial crisis. Models (5) and (6) report our results when we cluster the standard errors by country. Models (7) and (8) report our results when we exclude US firms. Models (9) and (10) report our results when we exclude Japanese firms.Below each estimate are the z-statistics. 10% significance level is indicated by *, 5% significance level is indicated by **, and 1% significance level is indicated by ***.

Variables	Excluding non-OECD		–	Pre-financial		–	country-level		–	Excluding US		–	Excluding Japanese	
	countries		–	crisis period		–	clustering		–	firms		–	firms	
	(1)	(2)	–	(3)	(4)	–	(5)	(6)	–	(7)	(8)	–	(9)	(10)
	N_SKEW_t	D_UVOL_t		N_SKEW_t	D_UVOL_t		N_SKEW_t	D_UVOL_t		N_SKEW_t	D_UVOL_t		N_SKEW_t	D_UVOL_t
$GOVDEBT\_GDP_{t-1}$	0.164***	0.008***		0.498***	0.033*		0.122**	0.036**		0.039***	0.021***		0.105***	0.053***
	(22.603)	(2.807)		(32.443)	(1.847)		(2.412)	(2.105)		(6.186)	(3.190)		(2.992)	(6.896)
N_SKEW_{t-1}	0.056***	0.031***		0.058***	0.027***		0.058***	0.032***		0.071***	0.032***		0.069***	0.031***
	(14.220)	(19.830)		(9.274)	(11.481)		(8.819)	(15.004)		(20.355)	(23.387)		(24.346)	(22.763)
$FIRM\_SIZE_{t-1}$	0.022***	0.020***		0.019***	0.021***		0.019***	0.017***		0.026***	0.016***		0.020***	0.019***
	(11.211)	(25.538)		(6.209)	(17.139)		(3.457)	(6.311)		(14.775)	(20.447)		(13.050)	(25.920)
$LEVER_{t-1}$	-0.096***	0.007		-0.039	-0.003		-0.127***	-0.008		-0.009	-0.013		-0.009	0.002
	(−4.076)	(0.695)		(−0.999)	(−0.217)		(−3.447)	(−0.773)		(−0.434)	(−1.407)		(−0.447)	(0.278)
MTB_{t-1}	0.005***	0.003***		0.013***	0.003***		0.005**	0.003***		0.011***	0.004***		0.008***	0.003***
	(3.944)	(6.923)		(6.877)	(4.917)		(2.074)	(5.347)		(8.523)	(7.067)		(7.620)	(7.202)
$RTOA_{t-1}$	-0.062***	-0.008		-0.094***	-0.005		-0.039**	0.000		-0.008	0.019***		-0.098***	-0.001
	(−5.535)	(−1.641)		(−5.050)	(−0.631)		(−2.107)	(0.059)		(−0.514)	(2.939)		(−10.240)	(−0.132)
AQ_{t-1}	0.001	0.001*		-0.000	-0.000		0.000	0.000		-0.001	-0.001		0.003**	0.000
	(0.846)	(1.910)		(−0.018)	(−0.330)		(0.209)	(0.348)		(−0.368)	(−1.128)		(2.531)	(1.026)
RET_AVG_{t-1}	-0.799**	3.531***		-0.251	2.483***		0.212	3.750***		5.618***	3.342***		5.542***	3.962***
	(−2.090)	(22.810)		(−0.420)	(10.103)		(0.098)	(9.333)		(14.938)	(21.857)		(16.937)	(28.628)
RET_STDEV_{t-1}	1.572***	0.394***		1.873***	0.129*		1.326***	0.426**		1.222***	0.287***		2.610***	0.554***
	(14.330)	(8.474)		(10.560)	(1.690)		(2.796)	(2.527)		(11.218)	(6.195)		(31.118)	(13.401)
$TURNOVER_{t-1}$	0.002***	-0.000		0.001	0.000		0.002**	0.001***		0.001***	0.001***		0.002***	0.001***
	(3.429)	(−1.047)		(1.462)	(0.746)		(2.328)	(5.002)		(2.788)	(2.687)		(6.894)	(2.637)
LAW_ORDER_{t-1}	0.035***	-0.025***		0.006	-0.004		-0.060**	-0.011		-0.030***	-0.011***		-0.036***	-0.015***
	(3.330)	(−5.962)		(0.506)	(−0.693)		(−2.266)	(−1.085)		(−5.526)	(−4.750)		(−3.227)	(−6.345)
LN_GDPC_{t-1}	-0.148***	0.098***		-0.152***	0.017		0.021	0.041***		0.047***	0.016***		0.015	0.030***
	(−10.624)	(18.760)		(−14.752)	(1.604)		(0.547)	(5.244)		(7.777)	(5.891)		(0.812)	(11.636)
$GDPG_{t-1}$	-0.006**	-0.000		0.011***	0.001		0.005	0.001		0.001	-0.000		0.008***	-0.000
	(−2.262)	(−0.074)		(2.584)	(0.378)		(0.815)	(0.706)		(0.779)	(−0.608)		(5.063)	(−0.820)
$INFL_{t-1}$	-0.902***	0.469***		-0.005	0.006		-0.056	0.009		0.013	0.011		0.026	0.006
	(−4.797)	(8.053)		(−0.284)	(0.511)		(−0.758)	(0.993)		(0.921)	(0.989)		(1.045)	(0.563)
$\Delta EXCH\_RATE_{t-1}$	-0.368***	-0.113***		0.098	0.143***		-0.276*	-0.039		-0.143***	-0.042***		-0.062	0.016
	(−7.826)	(−6.321)		(1.221)	(3.821)		(−1.673)	(−0.655)		(−3.585)	(−2.660)		(−1.464)	(0.855)
Country fixed effects	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes
Industry fixed effects	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes
Year fixed effects	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes
Constant	0.741***	-1.294***		0.630***	-0.460***		-0.431	-0.685***		-0.925***	-0.436***		-0.565***	-0.506***
	(5.298)	(−24.563)		(5.332)	(−4.736)		(−1.132)	(−10.236)		(−12.382)	(−12.884)		(−2.697)	(−10.874)
Observations	126,002	126,002		50,849	50,849		187,991	187,991		157,318	157,318		151,037	151,037
R-squared	0.101	0.061		0.091	0.059		0.089	0.069		0.092	0.063		0.101	0.072

