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Badar Nadeem Ashraf * and Ningyu Qian

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Article

The Effect of Economic Policy Uncertainty on Banks: Distinguishing Short and Long-Term Effects

Badar Nadeem Ashraf [1,*] and Ningyu Qian [2]

[1] LSBU Business School, London South Bank University, London SE1 0AA, United Kingdom

[2] School of Management, Huazhong University of Science and Technology, Wuhan (430074), China

* Correspondence: ashrafb4@lsbu.ac.uk

Abstract

We investigate the impact of government economic policy uncertainty (GEPU) on bank risk, distinguishing short- and long-term effects. We argue that heightened GEPU increases bank risk in the short run by raising borrowers' default probabilities under adverse economic conditions, while reducing risk in the long run by discouraging banks from extending risky loans due to the higher option value of waiting under uncertainty. Using bank-level data from 22 countries over 1998–2017, we find that elevated GEPU raises bank risk contemporaneously but lowers it with a lag of two to four years. These results are robust to endogeneity concerns, alternative measures of bank risk and GEPU, variations in sample composition, and different estimation techniques. Our findings highlight the dual role of policy uncertainty in shaping bank risk-taking behavior and have implications for regulatory design and macroprudential policy.

Keywords: economic policy uncertainty; bank risk; WUI index; EPU index; bank loan growth

1. Introduction

Recent research increasingly recognizes that uncertainty in government economic policies has significant implications for businesses, the financial sector, and households (Schweitzer & Shane 2011; Giavazzi & McMahon 2012; Pastor & Veronesi 2013; Brogaard & Detzel 2015; Ghosal & Ye 2015; Gulen & Ion 2016; Julio & Yook 2016; Krol 2017; Xu 2023). Focusing on banking, prior studies document that heightened government policy uncertainty influences key bank decisions, leading to lower bank returns (Ashraf), higher loan interest rates (Francis *et al.* 2014; Ashraf & Shen 2019), reduced lending activity (Bordo *et al.* 2016; Caglayan & Xu 2018; Hu & Gong 2019; Danisman *et al.* 2020; Shabir *et al.* 2022), increased liquidity hoarding (Ashraf 2020; Berger *et al.* 2022), elevated bank risk (Phan *et al.* 2021; Shabir *et al.* 2021; De Silva *et al.* 2023; Danisman & Tarazi 2024) and lower earnings quality (Yiqiang Jin *et al.* 2019; Ng *et al.* 2020; Danisman *et al.* 2021; Desalegn & Zhu 2021; Tran & Houston 2021; Biswas *et al.* 2025).

These studies rest on the premise that heightened government economic policy uncertainty (GEPU) deteriorates the macroeconomic environment, elevates risk and default probabilities of economic agents, and induces greater risk aversion. While GEPU exerts immediate effects, it also generates lagged responses as the option value of waiting rises under uncertainty. (Stokey 2016) demonstrates that uncertainty surrounding policy changes prompts firms to adopt a "wait-and-see" strategy, delaying irreversible investments until uncertainty resolves. Once clarity emerges, firms often accelerate investment, illustrating the dynamic and delayed impact of uncertainty on decision-making. In the banking context, institutions may initially curtail lending following a surge in uncertainty, yet adopt more aggressive strategies over time, ultimately increasing credit exposure. Likewise, conservative lending during periods of elevated uncertainty may reduce credit risk in subsequent periods. In this paper, we examine the impact of GEPU on bank risk, explicitly distinguishing between short- and long-term effects.

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We hypothesize that economic policy uncertainty can affect bank risk in two ways: First, heightened policy uncertainty is likely to boost current-period bank risk by raising the average default risk of borrowers. The average default risk of borrowers increases because policy uncertainty shocks lead to higher idiosyncratic dispersion in firms' productivity (Brand *et al.* 2019) and household incomes (Bloom 2014; Li *et al.* 2018) due to a decrease in overall economic activity, including new investment, employment and household consumption (Bloom 2009; Baker *et al.* 2016; Bloom *et al.* 2018). Higher idiosyncratic dispersion in incomes enhances the probability of a bad state for both borrowing firms and households.

Second, real options theory-based literature suggests banks reduce lending in response to higher uncertainty, which increases the value of the option to wait and see (Bordo *et al.* 2016; Chi & Li 2017; Caglayan & Xu 2018; Hu & Gong 2018), while some other studies suggest reduction in current-period bank lending might result in lower bank default risk and loan losses with a lag of two to four years (Hess *et al.* 2009; Foos *et al.* 2010; Amador *et al.* 2013). Building on these studies, our second hypothesis is that current-period economic policy uncertainty, because of its negative impact on current-period bank lending, might result in lower bank risk with a lag of two to four years.

To investigate the impact of economic policy uncertainty on bank risk with respect to both hypotheses, we use bank-level data from 22 countries over the period from 1998 to 2017 for empirical analysis. We measure bank risk with five alternative proxies including the probability of bank default (z-score), volatility in bank total operating income, volatility in bank net interest margins, non-performing loans to gross loans ratio and loan loss provisions to gross loans ratio. These measures capture different aspects of bank risk. We measure government economic policy uncertainty with two alternative proxies including world uncertainty index of Ahir *et al.* (2018) and economic policy uncertainty index of Baker *et al.* (2016). Overall, our results provide evidence in favor of both hypotheses. Results remain robust when we use: political fractionalization index as an instrument for policy uncertainty, alternative estimation methods, alternative sample compositions and alternative control variables.

We contribute to the existing literature in several ways: First, we add to the recently expanding literature that argues the importance of economic policy uncertainty for economic outcomes. In this regard, existing studies have found that during the periods of higher policy uncertainty in a country, firms invest less (Bernanke 1983; Bloom 2009; Baker *et al.* 2016), firms delay merger and acquisition deals (Bonaime *et al.* 2018), foreign direct investment shrinks (Julio & Yook 2016), unemployment swells (Baker *et al.* 2016) and the gross domestic product drops significantly (Bloom *et al.* 2018).

Second, we complement the studies that argue that economic policy uncertainty is important for financial sector outcomes. In this regard, recent studies have found that firms pay higher costs on corporate bonds (Waisman *et al.* 2015; Bradley *et al.* 2016) and equity capital (Pastor & Veronesi 2013; Brogaard & Detzel 2015; Pham 2019) as the economic policy uncertainty increases. Specifically focusing on the banking sector, recent literature reports that bank loan interest rates increase (Francis *et al.* 2014; Ashraf & Shen 2019), loan growth declines (Bordo *et al.* 2016; Chi & Li 2017; Caglayan & Xu 2018; Hu & Gong 2018), liquidity hoarding increases (Berger et al 2018) and stock prices plummet (He & Niu 2018) in response to higher economic policy uncertainty. We complement these studies by investigating the impact of economic policy uncertainty on bank risk for a sample of 22 countries. Our main result, in this regard, is that economic policy uncertainty leads to higher current-period bank risk, while a lower bank risk with a lag of 2-4 years.

Finally, we add to the studies that examine the country-level environmental determinants of bank risk. in this regard, existing studies find that banking industry regulations such as minimum capital requirements, restrictions on bank activities and the existence of explicit deposit insurance (Laeven & Levine 2009; Anginer *et al.* 2014; Haq *et al.* 2014), political institutions (Ashraf 2017), legal institutions such as creditor rights and borrowers related information sharing mechanisms (Houston *et al.* 2010; Cole & Turk 2013; Fang *et al.* 2014) and national culture (Ashraf *et al.* 2016b; Ashraf & Arshad 2017; Mourouzidou-Damtsa *et al.* 2019) are significant determinants of bank risk. We find that economic policy uncertainty is also an economically significant determinant of bank risk.

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The paper is organized as follows. In Section 2, we draw testable hypotheses. Section 3 presents our data collection procedures. Section 4 introduces empirical methodology and variables. Empirical results are reported in Section 5. Final section concludes the study.

2. Hypotheses Development

We postulate that economic policy uncertainty boosts bank risk immediately by raising the default risk of borrowers, while it reduces bank risk with a lag of two to four years by decreasing current-year loan growth.

The banking sector is one of the main sources of financing for the real sector (i.e., businesses and households) in all major economies. Banks provide loans to earn interest; however, they face the risk of whether borrowers will be able to pay back the principal and interest payments. Thus, bank risk, in large part, depends on the factors that affect the financial conditions of borrowers. Keeping other things constant, the deterioration in the financial conditions of borrowers would adversely affect their debt-paying ability and, consequently, would increase the bank risk.

