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Article

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Article

Is Economic Uncertainty a Risk Factor in Bank Loan Pricing Decisions? International Evidence

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Abstract: Uncertainty in economic environment leads economic agents to act cautiously. In this paper, we postulate that such uncertainty leads banks to charge higher interest rate on loans. Measuring aggregate country-level economic uncertainty with the World Uncertainty Index (WUI) and using a bank-level dataset from 88 countries over the period 1998–2017, we find that heightened economic uncertainty increases bank loan interest rates. Specifically, bank loan interest rates rise by 20.67 basis points with a one standard deviation increase in WUI. Our results are robust when we use alternative proxy of uncertainty, include additional controls in the model, and extend the sample size. We also observe that WUI index is better at measuring local economic uncertainty as compared to the Economic Policy Uncertainty (EPU) index. Overall, this study provides evidence that bank price in economic uncertainty is an important risk while setting interest rates on bank loans.

Keywords: bank loan interest rates; economic uncertainty; political uncertainty; world uncertainty index; economic policy uncertainty



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1. Introduction

Uncertainty about economic environment has an important bearing on the decision making of economic agents at the micro-level. For instance, as uncertainty heightens, firms hold more cash [Cheng et al. \(2018\)](#); [Phan et al. \(2019\)](#) and reduce capital investment [Azzimonti \(2018\)](#); [Gulen and Ion \(2016\)](#), inventory holdings [Zeng et al. \(2019\)](#), and merger and acquisitions [Bonaime et al. \(2018\)](#). Likewise, households consume less and save more [Aaberge et al. \(2017\)](#); [Giavazzi and McMahon \(2012\)](#) and reduce the amount of risky assets such as stocks and bonds in their portfolios [Park and Suh \(2019\)](#). The financial sector is also not an exception. For instance, equity investors charge a risk premium for uncertainty [Pastor and Veronesi \(2013\)](#). Similarly, banks hoard more liquidity [Ashraf \(2020\)](#); [Berger et al. \(2020\)](#) and lend less [Bordo et al. \(2016\)](#); [Hu and Gong \(2019\)](#); [Nguyen et al. \(2020\)](#). In this study, we present the evidence regarding the impact of economic uncertainty on banks' loan pricing.

Theoretically, heightened economic uncertainty may increase bank loan pricing through two channels: By enhancing information asymmetry between lenders and borrowers and due to the recessionary impact on economic activities.

In pioneer studies, [Stiglitz and Weiss \(1981\)](#) and [Greenwald et al. \(1984\)](#) show that information asymmetry between lenders and borrowers leads to credit rationing. More related to our study, the theoretical model of [Greenwald and Stiglitz \(1990\)](#) demonstrate that greater uncertainty exacerbates information asymmetry between borrowers and lenders, and tightens financing constraints. Recent empirical research shows that uncertainty has dominant effect on the information environment of firms. For instance, [Chen et al. \(2018\)](#) find that as uncertainty heightens, the total amount of idiosyncratic information about a firm that is available to the market decreases. In other words, firms have a propensity to reduce the amount and quality of information provided to external investors. Likewise, [Yung and Root \(2019\)](#) report that the quality of financial information deteriorates in periods of higher policy uncertainty as firms tend to manage earnings more. With worsened

information environment, it becomes difficult for lenders to assess the creditworthiness of borrowing firms. As a result, banks demand higher interest rate to lend.

For the second channel, [Ashraf and Shen \(2019\)](#) argue policy uncertainty boosts bank loan interest rates by raising the default risk of borrowers. Since uncertainty shocks lead to decrease in investment, employment, household consumption, and, consequently, the GDP [Baker et al. \(2016\)](#); [Bloom \(2009\)](#); [Bloom et al. \(2018\)](#), the idiosyncratic dispersion in firms' productivity [Brand et al. \(2019\)](#) and household incomes [Bloom \(2014\)](#); [Li et al. \(2018\)](#) increases. The adverse effect of uncertainty shock at micro-level is not limited to a few firms or households, rather it increases the variance of firms' productivity at individual, industry, and aggregate levels [Bloom \(2009\)](#) and boosts household income volatility not only due to higher unemployment and less new hiring, but also because of changes in wages of those who remain employed [Bloom \(2014\)](#); [Li et al. \(2018\)](#). Thus, the uncertainty shock enhances the probability of bad state for both borrowing firms and households. In response, risk-averse banks increase average loan interest rates to cover potential loan losses.

To examine the impact of economic uncertainty on bank loan pricing, we use bank-level data from 88 countries over the period 1998–2017. Following [Ashraf and Shen \(2019\)](#), we measure bank loan pricing with annual bank interest income to gross loans ratio. Political and economic uncertainty is measured with the world uncertainty index (WUI) of [Ahir et al. \(2018\)](#). We find significant positive association between WUI and bank loan interest rates. More specifically, one standard deviation increase in WUI increases bank loan rates by 20.67 basis points. We observe that our results are robust when we use an alternative proxy of political uncertainty and include additional controls in our model.