Table 13
Safe vs. risky debt. This table presents our results separately for the sub-samples of countries with high and low government debt rating. Panel A reports our results when we use firm-level proxies of crash risk. Panel B reports our results when we use market-level proxies of crash risk. Below each estimate are the z-statistics. 10% significance level is indicated by *, 5% significance level is indicated by **, and 1% significance level is indicated by ***.

Variables	Panel A: Firm-level crash risk				Panel B: Market-wide crash risk			
	GOVDEBT_RATING				*GOVDEBT_RATING*			
	High	Low	High	Low	High	Low	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	N_SKEW_t	N_SKEW_t	D_UVOL_t	D_UVOL_t	N_SKEW_t	N_SKEW_t	D_UVOL_t	D_UVOL_t
$GOVDEBT\_GDP_{t-1}$	0.030***	0.304***	0.018**	0.088***	0.144***	0.352**	0.004	0.110**
	(4.163)	(10.627)	(2.148)	(7.662)	(2.784)	(2.577)	(0.227)	(2.581)
N_SKEW_{t-1}	0.065***	0.081***	0.028***	0.039***	0.007	0.113	-0.002	0.032
	(19.556)	(13.815)	(21.986)	(17.812)	(0.065)	(1.452)	(−0.044)	(1.326)
$FIRM\_SIZE_{t-1}$	0.024***	0.004	0.020***	0.005***	0.001	0.007	-0.027*	0.024
	(13.431)	(1.101)	(29.193)	(4.240)	(0.020)	(0.094)	(−1.686)	(1.096)
$LEVER_{t-1}$	-0.052**	0.066	-0.007	-0.005	0.388	-0.138	-0.184	-0.502
	(−2.257)	(1.644)	(−0.829)	(−0.345)	(0.290)	(−0.099)	(−0.387)	(−0.730)
MTB_{t-1}	0.010***	0.012***	0.003***	0.002**	0.033	0.008	0.010	0.002
	(8.121)	(5.113)	(6.398)	(2.223)	(0.939)	(0.138)	(0.819)	(0.100)
$RTOA_{t-1}$	-0.110***	-0.011	0.005	0.013	1.272*	-0.522	0.015	-0.110
	(−9.819)	(−0.371)	(1.289)	(1.148)	(1.921)	(−0.833)	(0.079)	(−0.593)
AQ_{t-1}	-0.005**	-0.005	0.001	0.003	-0.117	-0.127	-0.017	-0.026
	(−2.117)	(−0.903)	(1.302)	(1.276)	(−1.198)	(−1.287)	(−0.555)	(−0.764)
RET_AVG_{t-1}	6.773***	13.915***	3.310***	4.883***	2.150	18.616**	2.618	4.724
	(17.272)	(21.013)	(21.661)	(18.177)	(0.199)	(2.155)	(0.633)	(1.518)
RET_STDEV_{t-1}	2.051***	0.680***	0.431***	0.240***	-0.618	-3.575	0.521	-1.411
	(21.228)	(3.495)	(11.694)	(3.224)	(−0.222)	(−1.076)	(0.598)	(−1.073)
$TURNOVER_{t-1}$	0.001***	0.003***	0.001***	0.001***	0.015*	0.011	-0.006*	0.003
	(2.620)	(4.030)	(4.982)	(2.978)	(1.854)	(0.945)	(−1.916)	(0.786)
LAW_ORDER_{t-1}	-0.121***	-0.116***	-0.013**	-0.039***	-0.203**	-0.114*	-0.051*	-0.048**
	(−13.529)	(−9.652)	(−2.167)	(−9.371)	(−2.407)	(−1.705)	(−1.846)	(−2.129)
LN_GDPC_{t-1}	0.245***	0.139***	0.059***	0.059***	0.335**	0.211*	0.122***	0.075*
	(29.579)	(14.411)	(17.388)	(14.385)	(2.669)	(1.717)	(3.634)	(1.978)
$GDPG_{t-1}$	0.047***	0.054***	0.002**	0.002**	-0.011	-0.001	-0.004	-0.000
	(30.576)	(22.764)	(2.081)	(2.393)	(−0.927)	(−0.085)	(−1.188)	(−0.043)
$INFL_{t-1}$	-3.906***	-1.020***	-0.273**	0.129*	0.735	1.984**	0.384	0.727**
	(−15.189)	(−5.098)	(−2.204)	(1.681)	(0.518)	(2.638)	(0.989)	(2.435)
$\Delta EXCH\_RATE_{t-1}$	-1.247***	-0.043	-0.082***	-0.067**	0.464	0.260	0.103	0.090
	(−28.209)	(−0.599)	(−4.120)	(−2.216)	(0.720)	(0.685)	(0.538)	(0.606)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-2.426***	-1.368***	-0.869***	-0.629***	-2.866***	-1.642*	-0.756**	-0.825**
	(−28.593)	(−13.781)	(−22.412)	(−13.041)	(−2.776)	(−1.760)	(−2.439)	(−2.547)
Observations	116,790	36,495	116,790	36,495	386	338	386	338
R-squared	0.042	0.050	0.071	0.074	0.630	0.428	0.588	0.400
F-statistic	78.95***		22.35***		7.19***		8.40***	

relationship. The likelihood that managers hide losses caused by high levels of government debt is lower in larger and liquid stock markets. The intuition behind this is that larger and more liquid stock markets have higher quality accounting information, which reduces entrenched managers' likelihood of hoarding bad news (e.g., Hutton et al., 2009). Therefore, we expect a weaker relationship between government debt and stock price crash risk in countries with larger and more developed stock markets. To test this point of view, we use the ratio of stock market capitalization over GDP as a proxy for stock market size (MCAP) and the ratio of trading volume over the market capitalization of traded stocks (TRADED) as a proxy for stock market liquidity. We add GOVDEBT_GDP*MCAP and MCAP to our basic models (Models 1 and 2 in Table 4). The results show that at the 1% level, the coefficient of GOVDEBT_GDP*MCAP is negative and significant for Models 3 and 4 in Table 15. We also augment our basic models with GOVDEBT_GDP*TRADED and TRADED. As we can see in Models 5 of Table 15, GOVDEBT_GDP*TRADED is negative and significant at the 1% level, suggesting that the positive relationship between government debt and stock price crash risk is weaker in more liquid stock markets.