Economic policy uncertainty adversely affects the real sector. Due to higher economic policy uncertainty, risk-averse economic agents decrease investment and consumption. Recent literature identifies that higher economic policy uncertainty reduces short-run economic growth (i.e., quarterly and annual) by decreasing investment, hiring, output, consumption and trade (Bloom 2014, 2017). Although economic agents become cautious in making new decisions, nonetheless higher uncertainty increases the default risk on already taken positions, such as the existing loans, by expanding the size of left-tail default outcomes of both businesses and households. Higher policy uncertainty boosts the default risk of businesses by increasing the idiosyncratic dispersion in firms' productivity (Bloom 2009; Liu & Zhong 2017; Brand *et al.* 2019). And it boosts the default risk of households by enhancing the volatility of household incomes due to less new hiring and higher unemployment rate on the one hand, and the volatility of wages of those who remain employed on the other hand (Bloom 2014; Li *et al.* 2018). A consistent rise in aggregate economic policy uncertainty would gradually worsen the overall economic conditions and, ultimately, would let many financially weak businesses and households to default on their bank loans. Thus economic policy uncertainty increases bank risk by worsening ex post loan performance. Thus, our first hypothesis is as follows:

H-1: Economic policy uncertainty boosts bank risk immediately.

Economic policy uncertainty can indirectly affect bank risk by reducing loan growth. Building on the real-options theory, the studies, such as Bernanke (1983), Bloom (2009), and Baker *et al.* (2016), find that heightened uncertainty reduces new investments. In the similar vein, higher economic policy uncertainty can reduce bank investment in new loans by increasing the value of the option to wait because of the chances of unfavorable policies. Unfavorable policies such as adverse regulations or unexpected changes in government expenditures or interest rates might lead to weaker economic conditions. Thus in the face of heightened economic policy uncertainty, banks would hesitate to lend and postpone real investments to retain the option value. Consistent with these arguments, Bordo *et al.* (2016), Chi and Li (2017) and Hu and Gong (2018) find that economic policy uncertainty and bank loan growth rates have negative association.

However, another strand of studies suggests that decrease in loan growth reduces bank risk with a lag. For instance, in a seminal paper, Foos *et al.* (2010) argue that loan growth is an important driver of bank risk. Using bank-level data from 16 countries, they show that excessive current-period loan growth leads to increase in loan loss provisions in subsequent three years. Similarly, Hess *et al.* (2009) use the data of 32 Australian banks over the period 1980-2005 and find that strong loan growth translates into higher loan losses with a lag of two to four years. Likewise, Amador *et al.* (2013) use the data of Columbian banks and find that abnormal credit growth over a prolonged period results in higher bank default risk and non-performing loans in subsequent periods. In another recent study,

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Dang (2019) use the data of Vietnamese banks over the period 2006-2017 and conclude that higher loan growth leads to increase in loan loss provisions during the subsequent 2 to 3 years.

Building on above discussion, we make second hypothesis that economic policy uncertainty reduces bank risk with a lag of two to four years due to its immediate negative impact on loan growth.

H-2: Economic policy uncertainty reduces bank risk with a lag of two to four years.

3. Data Collection

We started our sample construction by downloading the data of world uncertainty index of Ahir *et al.* (2018) and economic policy uncertainty index of Baker *et al.* (2016) from the website http://www.policyuncertainty.com. We chose the countries for which both of these indices are available. We chose fairly long sample period from 1998 to 2017. Next, we obtained financial statements accounting data for banks in these countries from Bankfocus database. We included commercial, cooperative and saving banks in sample. We kept the data of both active and inactive banks to avoid survivorship bias of low risk banks.

Next, we collected data of banking industry-level and country-level control variables. We collected the data of banking industry regulations from World Bank surveys on bank regulations (Barth *et al.* 2013) and the data of banking industry structure from Financial Development database of World Bank. Data for macroeconomic variables was collected from World Development Indicators (WDI) database of World Bank. Data for law & order variable was collected from International Country Risk Guide (ICRG) database. Then we linked bank-level financial statements data with the banking industry-level and country-level data.

To refine the data, we dropped observations with missing necessary data. We also dropped banks with less than four valid yearly observations. Our final dataset consists of 5,138 banks with 50,595 yearly observations from 22 countries over the period 1998-2017. We winsorized all bank-level variables at 1% level in both lower and upper tails to eliminate the effect of outliers.

Table 1 reports the countries included in the sample, together with the number of banks and annual observations from each sample country.

Table 1. Sample distribution and country-wise mean values of main variables. This table reports country-wise sample distribution and mean values of dependent and main independent variables. Z-score, σ(ROA), σ(NIM), LLP and NPL are five alternative proxies of bank risk, where higher values of each of these proxies represent higher bank risk and vice versa. WUI and EPU are two alternative proxies of government economic policy uncertainty. WUI is world uncertainty index of Ahir *et al.* (2018). EPU is news-based economic policy uncertainty index of Baker et al. (2016). Higher values of both WUI and EPU represent higher policy uncertainty and vice versa.

			Country-level mean values						
Country	Banks	Observations	Z-score	σ(ROA)	σ(NIM)	LLP	NPL	WUI	EPU
Australia	31	200	-4.39	0.17	0.15	0.34	1.12	0.19	4.74
Brazil	115	1016	-2.75	1.60	2.03	2.88	8.01	0.27	4.96
Canada	58	287	-4.14	0.24	0.22	0.42	1.54	0.15	5.02
Chile	24	154	-3.80	0.45	0.53	1.19	3.72	0.15	4.70
China	187	1185	-3.73	0.30	0.42	0.97	1.74	0.10	5.23
Colombia	30	209	-3.24	0.94	0.88	2.60	3.18	0.26	4.61
France	270	2399	-4.07	0.27	0.23	0.49	5.28	0.20	5.08
Germany	1888	23442	-3.92	0.21	0.18	0.54	3.00	0.17	4.84
Greece	18	125	-3.07	0.57	0.34	2.23	18.49	0.12	4.71

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Hong Kong	33	295	-4.23	0.28	0.22	0.36	0.61	0.10	4.92
India	72	643	-3.75	0.32	0.29	1.20	4.24	0.10	4.52
Ireland	9	69	-3.59	0.29	0.20	1.69	15.00	0.23	4.83
Italy	661	4906	-3.76	0.35	0.29	1.16	12.17	0.22	4.75
Japan	638	8797	-4.20	0.13	0.09	0.49	7.36	0.18	4.64
Mexico	158	892	-3.19	0.96	1.06	2.48	2.83	0.26	4.06
Netherlands	37	253	-3.59	0.37	0.28	0.82	3.88	0.22	4.56
Rep. Korea	17	85	-3.65	0.44	0.34	0.85	1.83	0.19	4.93
Russia	515	2775	-2.96	1.41	1.37	2.13	7.80	0.25	5.05
Singapore	11	86	-4.75	0.14	0.23	0.21	1.22	0.06	4.87
Spain	163	981	-3.62	0.36	0.24	0.78	6.84	0.26	4.73
Sweden	93	910	-4.25	0.33	0.29	0.28	1.91	0.20	4.50
United Kingdom	110	886	-3.74	0.41	0.36	0.90	5.29	0.37	4.82
Total/mean	5138	50595	-3.86	0.34	0.31	0.80	6.42	0.19	4.80

4. Empirical Methodology

Following recent cross-country studies on banking (Ashraf 2017; Ashraf & Shen 2019), we specify following pooled-panel OLS model for estimations. Pooled-panel model takes into account both the cross-country and overtime variations, and is considered superior for cross-country studies involving country-level variables (Ashraf 2017).

$$Y_{i,j,t} = \alpha_i + \beta_1 Policy\ Uncertainty_{j,t} + \sum_{k=1}^{k} \beta_k X_{i,j,t}^{k} + \sum_{l=1}^{l} \beta_l X_{j,t}^{l} + \sum_{m=1}^{m} \beta_m X_{j,t}^{m} + \sum_{t=1}^{T-1} \epsilon_t D_t + \varepsilon_{i,j,t} \quad (1)$$

Here, i, j and t subscripts represent bank, country and year, respectively. α_i is a constant term. Dependent variable, Y, represents bank risk. Policy uncertainty represents the government economic policy uncertainty and is the main explanatory variable of interest. $X_{i,j,t}^{k}$ represents the bank-level annual control variables including bank size, equity to total assets ratio, non-interest income to total revenue ratio, annual growth in bank gross loans, liquid assets to total assets ratio, cost to income ratio, list bank dummy, state-owned bank dummy and bank market power ratio. $X_{j,t}^{l}$ represents banking industry-level regulatory and industry-structure control variables including capital stringency index, activity restrictions and banking industry concentration. And, $X_{j,t}^{m}$ represents country-level macroeconomic and institutional control variables including GDP growth rate, inflation, law & order and financial crisis dummy. D_t is a set of year dummy variables to control for international factors. $\varepsilon_{i,j,t}$ is an error term. We use heteroskedastic-robust standard errors to estimate p-values in regressions.