This paper is different in various aspects from two related studies by [Francis et al. \(2014\)](#) and [Ashraf and Shen \(2019\)](#). In this regard, [Francis et al. \(2014\)](#) use data from the U.S. and examine the impact of firm-level exposure to political uncertainty on bank loan spreads. To gauge firm-level exposure to political uncertainty, they use the political uncertainty index from [Baker et al. \(2016\)](#). On the other hand, [Ashraf and Shen \(2019\)](#) employ bank-level data from 17 countries and examine the impact of economic policy uncertainty on bank loan prices. They measure economic policy uncertainty with news-based EPU index developed by [Baker et al. \(2016\)](#). Different from them, we examine the impact of economic uncertainty on bank loan interest rates using a large bank-level dataset from 88 countries. To gauge economic uncertainty, we use the WUI index recently developed by [Ahir et al. \(2018\)](#). The WUI index is calculated by counting the word uncertainty (or its variants) in the quarterly Economist Intelligence Unit (EIU) country reports, which cover country-specific politics, economic policy, the domestic economy, and foreign and trade payments events. The WUI index offers several advantages in measuring economic uncertainty. First, in contrast to the EPU index, which just measures economic policy uncertainty based on newspaper articles, the WUI index is more comprehensive and captures overall uncertainty related to economic, financial, and political trends in a country. Second, the WUI index better captures the local economic uncertainty as compared to the EPU index, which arguably measures domestic economic policy uncertainty however is more global in nature [Ahir et al. \(2018\)](#). Newspapers articles counted for the EPU index may also include those articles that discuss uncertainty related to international factors. Because of this, the EPU index is more likely to co-move internationally; international factors explain 36% variation in the EPU index while only 17% in the WUI index [Ahir et al. \(2018\)](#). Third, the WUI index for different countries is constructed based on country specific reports from same single source, which mitigates concerns about the ideological bias and consistency of the WUI and makes it easier to compare the index in levels across countries. Lastly, the WUI index is available for a large number of countries (i.e., 143 countries) in contrast to the EPU index, which is available just for 22 countries.

This study offers at least two important contributions to the existing literature: First, this paper complements the literature that explores the factors affecting the bank loan pricing decisions [Asquith et al. \(2005\)](#); [Ge et al. \(2017\)](#); [Huang et al. \(2018\)](#); [Qian and Strahan \(2007\)](#); [Valta \(2012\)](#); [Waisman \(2013\)](#). For instance, these studies report that bank loan

interest rates incorporate the premium for borrowers' credit quality [Asquith et al. \(2005\)](#), the level of competition in borrower's industry [Valta \(2012\)](#); [Waisman \(2013\)](#), the level of overinvestment by the borrower [Ge et al. \(2017\)](#), and the quality of corporate governance of borrowing firm [Huang et al. \(2018\)](#), among others. Extending this debate, we provide comprehensive evidence how economic uncertainty impacts bank loan interest rates.

Second, this study also adds to the literature that argues that uncertainty leads to higher financing costs for corporate firms. In this regard, recent studies report that firms' cost of equity capital [Brogaard and Detzel \(2015\)](#); [Pastor and Veronesi \(2013\)](#); [Pham \(2019\)](#) and bond spreads [Bradley et al. \(2016\)](#); [Waisman et al. \(2015\)](#) rise as uncertainty goes up. Complementing these findings, we show that economic uncertainty increases cost of bank financing for firms.

The paper is organized as follows. Sections 2–5 present literature review, sample description, empirical model, empirical results, and conclusion, respectively.

2. Data Collection

We started our sample construction by downloading the data of the WUI index developed by [Ahir et al. \(2018\)](#) from the website <http://www.policyuncertainty.com> on 20 April 2020. Country-level quarterly data of the WUI index are available for 143 countries. We collected data of other country-level financial and macroeconomic control variables from World Development Indicators (WDI) and Financial Development databases of World Bank.

Next, we downloaded bank-level annual financial statements accounting data of deposit-taking financial institutions (i.e., commercial, cooperative and savings banks) from the Bankfocus (previous name was 'Bankscope') database over the period of 1998 to 2017. Bankfocus reports data of both active and inactive banks. To avoid any survival bias of prudent and well-managed banks, we kept both active and inactive banks in our sample.

Finally, we linked annual bank-level data with annual country-level data. We dropped observations with missing values. We also dropped banks with less than 5 annual observations over the whole sample period. Our final dataset consists of 34,752 annual observations of 3513 banks from 88 countries over the period from 1998 to 2017. We winsorize bank-level variables at the one percent level in both lower and upper tails to minimize the impact of outliers on empirical results.

The detail about sample countries and the number of banks and annual observations from each country is given in Table 1.

Table 1. Sample distribution. This table reports sample distribution and country-level mean values of dependent and main independent variables. WUI is world uncertainty index of [Ahir et al. \(2018\)](#). EPU index is news-based economic policy uncertainty index of [Baker et al. \(2016\)](#).

Sr. No.	Country	Banks	Annual Observations	Interest Income to Gross Loans Ratio	WUI	EPU Index
1	Albania	13	128	7.84	0.16	
2	Algeria	12	96	7.32	0.10	
3	Angola	15	122	12.16	0.08	
4	Argentina	66	863	19.14	0.32	
5	Armenia	15	160	13.38	0.06	
6	Australia	27	228	6.31	0.16	4.65
7	Azerbaijan	27	254	14.48	0.12	
8	Bangladesh	37	250	10.86	0.07	
9	Belarus	24	178	17.70	0.09	
10	Bolivia	14	155	10.01	0.24	
11	Botswana	10	79	14.10	0.27	
12	Brazil	121	1335	23.55	0.27	4.89
13	Bulgaria	20	213	8.91	0.22	
14	Burkina Faso	8	80	9.09	0.25	
15	Canada	54	390	4.52	0.15	5.08

Table 1. Cont.