Second, we examine the impact of the country's degree of openness to foreign investors on the relationship between government debt and stock price crash risk. Firms operating in countries open to foreign investors tend to be more transparent. The intuition behind this is that foreign investors require high transparency and help monitor managers (e.g., Aggrawal et al., 2011), which translates into a lower likelihood of hiding bad news. This leads us to predict a less pronounced effect of government debt on stock price crash risk in financially open countries. We use the capital account openness index (CAP_OPEN) from Chinn and Ito (2006) to measure the country's degree of financial openness. Models 7 and 8 in Table 15 report the coefficients for the interaction terms between government debt and financial openness (GOVDEBT_GDP*CAP_OPEN). As can be seen, GOVDEBT_GDP*CAP_OPEN is negative and significant at the 1% level, supporting our prediction.

4. Conclusion

We add to the growing literature on the economic outcomes of government debt level by examining its effect on stock price crash risk. More specifically, our paper is closely related to Croce et al. (2020), who show that the increase in future tax rates is the channel through which government debt issuance is positively associated with the cost of capital of highly innovative firms. Specifically, we add to this paper by showing that higher levels of a country's government debt relative to GDP contribute to an increased crash risk for individual firms.

Table 14

Set 1 Cross-sectional tests. In this table we present cross-sectional tests. Models (1) and (2) report our results while we add GOVDEBT_GDP*OVERALL_EPU and OVERALL_EPU to our basic models. Models (3) and (4) report our results while we add GOVDEBT_GDP*FPU and FPU to our basic models. Below each estimate are the z-statistics. 10% significance level is indicated by *, 5% significance level is indicated by **, and 1% significance level is indicated by ***.

Variables	(1)	(2)	(3)	(4)
	OVERALL_EPU		*FPU*	
	N_SKEW_t	D_UVOL_t	N_SKEW_t	D_UVOL_t
$GOVDEBT\_GDP_{t-1}$	0.149***	0.023***	0.169***	0.065***
	(36.743)	(13.274)	(13.206)	(14.354)
$GOVDEBT\_GDP_{t-1}$*$OVERALL\_EPU_{t-1}$	**0.022*** **	**0.030*** **		
	(3.794)	**(13.029)**		
$OVERALL\_EPU_{t-1}$	**0.059*** **	**0.018*** **		
	(10.675)	**(8.430)**		
$GOVDEBT\_GDP_{t-1}$*FPU_{t-1}			**0.073*** **	**0.025*** **
			(8.475)	**(7.360)**
FPU_{t-1}			**0.141*** **	**0.015*** **
			(15.956)	**(4.262)**
N_SKEW_{t-1}	0.064***	0.031***	0.058***	0.026***
	(20.837)	(21.720)	(12.213)	(13.620)
$FIRM\_SIZE_{t-1}$	0.019***	0.018***	0.020***	0.019***
	(11.880)	(26.796)	(8.816)	(20.690)
$LEVER_{t-1}$	-0.094***	-0.004	-0.052*	-0.013
	(−4.646)	(−0.513)	(−1.923)	(−1.193)
MTB_{t-1}	0.004***	0.003***	0.006***	0.002***
	(3.460)	(5.903)	(4.364)	(3.018)
$RTOA_{t-1}$	-0.067***	0.001	-0.103***	-0.003
	(−6.835)	(0.143)	(−8.438)	(−0.576)
AQ_{t-1}	0.002	0.000	-0.001	0.001
	(1.212)	(0.797)	(−0.829)	(1.176)
RET_AVG_{t-1}	0.410	3.144***	2.169***	2.726***
	(1.254)	(21.847)	(4.503)	(13.831)
RET_STDEV_{t-1}	1.531***	0.223***	2.486***	0.130**
	(17.352)	(5.564)	(19.197)	(2.453)
$TURNOVER_{t-1}$	0.003***	0.001	0.002***	0.001**
	(11.465)	(1.473)	(3.130)	(2.293)
LAW_ORDER_{t-1}	-0.032***	0.001	0.437***	-0.022**
	(−2.904)	(0.294)	(23.067)	(−2.375)
LN_GDPC_{t-1}	0.017***	0.029***	-0.157***	-0.170***
	(3.469)	(15.222)	(−2.609)	(−7.973)
$GDPG_{t-1}$	0.016***	0.001	-0.008**	-0.006***
	(9.066)	(1.612)	(−2.022)	(−4.161)
$INFL_{t-1}$	-0.026	0.004	-9.143***	-1.176***
	(−1.044)	(0.359)	(−17.915)	(−5.429)
$LN\_EXCH\_RATE_{t-1}$	-0.168***	-0.012	0.090	-0.040
	(−3.845)	(−0.659)	(1.208)	(−1.565)
Country fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Constant	-0.419***	-0.649***	-1.132*	1.529***
	(−7.553)	(−29.303)	(−1.775)	(6.744)
Observations	134,584	134,584	77,792	77,792
R-squared	0.100	0.079	0.122	0.078