To examine first hypothesis, we estimate Eq. (1) and estimates of β_1 show the immediate impact of economic policy uncertainty on bank risk. For second hypothesis, we estimate Eq. (1) by using lags of policy uncertainty together with all other explanatory variables. We use up to four lags in alternative estimations. Coefficient estimates of lagged policy uncertainty show that impact of policy uncertainty on bank risk with a lag.

We measure bank risk with five alternative proxies including Z-score, σ(NIM), σ(ROA), LLP and NPL.

Z-score measures the probability of bank default. Z-score= –1* (log((ROA+CAR)/σ(ROA))), where ROA is annual return on assets before loan loss provisions and taxes, CAR is annual equity to total assets ratio, and σ(ROA) is standard deviation of annual values of return on assets before loan loss provisions and taxes calculated over 3-year overlapping window over the sample period (i.e.,

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1998–2000, 1999–2001 and so on). The values of Z-score show the number of standard deviations from mean value by which the bank return has to fall to deplete all shareholders' equity. The higher the values of Z-score, the higher the banks' default risk, and vice versa. Lepetit and Strobel (2015) supported that Z-score defines bank default risk over the domain of all real numbers and is an attractive and unproblematic proxy of bank default risk to be used as dependent variable in standard regression analysis.

σ(NIM) measures the volatility in bank net interest margins. Specifically, σ(NIM) equals the standard deviation of annual net interest margin, calculated over 3-year overlapping periods (i.e., 1998–2000, 1999–2001 and so on). σ(NIM) denotes bank interest income risk.

σ(ROA) measures the volatility in overall bank operating income. Specifically, σ(ROA) equals the standard deviation of annual values of return on assets before loan loss provisions and taxes, calculated over 3-year overlapping periods. σ(ROA) represents bank overall operating income risk. Due to the 3-year overlapping window used for the calculation of σ(NIM) and σ(ROA), the effective sample period for empirical analysis starts from the year 2000.

LLP variable equals annual loan loss provisions to gross loans ratio. As banks regularly adjust loan loss provisions to reflect the changes in the risk of outstanding loans (Laeven & Huizinga 2019), an increase in loan loss provisions represents higher bank loans portfolio risk.

NPL equals annual non-performing loans to gross loan ratio for each bank. NPL represents bank realized credit losses. According to the United Nations System of National Accounts, a loan is classified as non-performing when payments of interest or principal are past due by 90 days or more. Banks periodically update their stock of non-performing loans if they find that certain borrowers have not paid back on their bank loans. Thus, the higher the volume of nonperforming loans, the higher the bank realized risks.

Main advantage of using alternative proxies is that they capture different aspects of bank risk. Z-score measures bank default risk, σ(NIM) and σ(ROA) capture volatility in bank net interest income and total earnings, and LLP and NPL represent bank expected and realized credit losses.

We use two alternative proxies to measure government economic policy uncertainty: world uncertainty index of Ahir *et al.* (2018) and economic policy uncertainty index of Baker *et al.* (2016). Ahir *et al.* (2018) develop world uncertainty index (WUI from hereafter) by counting the word 'uncertainty' (or its variants) in the quarterly country analysis reports prepared by The Economist Intelligence Unit (EIU) of The Economist Group for all countries around the world. These reports are prepared by a group of experts and discuss country-specific political and economic developments. We averaged quarterly values of WUI index for each year to get annual values to be used with annual bank-level data. Different from Ahir *et al.* (2018), Baker *et al.* (2016) construct the monthly economic policy uncertainty index (EPU from hereafter) based on the count of newspaper articles containing keywords in three categories, including uncertainty (i.e., uncertain or uncertainty), economy (i.e., economic or economy) and policy (i.e., central bank, regulation, tax, government spending or other country-specific policy related words), published in major newspapers of each country. We averaged monthly EPU index for annual values.

Ahir *et al.* (2018) argue WUI index is based on country reports from a single source and better captures the local political and economic policy uncertainty as compared to the EPU index which is more global in nature. Newspapers articles counted for EPU index may also include those articles which discuss uncertainty related with international factors. Because of this, EPU index is more likely to co-move internationally; international factors explain 36 percent variation in EPU index while only 17 percent in WUI index (Ahir *et al.* 2018). Further, WUI index does not suffer from the concerns such as ideological bias and consistency, and makes cross-country comparisons easier due to underlying single data source.

We add several variables to control for bank-level, banking industry-level and country-level factors which are likely to affect bank risk in addition to economic policy uncertainty.

Specifically, we add bank-level variables to control for individual bank characteristics, such as size, capitalization, growth, business model, liquidity holding, efficiency, ownership structure and

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market power, which are likely to have significant effect on bank risk. Specifically, we include bank size, growth in bank gross loans, noninterest income to total revenue ratio, liquid assets to total assets ratio, cost to income ratio, listed banks dummy, government banks dummy and bank market power. Bank size is measured as the natural logarithm of bank annual total assets. Growth in bank gross loans is measured as the year-on-year growth in bank total gross loans. Noninterest income to total revenue ratio measures the non-interest income, including net gains on trading and derivatives, net gains on other securities, net fees and commissions and other operating income, as a percentage of total bank revenue. Liquid assets to total assets ratio measures the year-end balances of liquid assets (cash and due from banks, trading securities and at fair value through income, loans and advances to banks, reverse repos and cash collaterals) as a percentage of total bank assets. Cost to income ratio measures the cost of running operations as a percentage of a bank's operating income. Listed banks dummy equals 1 if a bank is listed on a stock exchange and 0 otherwise. Government bank dummy equals 1 if government holds the majority shareholding of a bank and 0 otherwise. Bank market power is measured as the annual total assets of an individual bank divided by the sum of assets of all banks operating in a country in a year, multiplied by 100.

We add three banking industry-level variables to control for the effect of prudential regulations and banking industry structure on bank risk: capital stringency index, activity restrictions and banking industry concentration. Data for capital stringency index and activity restrictions is obtained from World Bank surveys on bank regulations as reported by Barth *et al.* (2013). Capital stringency index equals the sum of two sub-indices including initial capital stringency index and overall capital stringency index. Overall, the capital stringency index reflects whether the minimum capital requirements for banks in a country are in-line with Basel requirements, whether the minimum capital requirements are sensitive to bank credit, market and operational risks, and whether regulators verify the sources of bank capital. Further it also measures which types of funds can be categorized as bank capital and which types of losses banks have to deduct to determine capital adequacy ratios. The index ranges from 0 to 10, where higher values indicate that a country implements stringent capital requirements for banks, and vice versa. Activity restrictions variable measures to what extent commercial banks in a country are allowed to participate in non-lending activities such as securities, insurance, real estate activities and/or owning other firms. The variable ranges from 4 to 16 where higher values indicate that a country implements higher restrictions on bank activities, and vice versa. As the World Bank surveys on bank regulations were conducted in 1999, 2003, 2007 and 2011, we use information from the survey conducted in 1999 for bank observations over the year 2000, from 2003 survey for bank observations over the years 2001-2003, from 2007 survey for bank observations over the years 2004-2007 and from 2011 survey for banks observations over the years 2008-2018. Banking industry concentration is measured as 'the assets of three largest banks as a percentage of total assets of all banks operating in a country'. We collected data for this variable from Financial Development database of World Bank.