Sr. No.	Country	Banks	Annual Observations	Interest Income to Gross Loans Ratio	WUI	EPU Index
16	Chile	22	198	9.43	0.13	4.64
17	China	143	1234	6.10	0.09	5.10
18	Colombia	24	219	14.05	0.24	4.64
19	Congo, Dem. Rep.	6	46	12.66	0.37	
20	Costa Rica	54	579	14.97	0.16	
21	Cote d'Ivoire	11	89	8.12	0.27	
22	Croatia	32	366	9.17	0.11	4.20
23	Czech Republic	23	232	7.63	0.17	
24	Dominican Republic	52	496	20.78	0.10	
25	Egypt, Arab Rep.	22	210	9.42	0.18	
26	Gambia, The	3	15	18.60	0.09	
27	Greece	14	131	5.59	0.12	4.66
28	Guatemala	11	80	16.76	0.18	
29	Haiti	7	62	13.10	0.30	
30	Honduras	5	31	15.77	0.19	
31	Hong Kong SAR, C	25	250	5.94	0.10	4.85
32	Hungary	10	120	6.69	0.22	
33	India	77	977	10.60	0.10	4.49
34	Indonesia	81	652	12.01	0.13	
35	Iraq	2	14	12.78	0.12	
36	Israel	14	212	5.45	0.21	
37	Jamaica	5	43	12.57	0.14	
38	Japan	640	10,111	2.51	0.18	4.63
39	Jordan	17	228	8.21	0.08	
40	Kenya	31	274	13.73	0.36	
41	Korea, Rep.	14	101	5.57	0.22	4.93
42	Kuwait	9	100	8.00	0.13	
43	Latvia	24	258	8.21	0.16	
44	Lebanon	26	210	7.15	0.28	
45	Lithuania	11	120	5.22	0.12	
46	Madagascar	5	42	13.28	0.16	
47	Malaysia	34	211	4.39	0.13	
48	Mali	9	81	8.60	0.16	
49	Mexico	48	463	11.47	0.24	4.06
50	Moldova	12	113	13.14	0.29	
51	Mongolia	3	18	12.81	0.16	
52	Morocco	11	134	6.56	0.08	
53	Namibia	9	99	11.08	0.19	
54	Netherlands	19	124	6.47	0.17	4.65
55	New Zealand	16	138	6.95	0.16	
56	Nicaragua	6	55	15.25	0.24	
57	Niger	5	42	9.09	0.19	
58	Nigeria	18	123	13.83	0.45	
59	Oman	7	95	6.47	0.19	
60	Pakistan	27	227	9.89	0.09	
61	Panama	81	539	8.98	0.17	
62	Papua New Guinea	1	5	10.38	0.08	
63	Paraguay	13	80	13.26	0.22	
64	Peru	19	203	13.95	0.24	
65	Philippines	32	318	8.72	0.16	
66	Poland	62	476	7.05	0.25	
67	Qatar	10	115	5.89	0.05	
68	Romania	26	276	9.97	0.17	
69	Russia	505	3889	15.20	0.24	4.97
70	Senegal	13	104	7.97	0.14	
71	Sierra Leone	3	21	16.87	0.12	
72	Singapore	7	78	3.80	0.06	4.72
73	Slovenia	17	213	5.76	0.15	
74	South Africa	22	240	12.59	0.59	

Table 1. Cont.

Sr. No.	Country	Banks	Annual Observations	Interest Income to Gross Loans Ratio	WUI	EPU Index
75	Sri Lanka	15	90	11.86	0.13	
76	Sweden	67	344	5.61	0.16	4.37
77	Switzerland	245	1244	3.23	0.11	
78	Tanzania	25	230	13.85	0.19	
79	Thailand	28	344	5.54	0.22	
80	Togo	6	54	9.31	0.21	
81	Uganda	17	159	17.19	0.18	
82	Ukraine	70	424	14.70	0.27	
83	United Arab Emirates	24	189	6.08	0.17	
84	Uruguay	13	111	11.37	0.17	
85	Venezuela, RB	37	469	22.22	0.25	
86	Vietnam	31	242	11.58	0.13	
87	Yemen, Rep.	5	35	10.21	0.08	
88	Zambia	12	106	15.84	0.50	
	Total/mean	3513	34,752	9.06	0.19	4.73

3. Empirical Methodology

For empirical analysis, we adopt the following pooled OLS model developed by [Ashraf and Shen \(2019\)](#).

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

where i , j , and t subscripts represent bank, country, and year, respectively. α_i is a constant term. $\epsilon_{i,j,t}$ is an idiosyncratic error term.

Y , the dependent variable, represents the bank loan interest rate. Following [Ashraf and Shen \(2019\)](#), the bank loan interest rate is measured with annual interest income to gross loans ratio. This ratio measures the average interest rate, which banks charge on their loan portfolio in a year. α_i is a constant term. WUI is the main explanatory variable and stands for annual country-level economic uncertainty. $X_{i,j,t}^k$ is a set of bank-level annual control variables including return-on-equity ratio, interest-expense-to-total-liabilities ratio, operating-profit-to-total-assets ratio, non-interest-expenses-to-total-assets ratio, loan-loss-provisions-to-gross-loans ratio, loans-to-deposits ratio, and bank size. $X_{j,t}^l$ is a set of country-level variables including banking industry concentration, monetary policy rate, lending interest rate, GDP growth, inflation, developing countries dummy, and banking crisis dummy. D_t is a set of year dummy variables. $\epsilon_{i,j,t}$ is an idiosyncratic error term.

WUI is the world uncertainty index developed by [Ahir et al. \(2018\)](#) and represents the overall uncertainty related to economic environment of a country. [Ahir et al. \(2018\)](#) construct the WUI index by searching the words “uncertain”, “uncertainty”, and “uncertainties” in EIG reports for each country and quarter. The raw count of uncertainty-related words is scaled by the total number of words in each report to make the index comparable across countries. The WUI index is available at a quarterly frequency. Since our bank-level data are annual, we averaged quarterly values of WUI to get the annual value.

While setting loan interest rate, a bank considers its funding costs, expenses to provide financial service, the premium for borrowers’ risk, profit margin, the level of competition in the banking industry, its’ own position in the market, the strategies to expand in credit market, and macroeconomic factors [Ashraf and Shen \(2019\)](#). We add several variables to control for these confounding effects.