We argue that higher levels of a country's government debt relative to GDP increase crash risk for individual firms or the entire market. The intuition behind this is that higher levels of a country's government debt relative to GDP are associated with higher interest rates, hence lower stock prices. Managers may engage in bad news hoarding to protect their stock price-based compensation and careers. Weak performance hoarding accumulates to the point where hiding poor performance news is no longer worthwhile, so it is released to the public, inducing a crash in stock prices. Fiscal policy uncertainty stemming from high government debt relative to GDP may lead managers to withhold news on bad performance and to avoid taxes, which may increase the likelihood of stock price crashes. Using a large sample from 68 countries, we show that stock price crash risk is positively related to government debt level. We perform a mediation analysis and show that income smoothing and tax avoidance mediate the relationship between government debt level and stock price crash risk. Our results are robust to using instrumental variables, entropy balancing, and change regressions to address the endogeneity issues. Our results are robust to several sensitivity tests and alternative stock price crash proxies.

In addition, we show that the association between government debt level and stock price crash risk is more substantial in countries with high fiscal policy uncertainty. Furthermore, we show that in firms from highly competitive industries, government debt level has a weaker impact on stock price crashes. We also report a weaker relationship between government debt level and stock price crash risk in countries with larger and more liquid stock markets. Moreover, in financially open countries, government debt level has a weaker effect on stock price crash risk. Overall, our paper highlights the importance of government debt level for bad news hoarding and stock price crash risk.

Funding

Hamdi Bennasr would like to acknowledge financial support from Qatar University through the grant ID: QUST-1-CBE-2023-965.