Finally, we add country-level macroeconomic and legal institutional variables to control for the impact of cross-country and over-time variations in macroeconomic conditions and legal institutions on bank risk. Macroeconomic variables include GDP growth rate, inflation and developing countries dummy. GDP growth rate equals annual percentage growth in gross domestic product of a country. Inflation equals percentage change in annual average consumer prices. Developing countries dummy equals 1 if a sample country is classified as middle or low income by World Bank and 0 if it is classified as developed. Data for these variables is collected from the World Development Indicators database of World Bank. We include law & order variable, which measures the extent of law enforcement in a country, to account for cross-country differences in legal institutional environment. Further, financial crisis may increase bank risk by materializing downside risks. To control for this effect, we add a financial crisis dummy variable which equals 1 if a country faces financial crisis in a year according to the Laeven and Valencia (2018)'s financial crisis database, and 0 otherwise.

5. Empirical Results

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5.1. Summary Statistics

Table 1 reports the country-wise mean values of each of five proxies of bank risk and two proxies of policy uncertainty. As shown, the mean Z-score is higher in emerging market countries such as Brazil (-2.75) and Russia (-2.96) indicating that banks, on average, have higher probability of default in these countries. On the other hand, mean Z-score is lower for countries, such as Singapore (-4.75) and Australia (-4.39), with stable financial systems. Likewise, the mean value of WUI index is the highest for the United Kingdom (0.37) due to Brexit lead uncertainty shock and the lowest for Singapore (0.06).

Table 2 reports full sample summary statistics for main variables. The mean value of Z-score equals -3.86 with a standard deviation of 1.0. This summary statistics is largely comparable with previous studies on bank risk, such as Kanagaretnam *et al.* (2014) and Ashraf (2017) who report mean values of z-score equal to -3.48 and -3.64, respectively. Mean values of WUI and EPU indices are 0.19 and 4.10 with standard deviations of 0.12 and 0.37, respectively, pointing up considerable within sample variation in policy uncertainty. Likewise, control variables also demonstrate substantial variation across mean values.

Table 2. Summary statistics of main variables. This table reports summary statistics of main variables. Z-score, σ(ROA), σ(NIM), LLP and NPL are five alternative proxies of bank risk, where higher values of each of these proxies represent higher bank risk and vice versa. WUI and EPU are two alternative proxies of government economic policy uncertainty. WUI is world uncertainty index of Ahir *et al.* (2018). EPU is news-based economic policy uncertainty index of Baker et al. (2016). Higher values of both WUI and EPU represent higher policy uncertainty and vice versa. Others are bank-, banking industry- and country-level control variables.

Variable	Observations	Mean	Standard deviation	Minimum value	Maximum value
Z-score	50595	-3.86	1.00	-8.15	3.79
σ(ROA)	50595	0.34	0.58	0.01	9.79
σ(NIM)	50595	0.31	0.62	0.00	12.18
LLP	50595	0.80	1.41	-2.80	8.31
NPL	30266	6.42	6.61	0.02	35.41
WUI	50595	0.19	0.12	0.00	0.99
EPU	50595	4.80	0.37	3.30	5.90
Bank size	50595	14.06	2.02	6.04	22.11
Equity to total assets ratio	50595	8.77	6.85	1.95	92.98
Non-interest income to total revenue ratio	50595	26.46	17.15	-15.58	88.25
Annual growth in bank gross loan	50595	5.89	16.34	-33.27	95.15
Liquid assets to total assets ratio	50595	17.80	13.96	1.77	73.14
Cost to income ratio	50595	69.51	15.95	27.92	129.12
Listed bank dummy	50595	0.08	0.27	0.00	1.00
State-owned bank dummy	50595	0.01	0.10	0.00	1.00
Bank market power	50595	0.51	2.96	0.00	100.00
Banking industry concentration	50595	61.51	15.17	21.84	100.00
Capital stringency index	50595	6.63	1.48	2.00	10.00
Activity restrictions	50595	8.34	2.12	4.00	15.00
Developing countries dummy	50595	0.14	0.34	0.00	1.00

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GDP growth rate	50595	1.44	2.77	-7.80	25.01
Inflation	50595	1.95	2.55	-3.74	21.46
Law & order	50595	4.69	0.81	1.00	6.00
Financial crisis dummy	50595	0.13	0.33	0.00	1.00

Table 3 reports pairwise correlations between variables. As shown in Panel 1, correlation coefficients between alternative proxies of bank risk are positive, but not very high, which indicates that each proxy, to some extent, measures bank risk from different aspect. Likewise, the 0.31 correlation coefficient between WUI and EPU in Panel 2 suggests two proxies are different in measuring uncertainty about government policy. Correlations between control variables are also not very high suggesting that the chances of multicollinearity in multivariate models are remote.

Table 3. Matrix of pair-wise correlations between variables. This table reports pair-wise Pearson correlations between variables. All correlations are significant at 5 percent level except those with bold-faced. Z-score, σ(ROA), σ(NIM), LLP and NPL are five alternative proxies of bank risk, where higher values of each of these proxies represent higher bank risk and vice versa. WUI and EPU are two alternative proxies of government economic policy uncertainty. WUI is world uncertainty index of Ahir *et al.* (2018). EPU is news-based economic policy uncertainty index of Baker et al. (2016). Higher values of both WUI and EPU represent higher policy uncertainty and vice versa. Others are bank-, banking industry- and country-level control variables.

Panel 1: Pearson Correlations between alternative proxies of bank risk

	Variables	(1)	(2)	(3)	(4)	(5)
(1)	Z-score	1.00				
(2)	σ(ROA)	0.58	1.00			
(3)	σ(NIM)	0.31	0.60	1.00		
(4)	LLP	0.25	0.31	0.29	1.00	
(5)	NPL	0.22	0.17	0.11	0.38	1.00

Panel 2: Pearson Correlations between alternative measures of policy uncertainty

		(1)	(2)
(1)	WUI	1.00	
(2)	EPU	0.31	1.00

Panel 3: Pearson Correlations between control variables

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1)	Bank size	1.00																
(2)	Equity to total assets ratio	-0.32	1.00															
(3)	Non-interest income to total revenue ratio	0.05	0.18	1.00														
(4)	Annual growth in	0.04	0.04	0.08	1.00													

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	bank gross loan																	
(5)	Liquid assets to total assets ratio	-0.05	0.21	0.09	0.03	1.00												
(6)	Cost to income ratio	-0.25	-0.06	0.02	-0.13	0.08	1.00											
(7)	Listed bank dummy	0.43	-0.03	0.05	0.07	-0.06	-0.15	1.00										
(8)	State-owned bank dummy	0.11	0.05	0.03	-0.00	0.06	-0.06	0.13	1.00									
(9)	Bank market power	0.38	-0.03	0.08	0.04	0.03	-0.13	0.30	0.09	1.00								
(10)	Banking industry concentration	-0.16	-0.12	0.18	-0.08	-0.29	-0.00	-0.24	-0.08	0.01	1.00							
(11)	Capital stringency index	-0.01	0.02	0.23	0.04	-0.14	-0.11	-0.04	0.03	-0.02	0.30	1.00						
(12)	Activity restrictions	0.27	-0.06	-0.27	0.02	0.03	-0.13	-0.22	-0.00	0.05	-0.57	-0.21	1.00					
(13)	Developing countries dummy	-0.01	0.39	0.12	0.24	0.28	-0.17	0.21	0.15	0.12	-0.47	0.07	0.18	1.00				
(14)	GDP growth rate	0.12	0.00	-0.00	0.19	0.02	-0.18	0.11	0.06	0.08	-0.07	0.15	0.13	0.27	1.00			
(15)	Inflation	-0.15	0.37	0.24	0.21	0.24	-0.09	0.11	0.10	0.07	-0.23	0.13	-0.16	0.72	0.09	1.00		
(16)	Law & order	0.09	-0.37	-0.09	-0.16	-0.20	0.10	-0.12	-0.09	-0.05	0.38	0.10	-0.17	-0.78	-0.03	-0.55	1.00	
(17)	Financial crisis dummy	-0.02	-0.01	0.03	-0.03	0.00	0.02	-0.03	-0.04	-0.01	0.06	0.12	-0.08	-0.09	-0.49	0.04	0.06	1.00

5.2. Policy Uncertainty and Bank Risk: Main Specifications

To analyze hypothesis 1, we estimate Eq. (1) using five alternative proxies of bank risk as dependent variable one-by-one, and first representing policy uncertainty with WUI and then with EPU index.