To control for bank funding costs, we use return on equity ratio and interest expense to total liabilities ratio. Return on equity ratio measures the realized return for bank equity holders and controls for the required rate of return of bank shareholders. On the other

hand, interest expense to total liabilities ratio measures the interest expense paid to bank depositors and short- and long-term debt holders, and thus controls for the bank debt funding costs. The non-interest-expenses-to-total-assets ratio is included to control for bank costs to provide financial services. Likewise, return on assets (i.e., pre-impairment-operating-profit-to-total-assets ratio) is added to control for bank profit margins. To control for borrowers' risk, we add the annual-loan-loss-provisions-to-gross-loans ratio. Loan loss provisions show the banks' assessment of potential risks in their loan portfolios. Banks with risky loan portfolios need to book higher provisions to cover potential future loan losses. Thus, this variable controls for the average risk of all borrowers of a bank. Based on the simple cost plus loan price model, we expect that the higher the bank funding costs, costs to provide services, profit margin, and borrowers' risk, the higher the interest rate that banks would charge on loans.

We include the country-level monetary policy rate and the lending interest rate to control for cross-country differences in bank funding costs and borrowers' risk, respectively. Monetary policy rate is the monetary policy interest rate or bank rate that the central bank of a country regularly sets to manage money supply. A tight monetary policy would increase bank funding costs. Several studies have suggested that banks respond to monetary policy changes and adjust their loan rates accordingly [Becker et al. \(2012\)](#); [Blot and Labondance \(2013\)](#); [Espinosa-Vega and Rebucci \(2004\)](#); [Gregor and Melecký \(2018\)](#). Country-level lending interest rate is the average interest rate that lenders charge on short- and medium-term loans to private sector. This rate depends on borrowers' creditworthiness and objectives of financing. Lending interest rate would be high in countries that have higher risk. Lending interest rate may contain an average premium for cross-country differences in economic uncertainty. However, adding it as a control variable would confirm whether the WUI index captures the marginal impact of economic uncertainty on banks' loan interest rates decisions.

To control for banking industry competition, a bank's position in market, and bank strategy towards market, we include banking industry concentration, bank size, and loans-to-deposits-ratio, respectively. The impact of banking industry concentration and bank size on loan pricing is uncertain. On the one hand, large banks in a concentrated industry enjoy economies of scale and might pass on a low cost to customers by charging lower interest rates on loans. On the other hand, they might ask higher interest rate due to substantial market power. Banks with an aggressive strategy in financial intermediation are likely to charge lower interest rates to gain market share.

Recent literature suggests that uncertainty is counter-cyclical and is systematically higher in developing countries [Ahir et al. \(2018\)](#); [Bloom \(2014\)](#). Therefore, we add annual GDP Growth rate and inflation variables in Equation (1) to control for domestic business cycles. This will mitigate the concern that WUI represents the domestic business cycles. Likewise, we add the developing countries dummy variable, which equals 1 if a sample country is developing and 0 otherwise to control for countries' income level.

Since our sample period is fairly long, we add the banking crisis dummy variable in the model to control for the effect of banking crises on loan interest rates. Loan interest rates are likely to decline in crisis periods. We add time dummies to control for the effects of global business cycles.

Table 2 summarizes the definitions of main variables used in this study.

Table 2. Variable definitions.

Variable	Definition	Data Source
<i>Dependent variables</i>		
Interest income to gross loans ratio	Equals annual interest income to gross loans ratio of each bank.	Bankscope database
<i>Main independent variable</i>		
WUI	World uncertainty index (WUI) developed by Ahir et al. (2018) . This index is constructed based on the count of uncertainty related words in the quarterly Economist Intelligence Unit (EIU) country reports. WUI is available at quarterly frequency. Since our bank-level data are annual, we averaged quarterly values of WUI to get annual value. Higher values of the index represent higher policy uncertainty in a country.	Ahir et al. (2018)
<i>Independent control variables</i>		
(1) Bank-level		
Return on equity ratio	This variable for each bank is measured as the annual net income to total owners' equity ratio.	Bankfocus database
Interest expense to total liabilities ratio	This variable for each bank is measured as the annual interest expense on interest bearing bank liabilities to total interest bearing liabilities ratio.	
Loan loss provisions to gross loans ratio	This variable for each bank is measured as the annual loan loss provisions to bank gross loans ratio.	
Non-interest expenses to total assets ratio	This variable for each bank is measured as the annual non-interest expenses to bank total assets ratio	
Operating profit to total assets ratio	This variable for each bank is measured as the annual pre-impairment operating profit to bank total assets ratio.	
Loans to deposits ratio	This variable for each bank is measured as the annual gross loans to total customers' deposits ratio.	
Bank size	Bank size is measured as the natural logarithm of annual total assets of each bank.	
(2) Industry-level		
Bank industry concentration	Bank concentration measures the annual market share of three largest banks in terms of total assets (i.e., equals the sum of assets of three largest banks/the sum of assets of all commercial banks).	Global financial development database, World Bank
(3) Country-level		
Monetary policy rate	Monetary policy rate is the monetary policy interest rate or bank rate which central bank of a country regular sets to manage money supply.	International financial statistics, International Monetary Fund
Lending interest rate	Lending rate is defined as the country-level annual average interest rate which banks charge on short- and medium-term loans to private sector.	World Development Indicators database, World Bank
GDP growth rate	Equals year-on-year annual GDP growth rate of each country.	
Inflation	Equals annual percentage change in consumer prices in a country.	
Developing countries dummy	Dummy variable equals 1 if World Bank ranks a country as developing and 0 otherwise.	
Crises dummy	Dummy variable equals 1 if a country experiences a banking crisis in a year and 0 otherwise.	Laeven and Valencia (2018)
<i>Additional variables</i>		
EPU index	News-based economic policy uncertainty index developed by Baker et al. (2016) . This index is constructed based on the count of economic policy uncertainty-related articles published in major newspapers of each country. EPU index is available at monthly frequency and we average monthly values to get one annual value. We take natural log of annual values.	Baker et al. (2016)
Z-score	$Z\text{-score} = -\log(\text{ROA} + \text{CAR}) / \sigma(\text{ROA})$, where ROA is pre-impairment operating profit to total assets ratio, CAR is equity to total assets ratio, and $\sigma(\text{ROA})$ is standard deviation of annual values of pre-impairment operating profit to total assets ratio calculated over three-year overlapping window (i.e., 1998–2001, 1999–2002 and so on).	Authors' calculation