CRediT authorship contribution statement

Ben-Nasr Hamdi: Writing – original draft, Methodology,

Table 15
Set 2 Cross-sectional tests. In this table we present cross-sectional tests. Models (1) and (2) report our results while we add GOVDEBT_GDP*HHI_2 and HHI_2 to our basic models. Models (3) and (4) report our results while we add GOVDEBT_GDP*MCAP and MCAP to our basic models. Models (5) and (6) report our results while we add GOVDEBT_GDP*TRADED and TRADED to our basic models. Models (7) and (8) report our results while we add GOVDEBT_GDP**CAP_OPEN* and *CAP_OPEN* to our basic models. Below each estimate are the z-statistics. 10% significance level is indicated by *, 5% significance level is indicated by **, and 1% significance level is indicated by ***.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	HHI_2		*MCAP*		*TRADED*		*CAP_OPEN*	
	N_SKEW_t	D_UVOL_t	N_SKEW_t	D_UVOL_t	N_SKEW_t	D_UVOL_t	N_SKEW_t	D_UVOL_t
$GOVDEBT\_GDP_{t-1}$	0.041***	0.002	0.278***	0.067***	0.134***	0.029***	0.156***	0.023***
	(6.813)	(0.183)	(22.006)	(6.224)	(14.102)	(2.848)	(13.796)	(5.403)
$GOVDEBT\_GDP_{t-1}*HHI\_2_{t-1}$	**0.111*** **	**0.024** **						
	(3.506)	**(1.930)**						
HHI_2_{t-1}	-0.114***	-0.032**						
	(−3.519)	(−2.490)						
$GOVDEBT\_GDP_{t-1}*MCAP_{t-1}$			**-0.001*** **	**-0.001*** **				
			(−7.717)	**(−7.026)**				
$MCAP_{t-1}$			-0.001***	-0.001***				
			(−4.889)	(−5.782)				
$GOVDEBT\_GDP_{t-1}*TRADED_{t-1}$					**-0.001*** **	**0.000**		
					(−9.014)	**(0.910)**		
$TRADED_{t-1}$					-0.001***	-0.001***		
					(−14.760)	(−5.920)		
$GOVDEBT\_GDP_{t-1}*CAP\_OPEN_{t-1}$							**-0.001*** **	**-0.001*** **
							(−4.443)	**(−4.837)**
CAP_OPEN_{t-1}							0.001***	-0.001***
							(7.168)	(−7.158)
N_SKEW_{t-1}	0.063***	0.030***	0.062***	0.030***	0.067***	0.030***	0.068***	0.034***
	(24.474)	(29.643)	(18.249)	(22.669)	(24.750)	(23.006)	(24.277)	(31.127)
$FIRM\_SIZE_{t-1}$	0.018***	0.017***	0.017***	0.016***	0.019***	0.016***	0.016***	0.017***
	(13.056)	(30.650)	(9.375)	(21.640)	(13.004)	(22.366)	(10.780)	(29.892)
$LEVER_{t-1}$	-0.132***	-0.010	-0.063***	-0.004	-0.067***	-0.003	-0.079***	-0.003