As shown in Table 4, WUI index enters positive and significant in all five models. Results from Models 1 to 5 indicate that heightened policy uncertainty immediately boosts bank default risk, volatility in net interest income, volatility in bank overall operating income, expected loan losses and realized loan losses, respectively.

As to the economic significance of results, in Model (1), a one standard deviation increase in WUI index (0.12) increases Z-score by 0.06 (0.510 * 0.12) where the mean value of Z-score equals -3.86. Similarly, a one standard deviation increase in WUI index increases the σ(ROA) by 0.044 (0.158 * 0.12)

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in Model (2), σ(NIM) by 0.046 (0.246 * 0.12) in Model (3), LLP by 0.071 (0.592 * 0.12) in Model (4) and NPL by 0.81 (6.768 * 0.12) in Model (5).

Similarly, EPU index in Table 5 also enters positive and significant with bank risk in four Models except when non-performing loans is used to measure bank risk. Together, these results are consistent with our prediction and confirm that higher uncertainty about government policy leads to higher bank risk.

Results of control variables are also consistent with expectation and validate our empirical model. For example, negative coefficients of bank size indicate that large banks exhibit lower default risk, income volatility and loan losses. Positive results of non-interest income to total revenue ratio show that banks involved in extensive non-interest income based activities are more risky. Results of growth in bank gross loans variable show that banks with higher loan growth rates experience higher default risk and income volatility while lower realized and expected loan losses. These results of bank size, non-interest income and loan growth are consistent with Kanagaretnam *et al.* (2014) and Ashraf (2017). Likewise, banks with higher levels of liquid assets are also more risky. It is consistent with the studies that banks hoard liquidity by reducing lending (Acharya & Skeie 2011) and holding higher amount of liquid assets due to precautionary motive further escalates agency problems (Acharya *et al.* 2012) and results in higher bank risks (Delis *et al.* 2014; Khan *et al.* 2017). Results of cost to income ratio show that inefficient banks have higher default risk, income volatility and non-performing loans, but book lower provisions for expected losses. Last result points to the imprudent behavior of inefficient banks to book timely provisions for expected losses. State-owned banks have higher default risk and loan losses, but at the same time exhibit lower earnings volatility. One possible explanation is that stated-owned banks enjoy government protection and usually extend loans to priority areas where the chances of defaults are higher. In contrast, listed banks experience lower default risk, income volatility and non-performing loans, but book higher provisions for expected losses. These results for listed banks support that outside investors' pressure and market monitoring is beneficial because it force listed banks to reduce risks and be more prudent in booking provisions for expected losses (Samet *et al.* 2018; Tran *et al.* 2019).

Results of industry-level control variables show that strict financial regulations such as stringent capital requirements and higher activity restrictions are effective in controlling bank risk. These findings are consistent with the results of recent studies (Rahman *et al.* 2015; Ashraf *et al.* 2016a).

For country-level macroeconomic controls, positive and significant coefficients of developing countries dummy variable indicate that bank risk is higher in developing countries as compared to developed ones. The possible explanation for this finding is that banks in developed countries have better access to advanced risk management techniques, diversification opportunities and human and capital resources. The negative coefficients of GDP growth show that bank risk is lower when economy is in growth phase of business cycle. These findings are consistent with the studies which report that bank risk, especially nonperforming loans and loan loss provisions, is pro-cyclical (Bikker & Metzemakers 2005; Laeven & Huizinga 2019): that is, it decreases when GDP growth is higher and vice versa.

Likewise, negative results of law & order suggest that better institutional environment promotes bank stability by lowering bank risk, and thus is beneficial.

Lastly, positive results of financial crisis variable show that bank default risk, income volatility and loan losses increase during the crisis situation.

Table 4. Impact of policy uncertainty on bank risk: main specifications. This table reports results regarding the impact of policy uncertainty on bank risk. Bank risk is dependent variable and is measured with five alternative proxies including Z-score, σ(ROA), σ(NIM), LLP and NPL, where higher values of each of these proxies represent higher bank risk and vice versa. Policy uncertainty is main explanatory variable and is measured with WUI (world uncertainty index) index of Ahir *et al.* (2018). Higher values of WUI represent higher policy uncertainty and vice versa. Others are bank-, banking industry- and country-level control variables. The

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results are estimated with pooled OLS estimator using heteroskedasticity robust standard errors. *P*-values are given in parenthesis. ***, **,* represent statistical significance at 1%, 5%, and 10% levels, respectively.

Variables	Z-score	σ(ROA)	σ(NIM)	LLP	NPL
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
WUI	0.510***	0.158***	0.246***	0.592***	6.768***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Bank-level control variables					
Bank size	-0.037***	-0.018***	-0.010***	-0.039***	-0.504***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Equity to total assets ratio	-0.030***	0.020***	0.017***	-0.014***	0.035***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Non-interest income to total revenue ratio	0.006***	0.003***	0.000	0.002***	0.024***
	(0.000)	(0.000)	(0.791)	(0.000)	(0.000)
Annual growth in bank gross loan	0.002***	0.001***	0.002***	-0.002***	-0.065***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Liquid assets to total assets ratio	0.004***	0.002***	0.002***	0.003***	0.019***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Cost to income ratio	0.013***	0.004***	0.002***	-0.014***	0.003
	(0.000)	(0.000)	(0.000)	(0.000)	(0.119)
Listed bank dummy	-0.072***	0.000	-0.015	0.104***	-0.445***
	(0.000)	(0.995)	(0.130)	(0.000)	(0.000)
State-owned bank dummy	0.173***	-0.074***	-0.053**	0.438***	4.096***
	(0.000)	(0.000)	(0.014)	(0.000)	(0.000)
Bank market power	0.003**	0.002**	-0.001	0.007***	0.140***
	(0.027)	(0.035)	(0.332)	(0.001)	(0.000)
Banking industry-level control variables					
Banking industry concentration	0.004***	-0.001***	0.000	0.005***	-0.053***
	(0.000)	(0.000)	(0.105)	(0.000)	(0.000)
Capital stringency index	-0.013***	-0.023***	-0.021***	-0.072***	-0.090***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Activity restrictions	-0.018***	-0.029***	-0.033***	-0.020***	0.557***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Country-level control variables					
Developing countries dummy	0.776***	0.455***	0.504***	1.037***	-5.538***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GDP growth rate	-0.004	-0.011***	-0.010***	-0.110***	-0.280***
	(0.162)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation	0.015***	0.012***	0.018***	-0.001	-0.092***
	(0.000)	(0.000)	(0.000)	(0.720)	(0.000)
Law & order	-0.198***	-0.095***	-0.144***	-0.399***	-2.935***

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	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Financial crisis dummy	0.089***	-0.032***	-0.030***	0.030	1.215***
	(0.000)	(0.001)	(0.005)	(0.278)	(0.000)
Year FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Constant	-3.083***	0.930***	1.177***	5.139***	25.090***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	50,595	50,595	50,595	50,595	30,266
R-squared	0.251	0.403	0.390	0.228	0.255

Table 5. Impact of policy uncertainty on bank risk: main specifications. This table reports results regarding the impact of policy uncertainty on bank risk. Bank risk is dependent variable and is measured with five alternative proxies including Z-score, σ(ROA), σ(NIM), LLP and NPL, where higher values of each of these proxies represent higher bank risk and vice versa. Policy uncertainty is main explanatory variable and is measured with news-based EPU (economic policy uncertainty) index of Baker et al. (2016). Higher values of EPU represent higher policy uncertainty and vice versa. Others are bank-, banking industry- and country-level control variables. The results are estimated with pooled OLS estimator using heteroskedasticity robust standard errors. *P*-values are given in parenthesis. ***, **,* represent statistical significance at 1%, 5%, and 10% levels, respectively.