Table 2. Cont.

Variable	Definition	Data Source
Democratic Accountability	A measure of, not just whether there are free and fair elections, but how responsive government is to its people. The less responsive it is, the more likely it will fall. Even democratically elected governments can delude themselves into thinking they know what is best for the people, regardless of clear indications to the contrary from the people.	International Country Risk Guide (ICRG) dataset
Corruption	A measure of corruption within the political system that is a threat to foreign investment by distorting the economic and financial environment, reducing the efficiency of government and business by enabling people to assume positions of power through patronage rather than ability, and introducing inherent instability into the political process.	
Law & order	Two measures comprising one risk component. Each sub-component equals half of the total. The “law” sub-component assesses the strength and impartiality of the legal system, and the “order” sub-component assesses popular observance of the law.	

4. Empirical Results

4.1. Summary Statistics

The summary statistics of the main variables is reported in Table 3. The interest-income-to-gross-loans ratio has a mean value of 9.06, which suggests sample banks on average have charged 9.06% interest on their loan portfolios. This value is comparable with the 7.53% interest rate reported by [Ashraf and Shen \(2019\)](#). The slight difference might be due to the different sample composition in this study; the number of countries in [Ashraf and Shen \(2019\)](#) is 17 while we have 88 countries. Similarly, their sample period is 1998–2012 while our sample period spans from 1998 to 2017. The 7.80 standard deviation shows that the interest-income-to-gross-loans ratio possess considerable variation. The WUI, which is the main independent variable, has a mean value of 0.19 with a standard deviation of 0.13 around the mean value. Control variables also possess significant variation.

Table 3. Summary statistics of main variables.

Variables	Observations	Mean	S.D.	Min	Max
Interest income to gross loans ratio	34,752	9.06	7.80	1.14	43.42
WUI	34,752	0.19	0.13	0.00	1.34
Return on equity ratio	34,752	6.58	16.19	−76.06	48.58
Interest expense to total liabilities ratio	34,752	3.52	3.84	0.00	20.04
Loan loss provisions to gross loans ratio	34,752	1.41	2.48	−2.85	15.01
Non-interest expenses to total assets ratio	34,752	4.26	5.00	0.55	32.82
Operating profit to total assets ratio	34,752	1.88	2.23	−3.68	11.44
Loans to deposits ratio	34,752	99.49	87.11	14.16	617.03
Bank size	34,752	14.21	2.22	9.27	20.05
Deposits interest rate	34,752	4.42	4.89	−0.27	39.25
Lending interest rate	34,752	9.65	10.88	0.99	86.36
Bank industry concentration	34,752	49.73	16.90	20.85	100.00
GDP growth rate	34,752	2.79	3.91	−20.60	34.47
Inflation	34,752	4.83	14.61	−10.07	493.00
Developing countries dummy	34,752	0.60	0.49	0.00	1.00
Crises dummy	34,752	0.10	0.30	0.00	1.00
EPU index	20,149	4.73	0.40	3.30	5.90

Pair-wise Pearson correlation coefficients between variables are reported in Table 4. The correlation coefficients between other variables are mostly lower than 0.8 suggesting that the chances of multicollinearity in multivariate analysis are lower.

Table 4. Matrix of pair-wise correlations between variables. This table reports pair-wise Pearson correlations between variables. All correlations are significant at the 5% level except those in bold.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1) Interest income to gross loans ratio	1.00															
(2) WUI	0.17	1.00														
(3) Return on equity ratio	0.21	−0.02	1.00													
(4) Interest expense to total liabilities ratio	0.75	0.12	0.11	1.00												
(5) Loan loss provisions to gross loans ratio	0.42	0.14	−0.24	0.33	1.00											
(6) Non-interest expenses to total assets ratio	0.64	0.15	−0.04	0.45	0.44	1.00										
(7) Operating profit to total assets ratio	0.57	0.11	0.50	0.39	0.38	0.34	1.00									
(8) Loans to deposits ratio	0.25	0.03	0.01	0.30	0.12	0.32	0.23	1.00								
(9) Bank size	−0.40	−0.09	0.09	−0.27	−0.16	−0.44	−0.14	−0.20	1.00							
(10) Deposits interest rate	0.72	0.16	0.17	0.74	0.33	0.48	0.43	0.20	−0.27	1.00						
(11) Lending interest rate	0.70	0.16	0.14	0.75	0.32	0.42	0.39	0.24	−0.23	0.83	1.00					
(12) Bank industry concentration	−0.01	−0.08	0.08	0.02	−0.01	−0.05	0.02	−0.02	−0.01	−0.01	0.05	1.00				
(13) GDP growth rate	0.11	−0.12	0.23	0.09	−0.08	−0.10	0.16	0.04	0.05	0.00	0.02	0.05	1.00			
(14) Inflation	0.29	0.06	0.13	0.21	0.12	0.21	0.20	0.06	−0.16	0.36	0.24	−0.00	−0.13	1.00		
(15) Developing countries dummy	0.62	0.14	0.22	0.59	0.27	0.44	0.44	0.24	−0.25	0.62	0.54	−0.03	0.32	0.25	1.00	
(16) Crises dummy	−0.06	−0.04	−0.17	−0.04	0.04	0.09	−0.09	0.08	−0.07	−0.00	−0.02	−0.10	−0.30	0.00	−0.17	1.00

4.2. Policy Uncertainty and Bank Loan Interest Rates

Model 1 in Table 5 reports results of baseline model, while the WUI index is added in Model 2.