	(−7.425)	(−1.450)	(−3.139)	(−0.466)	(−3.592)	(−0.428)	(−4.122)	(−0.470)
MTB_{t-1}	0.005***	0.003***	0.005***	0.002***	0.006***	0.002***	0.010***	0.004***
	(5.437)	(7.595)	(4.560)	(5.517)	(6.339)	(5.647)	(9.432)	(10.196)
$RTOA_{t-1}$	-0.051***	0.006	-0.060***	0.007	-0.084***	0.004	-0.074***	-0.001
	(−5.520)	(1.522)	(−5.855)	(1.531)	(−8.921)	(1.039)	(−7.581)	(−0.179)
AQ_{t-1}	0.001	0.000	0.001	-0.000	0.001	-0.000	-0.008***	-0.003***
	(0.602)	(0.200)	(0.658)	(−0.081)	(0.926)	(−0.066)	(−6.742)	(−5.822)
RET_AVG_{t-1}	1.374***	3.280***	1.643***	3.196***	3.213***	3.228***	3.685***	3.754***
	(4.718)	(27.935)	(4.963)	(23.274)	(10.365)	(23.713)	(12.026)	(32.101)
RET_STDEV_{t-1}	1.523***	0.333***	1.766***	0.273***	1.868***	0.248***	1.328***	0.294***
	(20.193)	(10.994)	(18.109)	(6.622)	(23.312)	(6.074)	(16.434)	(9.536)
$TURNOVER_{t-1}$	0.002***	0.001***	0.002***	0.000**	0.002***	0.000***	0.001***	-0.000
	(5.879)	(3.866)	(3.270)	(2.548)	(7.219)	(2.621)	(4.301)	(−0.138)
LAW_ORDER_{t-1}	-0.041***	-0.006	-0.068***	-0.001	-0.055***	0.005	-0.061***	-0.003*
	(−10.987)	(−1.502)	(−6.833)	(−0.331)	(−13.049)	(1.211)	(−14.810)	(−1.951)
$LN\ \_GDPC_{t-1}$	0.036***	-0.012*	-0.015	0.031***	0.093***	0.030***	0.111***	0.029***
	(10.598)	(−1.852)	(−1.441)	(6.657)	(24.136)	(6.666)	(26.002)	(18.087)
$GDPG_{t-1}$	0.007***	0.001	0.017***	0.001**	0.005***	0.001*	0.041***	0.010***
	(5.569)	(1.215)	(10.112)	(2.083)	(3.702)	(1.676)	(32.996)	(22.112)
$INFL_{t-1}$	-0.072***	0.005	-0.574***	0.082	-0.007	0.009	-0.060**	-0.010
	(−2.891)	(0.494)	(−4.702)	(1.614)	(−0.283)	(0.855)	(−2.310)	(−1.009)
$\Delta EXCH\_RATE_{t-1}$	-0.279***	-0.018	-0.295***	-0.034**	-0.290***	-0.041**	-0.272***	-0.047***
	(−8.063)	(−1.253)	(−7.301)	(−2.075)	(−8.083)	(−2.562)	(−8.370)	(−3.757)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.452***	-0.214***	-0.131	-0.552***	-1.092***	-0.569***	-1.319***	-0.618***
	(−7.543)	(−3.059)	(−1.393)	(−12.974)	(−17.012)	(−13.986)	(−29.743)	(−36.539)
Observations	187,991	187,991	164,459	164,459	166,907	166,907	168,065	168,065
R-squared	0.090	0.072	0.100	0.075	0.101	0.074	0.026	0.040

Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Boubaker Sabri:** Writing – review & editing, Visualization, Validation, Supervision, Software, Resources, Project administration, Conceptualization.

Data availability

Data will be made available on request.

Appendix A: Variable definition

Variable	Description
Panel A: Variables used in the main analysis	
N_SKEW	The negative coefficient of skewness of firm-specific weekly returns for each sample year. An explanation of how the skewness of firm-specific weekly returns is estimated can be found in Equation (2).
D_UVOL	The natural logarithm of the standard deviation of weekly firm-specific returns that are lower than the average of weekly firm-specific returns in a given year is divided by the standard deviation of weekly firm-specific returns that are higher than the average of weekly firm-specific returns in a given year.
GOVDEBT_GDP	The ratio of government debt over GDP.
FIRM_SIZE	The natural logarithm of the firm's total assets in US$.
LEVER	Long-term debt as a percentage of total assets.
MTB	Market value as a percentage of book value.
RTOA	The return-on-assets ratio.
AQ	The absolute value of Dechow and Dichev's (2002) measure of abnormal accruals, as modified by Ball and Shivakumar (2005).
RET_AVG	The yearly average of $(1+\xi_{i,t})$.
RET_STDEV	Weekly returns' standard deviation during the year.
TURNOVER	The change between the average monthly turnover at the beginning and end of the year.
LAW_ORDER	The law-and-order index.
LN _GDPC	The natural logarithm of GDP per capita.
GDPG	The growth in GDP per capita.
INFL	The inflation rate calculated as the percentage change in the consumer price index.
Δ_EXCH_RATE	The yearly change in the country's exchange rate, denoted in local currency units per US dollar.
Panel B: Mediating variables	
INCOME_SMOOTHING	The negative correlation between the ratio of cash flow from operations over total assets and the ratio of total accruals over total assets.
TAX_AVOIDANCE	ETR GAAP in line with Dyreng et al. (2017) calculated ad GAAP tax expense divided by pre-tax accounting income. The proxy varies between 0 and 1. For ease of interpretation, we multiply this ratio by −1.
Panel C: Instrumental variable	
MIL_GDP	The ratio of military expenses over GDP.
Panel D: Alternative crash risk variables	
CRASH_DUMMY	For firm-year observations for which at least a weekly firm-specific returns are lower than 3.09 standard deviations times the sample average of weekly firm-specific returns, a binary variable is equal to one and zero otherwise.
SUM_CRASH	The number of weeks in which firm-specific returns are lower than 3.09 standard deviations times the sample average of weekly firm-specific returns in a given year.
Panel D: Moderating variables	
GOVDEBT_RATING	Standard and Poor's government debt ratings from Capital IQ.
OVERALL_EPU	Baker et al.'s (2016) overall economic policy uncertainty index. A higher index indicates higher economic policy uncertainty.
FPU	Baker et al.'s (2016) fiscal policy index. A higher index indicates higher fiscal policy uncertainty.
HHI_2	The sum of the squared firm sales over total industry sales. We define industry at the two-digit SIC code level.
MCAP	The ratio of stock market capitalisation over GDP.
TRADED	The ratio of trading volume over the market capitalisation of traded stocks.
CAP_OPEN	Capital account openness index. The index is the principal component of the following IMF variables: 'an indicator variable for the existence of multiple exchange rates (k1); restrictions on current account (k2); capital account transactions (k3); and a variable indicating the requirement of the surrender of export proceeds (k4)'. Source: Chinn and Ito (2006), footnote 12).

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