Variables	Z-score	σ(ROA)	σ(NIM)	LLP	NPL
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
EPU	0.083***	0.060***	0.202***	0.082***	0.048
	(0.000)	(0.000)	(0.000)	(0.008)	(0.415)
Bank-level control variables					
Bank size	-0.037***	-0.019***	-0.013***	-0.038***	-0.499***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Equity to total assets ratio	-0.030***	0.020***	0.017***	-0.014***	0.037***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Non-interest income to total revenue ratio	0.006***	0.003***	0.000	0.002***	0.025***
	(0.000)	(0.000)	(0.540)	(0.000)	(0.000)
Annual growth in bank gross loan	0.002***	0.001***	0.002***	-0.002***	-0.066***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Liquid assets to total assets ratio	0.004***	0.002***	0.002***	0.003***	0.017***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Cost to income ratio	0.013***	0.004***	0.002***	-0.014***	0.004*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.052)
Listed bank dummy	-0.071***	0.002	-0.007	0.103***	-0.503***
	(0.000)	(0.818)	(0.473)	(0.000)	(0.000)
State-owned bank dummy	0.178***	-0.074***	-0.055***	0.445***	4.272***
	(0.000)	(0.000)	(0.010)	(0.000)	(0.000)
Bank market power	0.004**	0.002**	0.000	0.008***	0.132***
	(0.012)	(0.013)	(0.936)	(0.000)	(0.000)
Banking industry-level control variables					

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Banking industry concentration	0.004***	-0.001***	0.001***	0.005***	-0.051***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Capital stringency index	-0.028***	-0.031***	-0.045***	-0.081***	-0.091***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)
Activity restrictions	-0.021***	-0.030***	-0.031***	-0.026***	0.434***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Country-level control variables					
Developing countries dummy	0.774***	0.450***	0.481***	1.044***	-5.207***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GDP growth rate	-0.005	-0.010***	-0.005***	-0.113***	-0.352***
	(0.102)	(0.000)	(0.002)	(0.000)	(0.000)
Inflation	0.014***	0.012***	0.018***	-0.003	-0.117***
	(0.000)	(0.000)	(0.000)	(0.454)	(0.000)
Law & order	-0.208***	-0.100***	-0.157***	-0.406***	-2.953***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Financial crisis dummy	0.119***	-0.014	0.022**	0.048*	0.499***
	(0.000)	(0.158)	(0.045)	(0.086)	(0.004)
Year FE	Yes	Yes	Yes	Yes	Yes
Constant	-3.269***	0.744***	0.494***	5.182***	30.164***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	50,595	50,595	50,595	50,595	30,266
R-squared	0.249	0.403	0.394	0.226	0.248

5.3. Robustness Tests

We perform several robustness tests to further verify the main results. In this regard, we perform tests for endogeneity, add additional control variables in main model, apply alternative estimation methods and drop countries with higher number of observations. For brevity, we only report robustness tests for WUI index.

5.3.1. Tests for Endogeneity

Endogeneity might be a potential concern with our results. Endogeneity may arise because of at least three reasons: reverse causality, measurement error or omitted variables.

There might be reverse causality between policy uncertainty and bank risk. Bloom (2014) observes that policy uncertainty and domestic business cycles are countercyclical; that is, uncertainty goes down in booms and up in recessions. In the similar vein, if excessive loan losses start materializing on bank balance sheets, governments usually respond with policies to avoid large scale crisis. Such policy responses often entail uncertainty regarding the likely and the best set of options available and to be used by the governments. To account for this reverse causality problem, we measure policy uncertainty together with all other control variables at the start of the year and re-estimate results. As shown in Table 6, WUI index still enters positive and significant confirming the main results. One interesting observation is coefficients of lagged WUI are lower as compared to the coefficients reported in Table 4 suggesting previous year's uncertainty has weaker effect on bank risk than the current year's uncertainty.

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Table 6. Impact of policy uncertainty on bank risk: robustness tests for endogeneity. This table reports results regarding the impact of policy uncertainty on bank risk when all independent variables are lagged by one period to test reverse causality problem. Bank risk is dependent variable and is measured with five alternative proxies including Z-score, σ(ROA), σ(NIM), LLP and NPL, where higher values of each of these proxies represent higher bank risk and vice versa. Policy uncertainty is main explanatory variable and is measured with WUI (world uncertainty index) index of Ahir et al. (2018). Higher values of WUI represent higher policy uncertainty and vice versa. Others are bank-, banking industry- and country-level control variables. The results are estimated with pooled OLS estimator using heteroskedasticity robust standard errors. *P*-values are given in parenthesis. ***, **,* represent statistical significance at 1%, 5%, and 10% levels, respectively.

Variables	Z-score	σ(ROA)	σ(NIM)	LLP	NPL
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
L.WUI	0.339***	0.103***	0.045*	0.437***	5.759***
	(0.000)	(0.000)	(0.096)	(0.000)	(0.000)
Bank-level control variables					
L.Bank size	-0.051***	-0.021***	-0.012***	-0.032***	-0.587***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
L.Equity to total assets ratio	-0.028***	0.020***	0.015***	-0.005***	0.003
	(0.000)	(0.000)	(0.000)	(0.000)	(0.698)
L.Non-interest income to total revenue ratio	0.008***	0.003***	-0.000***	0.003***	0.026***
	(0.000)	(0.000)	(0.006)	(0.000)	(0.000)
L.Annual growth in bank gross loan	0.002***	0.001***	0.001***	-0.001***	-0.059***
	(0.000)	(0.000)	(0.000)	(0.005)	(0.000)
L.Liquid assets to total assets ratio	0.002***	0.001***	0.002***	-0.001***	0.006*
	(0.000)	(0.000)	(0.000)	(0.004)	(0.061)
L.Cost to income ratio	0.009***	0.003***	0.002***	-0.007***	-0.011***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
L.Listed bank dummy	-0.099***	-0.021**	-0.029***	0.039	-0.729***
	(0.000)	(0.013)	(0.002)	(0.129)	(0.000)
L.State-owned bank dummy	0.226***	-0.025	-0.047**	0.515***	4.374***
	(0.000)	(0.224)	(0.035)	(0.000)	(0.000)
L.Bank market power	0.006***	0.002***	-0.000	0.012***	0.158***
	(0.000)	(0.004)	(0.670)	(0.000)	(0.000)
Banking industry-level control variables					
L.Banking industry concentration	0.002***	-0.002***	0.000	-0.000	-0.055***
	(0.000)	(0.000)	(0.536)	(0.985)	(0.000)
L.Capital stringency index	-0.018***	-0.024***	-0.026***	-0.070***	-0.044
	(0.000)	(0.000)	(0.000)	(0.000)	(0.133)
L.Activity restrictions	-0.014***	-0.028***	-0.035***	-0.039***	0.555***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Country-level control variables					
L.Developing countries dummy	0.678***	0.412***	0.499***	1.225***	-5.878***

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	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
L.GDP growth rate	-0.021***	-0.016***	-0.015***	-0.105***	-0.390***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
L.Inflation	0.025***	0.018***	0.023***	-0.004	0.098***
	(0.000)	(0.000)	(0.000)	(0.351)	(0.000)
L.Law & order	-0.205***	-0.090***	-0.146***	-0.363***	-2.860***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
L.Financial crisis dummy	0.148***	-0.015	0.014	0.151***	1.723***
	(0.000)	(0.104)	(0.176)	(0.000)	(0.000)
Year FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Constant	-2.369***	1.061***	1.339***	4.822***	28.503***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	42,482	42,482	42,482	42,482	25,289
R-squared	0.227	0.402	0.395	0.223	0.269

Since we have used two alternative proxies of policy uncertainty which are constructed by different authors using the underlying data from different sources, the largely similar results with both proxies confirm that measurement error is less likely to be a concern regarding our findings.

Lastly, we have added a large number of bank-, banking industry- and country-level control variables in the main model, which, to some extent, confirms that our results are not driven by some important omitted variables. However, to further account for omitted variables bias, we use two-stage instrumental variable analysis. A valid instrument should be relevant and exogenous: that is, instrument should be directly correlated with policy uncertainty, but only indirectly with bank risk through the channel of policy uncertainty. Following El Ghoul *et al.* (2018), we use fractionalization index from the Database of Political Institutions (DPI2017) as instrument for policy uncertainty.

Fractionalization index measures the probability that two deputies picked from the legislature at random would be from different political parties. This index is relevant because higher values of it represent thin majority for any single party in legislature and thus the higher chances of different parties to disagree on policy related legislation (i.e., higher policy uncertainty). Aghion *et al.* (2004) find that legislative actions are more likely to be blocked with higher political fractionalization. On the other hand, the index is also exogenous because the distribution of members of political parties in legislature is less likely to have any direct effect on bank risk.