Table 5. Economic and political uncertainty and bank loan pricing: Main specification. This table reports results regarding the impact of economic uncertainty on bank loan interest rates. Bank loan interest rate is measured with annual ‘interest income to gross loans ratio’ and is dependent variable in all models. WUI is world uncertainty index of [Ahir et al. \(2018\)](#), which represents economic uncertainty. Others are control variables. Detailed definitions of variables are given in Table 2. The results are estimated with pooled OLS estimator using heteroskedasticity robust standard errors. *P*-values are given in parenthesis. *** represents statistical significance at 1% level.

Variables	Interest Income to Gross Loans Ratio	
	Model (1)	Model (2)
WUI		1.591 *** (0.000)
Return on equity ratio	0.025 *** (0.000)	0.025 *** (0.000)
Interest expense to total liabilities ratio	0.634 *** (0.000)	0.636 *** (0.000)
Loan loss provisions to gross loans ratio	0.130 *** (0.000)	0.128 *** (0.000)
Non-interest expenses to total assets ratio	0.444 *** (0.000)	0.443 *** (0.000)
Operating profit to total assets ratio	0.653 *** (0.000)	0.645 *** (0.000)
Loans to deposits ratio	−0.007 *** (0.000)	−0.007 *** (0.000)
Bank size	−0.407 *** (0.000)	−0.403 *** (0.000)
Deposit interest rate	0.120 *** (0.000)	0.122 *** (0.000)
Lending interest rate	0.110 *** (0.000)	0.107 *** (0.000)
Bank industry concentration	−0.011 *** (0.000)	−0.010 *** (0.000)
GDP growth rate	0.113 *** (0.000)	0.124 *** (0.000)
Inflation	0.023 *** (0.000)	0.023 *** (0.000)
Developing countries dummy	0.522 *** (0.000)	0.479 *** (0.000)
Crises dummy	−1.270 *** (0.000)	−1.210 *** (0.000)
Year FE	Yes	Yes
Constant	8.508 *** (0.000)	8.103 *** (0.000)
Observations	34,752	34,752
R-squared	0.781	0.782

The results of baseline model are consistent with expectation and validate our model. For instance, bank-level variables representing bank funding costs (i.e., the return-on-equity ratio and the interest-expense-to-total-liabilities ratio), bank profit margin (i.e., the operating-profit-to-total-assets ratio), bank costs to provide financial services (i.e., the non-interest-expenses-to-total-assets ratio), and the average borrowers’ risk (i.e., the loan-loss-provisions-to-total-assets ratio) all result as positive and significant suggesting that bankers set higher loan interest rates if their funding and operational costs, profit margin, and borrowers’ average risk are higher.

Likewise, positive results of country-level monetary policy rate and lending interest rate variables suggest banks charge higher loan interest rates in countries with tightened monetary policy and higher average risk, respectively. The negative association of banking industry concentration and bank size implies large banks in a concentrated banking industry benefit from economies of scale and charge lower rates on loans, results consistent with [Berger et al. \(2005\)](#) and [Grechyna \(2018\)](#). Banks with aggressive financial intermediation strategy charge lower rates as shown by results of the loans-to-deposits ratio. Similarly, banks increase loan rates in response to speculative demand due to accelerated GDP growth, while reducing loan interest rates during crises due to adverse demand shock. Finally, banks charge higher interest rates in developing countries due to poor institutional environment and higher economic and financial risks.

The WUI index results as positive and significant at the 1% level in Model 2. This result indicates that banks price risks related to economic uncertainty into loan interest rates and increase bank loan interest rates in response to higher uncertainty. Economically, one standard deviation increase in the WUI index (0.13) increases bank loan rates by 0.2067 (1.59×0.13) where the mean value of bank loan rates is 9.06%. Alternatively, one standard deviation increase in WUI increases bank loan rates by 20.67 basis points. These results are comparable with [Francis et al. \(2014\)](#) who report a 11.9-basis-points increase and [Ashraf and Shen \(2019\)](#) who found a 21.84-basis-points increase in loan interest rates in response to a one-standard-deviation change in uncertainty.

Together, these results confirm that economic uncertainty leads to higher loan interest rates.

4.3. Robustness Tests

We perform several robustness tests to further confirm the above results. First, we use EPU index as an alternative proxy of uncertainty. Since EPU index is only available for around 20 countries, sample size drops substantially for this robustness test. As shown in Table 6, Model (1), EPU index enters positive and significant, which confirms that policy uncertainty results in higher loan interest rates.