In the first-stage regression, we regress WUI index on instrumental variable together with all control variables in the model. In Table 7, we observe that fractionalization index enters positive and significant with WUI index. We rely on F-test and Kleibergen-Paap under-identification test to check the appropriateness of the instrument. The F-test in first stage regression rejects the null hypothesis that fractionalization index does not explain the variation in policy uncertainty confirming that the instrument is relevant. Likewise, Kleibergen-Paap rk LM statistic reports a zero *p*-value showing that the model is identified and the fractionalization index is an appropriate external instrument for policy uncertainty.

Table 7. Impact of policy uncertainty on bank risk: robustness tests for endogeneity. This table reports results of instrumental variable analysis regarding the impact of policy uncertainty on bank risk WUI (world uncertainty index) index of Ahir *et al.* (2018) which measures policy uncertainty is instrumented with Fractionalization index from the Database of Political Institutions (DPI2017). Model (1) is first-stage regression where WUI is used as dependent variable. Models (2) to (6) are second-stage regressions where bank risk is dependent variable which is measured with five alternative proxies including Z-score, σ(ROA), σ(NIM), LLP and NPL. Higher values of

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each of these five proxies represent higher bank risk and vice versa. WUI_instrumented which is predicted values of WUI index from first-stage regression is used as main explanatory variable in second-stage regressions. Bank-, banking industry- and country-level control variables are added in all models. The results are estimated with pooled OLS estimator using heteroskedasticity robust standard errors. *P*-values are given in parenthesis. ***, **,* represent statistical significance at 1%, 5%, and 10% levels, respectively.

Variables	WUI	Z-score	σ(ROA)	σ(NIM)	LLP	NPL
	First-stage regression	Second-stage regressions				
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Fractionalization index	0.059***					
	(0.000)					
WUI_instrumented		1.549**	4.043***	5.324***	8.738***	82.801***
		(0.028)	(0.000)	(0.000)	(0.000)	(0.000)
Bank-level control variables	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Banking industry-level control variables	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Country-level control variables	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Year FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Constant	0.181***	-3.346***	-0.037	-0.108	3.169***	6.114***
	(0.000)	(0.000)	(0.707)	(0.321)	(0.000)	(0.000)
Observations	50,221	50,221	50,221	50,221	50,221	29,959
R-squared	0.479	0.247	0.406	0.394	0.229	0.249

The fitted values of WUI from the first-stage regression are then used to represent instrumented policy uncertainty (i.e., WUI_instrumented) in second-stage regressions. As shown in Table 7, instrumented WUI enters positive and significant with all five proxies of bank risk.

Together, the results of these tests drive out the concern that the positive impact of policy uncertainty on bank risk found above is due to endogeneity problem.

5.3.2. Political Risk Index from ICRG Database as Additional Control Variable

As another robustness test for omitted variable bias, we control our model with political risk index from ICRG database. This index measures more general form of political risk which arises due to government instability, internal or external conflicts, the type of political system (i.e., democracy vs. autocracy), the level of corruption, law and order situation, and military involvement in politics. Models (1) to (5) in Table 8 show that WUI index enters positive and significant even after controlling for political risk indicating that our proxies of policy uncertainty are not capturing the effect of more general form of political risk, but the effect of government economic policy uncertainty. Political risk variable enters negative showing that lower political risk (higher value of political risk index represent lower political risk and vice versa) decreases bank risk. In unreported results, we controlled

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our model with different sub-components of political risk index, such as government instability, democratic accountability, internal conflict, external conflict and corruption, one-by-one and observed that the results of WUI index largely remain similar.

Table 8. Impact of policy uncertainty on bank risk: robustness tests with additional control variable and country fixed-effects. This table reports results regarding the impact of policy uncertainty on bank risk, after including political risk index from ICRG database as additional control variable and country fixed-effects. Bank risk is dependent variable in all models of Panel 1 and 2 and is measured with five alternative proxies including Z-score, σ(ROA), σ(NIM), LLP and NPL, where higher values of each of these proxies represent higher bank risk and vice versa. Policy uncertainty is main explanatory variable and is measured with WUI (world uncertainty index) index of Ahir *et al.* (2018). Higher values of WUI represent higher policy uncertainty and vice versa. Bank-, banking industry- and country-level control variables are included in all models. The results are estimated with pooled OLS estimator using heteroskedasticity robust standard errors. *P*-values are given in parenthesis. ***, **,* represent statistical significance at 1%, 5%, and 10% levels, respectively.

Variables	Z-score	σ(ROA)	σ(NIM)	LLP	NPL	Z-score	σ(ROA)	σ(NIM)	LLP	NPL
	Including political risk index as additional control variable					Including country fixed-effects				
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)
WUI	0.404***	0.142***	0.252***	0.482***	3.992***	0.299***	0.050**	0.118***	0.331***	4.327***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.034)	(0.000)	(0.000)	(0.000)
Bank-level control variables	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Banking industry-level control variables	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Country-level control variables	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Political risk	-0.033***	-0.005***	0.002**	-0.034***	-0.409***					
	(0.000)	(0.000)	(0.011)	(0.000)	(0.000)					
Year FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Country FE						*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Constant	-0.752***	1.277***	1.053***	7.547***	55.393***	-2.845***	0.809***	0.669***	4.266***	1.735
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.291)
Observations	50,595	50,595	50,595	50,595	30,266	50,595	50,595	50,595	50,595	30,266
R-squared	0.261	0.404	0.390	0.233	0.296	0.278	0.429	0.424	0.242	0.371

5.3.3. Adding Country Fixed-Effects

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Previous studies have shown that country-level formal institutions, such as legal origin and creditor rights, and informal institutions, such as national culture, are important to explain cross-country variation in bank risk. Though, our results are less likely to be affected by such factors due to the small number of sample countries, however we still perform tests to account for this concern. Since the formal and informal institutional variables largely remain constant or change very slowly over time, therefore for brevity we re-estimate our main model by including country-fixed effects. Country-fixed effects largely control for all factors which remain constant and cause cross-country variation in bank risk. Models (6) to (10) in Table 8 show that WUI index still enters positive and significant after including country fixed-effects, ruling out the possibility that WUI index is capturing the effect of institutional variables.

5.3.4. Alternative Estimation Methods

As another robustness test, we use panel random-effects and fixed-effects models as alternative estimation methods. We estimate all five specifications of Table 4 with these two estimators one-by-one. As shown in Table 9, WUI index enters positive and significant confirming that our results are not biased due to some specific estimation technique.

Table 9. Impact of policy uncertainty on bank risk: robustness tests using alternative estimation techniques. This table reports results, regarding the impact of policy uncertainty on bank risk, estimated with panel random-effects and fixed-effects estimators. Bank risk is dependent variable in all models and is measured with five alternative proxies including Z-score, σ(ROA), σ(NIM), LLP and NPL, where higher values of each of these proxies represent higher bank risk and vice versa. Policy uncertainty is main explanatory variable and is measured with WUI (world uncertainty index) index of Ahir *et al.* (2018). Higher values of WUI represent higher policy uncertainty and vice versa. Bank-, banking industry- and country-level control variables are added in all models. P-values are given in parenthesis. ***, **,* represent statistical significance at 1%, 5%, and 10% levels, respectively.

Variables	Z-score	σ(ROA)	σ(NIM)	LLP	NPL	Z-score	σ(ROA)	σ(NIM)	LLP	NPL
	Panel random-effects estimator					Panel fixed-effects estimator				
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)
WUI	0.385***	0.097***	0.177***	0.560***	4.885***	0.280***	0.050**	0.126***	0.464***	4.015***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.012)	(0.000)	(0.000)	(0.000)
Bank-level control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Banking industry-level control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-level control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-3.212***	0.971***	1.290***	5.565***	19.322**	-	0.788***	1.131***	4.424***	3.193

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					*	5.238***				
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.101)
Observations	50,595	50,595	50,595	50,595	30,266	50,595	50,595	50,595	50,595	30,266
R-squared						0.168	0.051	0.023	0.129	0.227
Banks	5,138	5,138	5,138	5,138	4,443	5,138	5,138	5,138	5,138	4,443

5.3.5. Dropping Countries with the Higher Number of Observations

The sample distribution in Table 1 shows that the number of bank observations is relatively higher from some countries, such as Germany (23442), Japan (8797) and Italy (4906), as compared to the others. Since such sample distribution may bias econometric results, we drop all observations of Germany, Japan and Italy one-by-one and re-estimate all five specifications of Table 4. As shown in Table 10, the WUI index enters positive and significant in all models confirming that our results are not driven by higher observations from few countries.

Table 10. Impact of policy uncertainty on bank risk: robustness tests dropping countries with the higher number of observations. This table reports results, regarding the impact of policy uncertainty on bank risk, after excluding all observations of Germany, Japan and Italy one-by-one from the main sample. Bank risk is dependent variable in all models and is measured with five alternative proxies including Z-score, σ(ROA), σ(NIM), LLP and NPL, where higher values of each of these proxies represent higher bank risk and vice versa. Policy uncertainty is main explanatory variable and is measured with WUI (world uncertainty index) index of Ahir *et al.* (2018). Higher values of WUI represent higher policy uncertainty and vice versa. Bank-, banking industry- and country-level control variables are added in all models. The results are estimated with pooled OLS estimator using heteroskedasticity robust standard errors. *P*-values are given in parenthesis. ***, **,* represent statistical significance at 1%, 5%, and 10% levels, respectively.

Variables	Z-score	σ(ROA)	σ(NIM)	LLP	NPL	Z-score	σ(ROA)	σ(NIM)	LLP	NPL	Z-score	σ(ROA)	σ(NIM)	LLP	NPL
	All observations of Germany dropped					All observations of Germany and Japan dropped					All observations of Germany, Japan and Italy dropped				
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)	Model (12)	Model (13)	Model (14)	Model (15)
WUI	0.810***	0.108***	0.160***	0.940***	7.797***	0.674***	0.126**	0.284***	0.989***	6.530***	0.536***	0.077	0.393***	0.777***	2.923***
	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.013)	(0.000)	(0.000)	(0.000)	(0.000)	(0.215)	(0.000)	(0.000)	(0.000)
Bank-level control variables	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Banking	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

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industry-level															
control															
variables															
Country-level															
control	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
variables															
Year FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Constant	-2.595***	1.238***	1.403***	5.015***	29.794***	-2.692***	1.170***	1.397***	4.852***	28.582***	-3.216***	1.190***	1.344***	4.604***	13.664***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	27,153	27,153	27,153	27,153	23,632	18,356	18,356	18,356	18,356	15,192	13,450	13,450	13,450	13,450	10,407
R-squared	0.301	0.403	0.387	0.210	0.256	0.293	0.357	0.341	0.187	0.281	0.334	0.348	0.320	0.196	0.204

5.4. Impact of Policy Uncertainty on Bank Risk with a Lag

To examine the second hypothesis, we re-estimate Eq. (1) by lagging WUI and all related control variables first by one-year, then by two-years, after that by three-years and lastly by four-years. As shown in Table 11, the coefficients of WUI still enter positive when lagged by one-year. However, signs of some coefficients change to negative when WUI is lagged by two years. When lagged by three years, WUI enters negative and significant with bank default risk in Model (11) and expected loan losses in Model (14). The significance level of coefficients further strengthens when WUI is lagged by four years. These results suggest policy uncertainty reduces bank default risk and loan losses with a lag of two to four years. Signs of coefficients of lagged WUI don't change when bank risk is measured with σ(ROA) and σ(NIM). This is not beyond expectation because of at least two reasons: First, since we argue policy uncertainty reduces bank risk with a lag through the channel of loan growth, previous studies show that bank loan growth largely don't affect bank income with a lag (Dang 2019). Second, as described in Section 4, both σ(ROA) and σ(NIM) are calculated over three year rolling window. Such variable generation process can easily smooth out short-term fluctuations in profitability and net interest margins (Delis *et al.* 2014).

As robustness tests, we replaced WUI with EPU index and re-estimated all specifications of Table 11. In unreported results, we observed that the coefficients of EPU index change to negative with bank default risk and loan loss provisions when it is lagged by three and four years, the findings which are consistent with the results above for WUI index.

Table 11. Impact of policy uncertainty on bank risk with a lag. This table reports results, regarding the impact of policy uncertainty on bank risk with a lag of 2 to 4 years. Bank risk is dependent variable in all models and is measured with five alternative proxies including Z-score, σ(ROA), σ(NIM), LLP and NPL, where higher values of each of these proxies represent higher bank risk and vice versa. Policy uncertainty is main explanatory variable and is measured with WUI (world uncertainty index) index of Ahir et al. (2018). Higher values of WUI represent higher policy uncertainty and vice versa. L.WUI, L2.WUI, L3.WUI and L4.WUI represent that WUI index has been lagged by one-year, two-years, three-years and four-years, respectively. Bank-, banking industry- and country-level control variables are added in all models. In each model, control variables are lagged by the same year(s) as the WUI index. *P*-values are given in parenthesis. ***, **,* represent statistical significance at 1%, 5%, and 10% levels, respectively.

Variables	Z-score	σ(ROA)	σ(NIM)	LLP	NPL	Z-score	σ(ROA)	σ(NIM)	LLP	NPL	Z-score	σ(ROA)	σ(NIM)	LLP	NPL	Z-score	σ(ROA)	σ(NIM)	LLP	NPL
	WUI lagged by one year					WUI lagged by two years					WUI lagged by three years					WUI lagged by four years				
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)	Model (12)	Model (13)	Model (14)	Model (15)	Model (16)	Model (17)	Model (18)	Model (19)	Model (20)
L.WUI	0.339***	0.103***	0.045*	0.437***	5.759***															
	(0.000)	(0.000)	(0.096)	(0.000)	(0.000)															
L2.WUI						-0.023	0.195***	0.070**	-0.401***	4.280***										
						(0.703)	(0.000)	(0.018)	(0.000)	(0.000)										
L3.WUI											-0.454***	0.125***	0.215***	-0.468***	0.510					
											(0.000)	(0.000)	(0.000)	(0.000)	(0.283)					
L4.WUI																-0.254***	0.213***	0.230***	-0.618***	-0.857
																(0.002)	(0.000)	(0.000)	(0.000)	(0.112)
Bank-level control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Banking industry-level control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Country-level control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-2.369***	1.061***	1.339***	4.822***	28.503***	-2.289***	1.197***	1.401***	4.909***	28.836***	-2.227***	0.961***	1.213***	4.533***	26.431***	-2.423***	0.860***	1.032***	4.473***	22.616***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	42,482	42,482	42,482	42,482	25,289	37,487	37,487	37,487	37,487	22,934	32,494	32,494	32,494	32,494	20,293	28,414	28,414	28,414	28,414	18,057
R-squared	0.227	0.402	0.395	0.223	0.269	0.204	0.381	0.383	0.211	0.272	0.182	0.325	0.345	0.220	0.288	0.173	0.288	0.319	0.251	0.318

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6. Conclusion

This paper investigates the impact of government economic policy uncertainty (GEPU) on bank risk, distinguishing between short- and long-term effects. We hypothesize that heightened GEPU increases bank risk in the short run by raising borrowers' default probabilities, while reducing risk over time as banks adopt more conservative current lending strategies. Using bank-level data from 22 countries over the period 1998–2017, we find strong evidence supporting both hypotheses: GEPU exerts an immediate positive effect on bank risk and a negative effect with a lag of two to four years. These results remain robust to endogeneity concerns, alternative measures of GEPU and bank risk, variations in sample composition, and different estimation techniques.

Our findings suggest that policy uncertainty has a dual role in shaping bank risk—amplifying risk in the short term while mitigating it in the long term. This dynamic underscores the importance of incorporating uncertainty into risk management and regulatory frameworks. By highlighting the temporal dimension of policy uncertainty, this study contributes to the growing literature on uncertainty and financial stability and offers timely insights for policymakers and banking regulators.

Future research could extend this analysis by examining the effects of economic policy uncertainty on other aspects of banking, such as lending behavior, performance, business models, dividend policies, and earnings quality—explicitly distinguishing between short- and long-term impacts. In contrast to existing studies that primarily focus on immediate effects, such investigations would provide a more comprehensive understanding of uncertainty's dynamic influence on banking. Additionally, country-level case studies could further enrich the debate by exploring how institutional and regulatory environments shape the short- versus long-term consequences of policy uncertainty for bank risk.

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