Second, since uncertainty can also boost loan interest rates raising default risk of banks [Francis et al. \(2014\)](#), following [Ashraf and Shen \(2019\)](#), we add z-score to control for bank-level idiosyncratic default risk. Z-score is calculated as follows:

$$Z\text{-score} = -\log(\text{ROA} + \text{CAR})/\sigma(\text{ROA}) \quad (2)$$

where ROA is the pre-impairment-operating-profit-to-total-assets ratio, CAR is the annual-equity-to-total-assets ratio, and $\sigma(\text{ROA})$ is the standard deviation of annual values of the pre-impairment-operating-profit-to-total-assets ratio calculated over a three-year overlapping window (i.e., 1998–2001, 1999–2002, and so on). Z-score measures the distance from potential bank default, where higher values show the higher probability of bank default and vice versa. Z-score has been widely used by recent literature to measure bank default risk [Ashraf \(2017\)](#); [Houston et al. \(2010\)](#); [Kanagaretnam et al. \(2014\)](#). Additionally, $\sigma(\text{ROA})$ represents the volatility in overall bank operating income and we use it as an alternative proxy of bank income risk. Due to the three-year window, sample size decreases in regressions with Z-score. The WUI index still results as positive and significant after controlling for bank risk as shown in Table 6, Model (2). Consistent with expectation, risky banks charge higher rates on loans.

Third, to isolate the effect of economic uncertainty from the design and quality of political institutions, which also impact financing costs [Belkhir et al. \(2017\)](#), we add variables from ICRG dataset to control for democratic accountability, corruption, and law and order situation. The results of WUI index largely remain similar as shown in Table 6, Models (3) to (5). At the same time, results of additional controls suggest that banks charge lower loan interest rates in countries with higher democratic accountability, lower corruption, and better law and order situation.

Table 6. Economic and political uncertainty and bank loan pricing: Robustness checks with additional controls. This table reports results of robustness checks regarding the impact of policy uncertainty on bank loan interest rates. Bank loan interest rate is measured with annual ‘interest income to gross loans ratio’ and is the dependent variable in all models. WUI is world uncertainty index of [Ahir et al. \(2018\)](#), which represents economic uncertainty. EPU index is the economic policy uncertainty index of [Baker et al. \(2016\)](#). Others are control variables. Detailed definitions of variables are given in Table 2. The results are estimated with pooled OLS estimator using heteroskedasticity robust standard errors. *P*-values are given in parenthesis. *** and ** represent statistical significance at 1% and 5% levels, respectively.

Variables	Interest Income to Gross Loans Ratio				
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
WUI		1.437 *** (0.000)	1.679 *** (0.000)	1.528 *** (0.000)	1.385 *** (0.000)
EPU index	0.215 ** (0.031)				
Return on equity ratio	0.015 *** (0.000)	0.029 *** (0.000)	0.026 *** (0.000)	0.026 *** (0.000)	0.025 *** (0.000)
Interest expense to total liabilities ratio	0.514 *** (0.000)	0.635 *** (0.000)	0.642 *** (0.000)	0.639 *** (0.000)	0.637 *** (0.000)
Loan loss provisions to gross loans ratio	0.190 *** (0.000)	0.091 *** (0.002)	0.128 *** (0.000)	0.125 *** (0.000)	0.123 *** (0.000)
Non-interest expenses to total assets ratio	0.341 *** (0.000)	0.465 *** (0.000)	0.440 *** (0.000)	0.442 *** (0.000)	0.440 *** (0.000)
Operating profit to total assets ratio	0.647 *** (0.000)	0.613 *** (0.000)	0.641 *** (0.000)	0.642 *** (0.000)	0.643 *** (0.000)
Loans to deposits ratio	−0.006 *** (0.000)	−0.007 *** (0.000)	−0.007 *** (0.000)	−0.007 *** (0.000)	−0.006 *** (0.000)
Bank size	−0.381 *** (0.000)	−0.349 *** (0.000)	−0.401 *** (0.000)	−0.401 *** (0.000)	−0.403 *** (0.000)
Deposit interest rate	0.126 *** (0.001)	0.159 *** (0.000)	0.114 *** (0.000)	0.122 *** (0.000)	0.123 *** (0.000)
Lending interest rate	0.129 *** (0.000)	0.096 *** (0.000)	0.110 *** (0.000)	0.108 *** (0.000)	0.096 *** (0.000)
Bank industry concentration	−0.016 *** (0.000)	−0.009 *** (0.000)	−0.009 *** (0.000)	−0.008 *** (0.000)	−0.009 *** (0.000)
GDP growth rate	0.088 *** (0.000)	0.099 *** (0.000)	0.119 *** (0.000)	0.127 *** (0.000)	0.123 *** (0.000)
Inflation	0.066 *** (0.003)	0.020 *** (0.000)	0.023 *** (0.000)	0.023 *** (0.000)	0.022 *** (0.000)
Developing countries dummy	1.323 *** (0.000)	0.498 *** (0.000)	0.392 *** (0.000)	0.150 (0.147)	0.100 (0.225)
Crises dummy	−0.983 *** (0.000)	−2.047 *** (0.000)	−1.180 *** (0.000)	−1.278 *** (0.000)	−1.147 *** (0.000)
Z-score		0.142 *** (0.000)			
Democratic Accountability			−0.121 *** (0.000)		
Corruption				−0.179 *** (0.000)	
Law & order					−0.320 *** (0.000)
Year FE	Yes	Yes	Yes	Yes	Yes
Constant	7.018 *** (0.000)	7.894 *** (0.000)	8.628 *** (0.000)	8.745 *** (0.000)	10.011 *** (0.000)
Observations	20,149	26,758	34,752	34,752	34,752
R-squared	0.819	0.799	0.782	0.782	0.782

Fourth, one caveat with the above analysis is that the main sample, as reported in Table 1, excludes financial sectors of the US and large European countries raising concern about the international context of our study. Large European countries, as well as many other small countries, get excluded because the two country-level control variables, including Lending interest rate and Deposit interest rate, are missing for these countries in the WDI database of World Bank. To eliminate the concern whether including these countries would change the results, we re-estimate Equation (1) by excluding these two control variables. Exclusion of these two control variables from the model increases the effective sample size to 130 countries with 92,169 annual observations from the previous 88 countries and 34,752 annual observations. The extended sample also includes the large European countries, including France (2786 observations), Germany (29,864), Italy (4361), and the UK (688), among many others. As shown in Table 7, the WUI index results as positive and significant with the extended sample as well, ruling out the concern of biased results due to the sample selection. We still do not include the US in the extended sample due to the relatively large number of banks in the US, which may raise the concern of over-representation of a single country in the regression analysis. This can be considered as a shortcoming of our sample.

Table 7. Economic and political uncertainty and bank loan pricing: Robustness test with extended sample size. This table reports results of robustness checks regarding the impact of policy uncertainty on bank loan interest rates. Bank loan interest rate is measured with annual ‘interest income to gross loans ratio’ and is the dependent variable in all models. WUI is the world uncertainty index of [Ahir et al. \(2018\)](#), which represents economic uncertainty. EPU index is the economic policy uncertainty index of [Baker et al. \(2016\)](#). Others are control variables. Two control variables, Deposit interest rate and Lending interest rate, are omitted from this regression to maximize sample size. Detailed definitions of variables are given in Table 2. The results are estimated with pooled OLS estimator using heteroskedasticity robust standard errors. *P*-values are given in parenthesis. *** represents statistical significance at 1% level.

Variables	Interest Income to Gross Loans Ratio
	Model (1)
WUI	1.931 *** (0.000)
Return on equity ratio	0.021 *** (0.000)
Interest expense to total liabilities ratio	0.887 *** (0.000)
Loan loss provisions to gross loans ratio	0.183 *** (0.000)
Non-interest expenses to total assets ratio	0.364 *** (0.000)
Operating profit to total assets ratio	0.649 *** (0.000)
Loans to deposits ratio	−0.008 *** (0.000)
Bank size	−0.322 *** (0.000)
Deposit interest rate	Omitted
Lending interest rate	Omitted
Bank industry concentration	0.003 *** (0.000)
GDP growth rate	0.079 *** (0.000)
Inflation	0.036 *** (0.000)

Table 7. Cont.

Variables	Interest Income to Gross Loans Ratio	
	Model (1)	
Developing countries dummy	1.513 ***	(0.000)
Crises dummy	−0.226 ***	(0.000)
Year FE	Yes	
Constant	7.570 ***	(0.000)
Observations	92,169	
R-squared	0.695	

4.4. Comparison of the Impact of WUI and EPU

As described above, [Ahir et al. \(2018\)](#) argue that the WUI index better captures the local economic uncertainty as compared to the EPU index, which arguably measures domestic economic policy uncertainty however is more global in nature. To examine this, we re-estimate Equation (1) with and without time fixed-effects with both WUI and EPU indexes. Time-fixed effects in our model effectively control for global trends. For comparison, we keep only those countries for which the data of both indexes is available. As shown in Table 8, results of WUI index do not change with or without time fixed-effects. On the contrary, EPU loses significance in the model without time fixed effects. These results suggest that the impact of WUI is time independent while that of the EPU index is more likely to confound with time-fixed effects. Overall, these results are consistent with the argument of [Ahir et al. \(2018\)](#) that the EPU index is more global in nature.

Table 8. Economic and political uncertainty and bank loan pricing: Comparison of WUI and EPU indexes. This table reports results regarding the comparison of WUI and EPU indexes. Bank loan interest rate is measured with annual ‘interest income to gross loans ratio’ and is dependent variable in all models. WUI is world uncertainty index of [Ahir et al. \(2018\)](#) which represents economic uncertainty. EPU index is the economic policy uncertainty index of [Baker et al. \(2016\)](#). Others are control variables. Detailed definitions of variables are given in Table 2. 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	Interest Income to Gross Loans Ratio			
	Model (1)	Model (2)	Model (3)	Model (4)
WUI	2.429 *** (0.000)		2.041 *** (0.000)	
EPU index		0.215 ** (0.031)		0.106 (0.135)
Return on equity ratio	0.015 *** (0.000)	0.015 *** (0.000)	0.015 *** (0.000)	0.014 *** (0.000)
Interest expense to total liabilities ratio	0.513 *** (0.000)	0.514 *** (0.000)	0.529 *** (0.000)	0.533 *** (0.000)
Loan loss provisions to gross loans ratio	0.186 *** (0.000)	0.190 *** (0.000)	0.181 *** (0.000)	0.187 *** (0.000)
Non-interest expenses to total assets ratio	0.343 *** (0.000)	0.341 *** (0.000)	0.337 *** (0.000)	0.331 *** (0.000)
Operating profit to total assets ratio	0.642 *** (0.000)	0.647 *** (0.000)	0.654 *** (0.000)	0.657 *** (0.000)
Loans to deposits ratio	−0.006 *** (0.000)	−0.006 *** (0.000)	−0.006 *** (0.000)	−0.006 *** (0.000)
Bank size	−0.369 *** (0.000)	−0.381 *** (0.000)	−0.382 *** (0.000)	−0.396 *** (0.000)
Deposit interest rate	0.147 *** (0.000)	0.126 *** (0.001)	0.119 *** (0.002)	0.099 *** (0.009)
Lending interest rate	0.123 *** (0.000)	0.129 *** (0.000)	0.131 *** (0.000)	0.138 *** (0.000)

Table 8. Cont.

Variables	Interest Income to Gross Loans Ratio			
	Model (1)	Model (2)	Model (3)	Model (4)
Bank industry concentration	−0.016 *** (0.000)	−0.016 *** (0.000)	−0.019 *** (0.000)	−0.019 *** (0.000)
GDP growth rate	0.117 *** (0.000)	0.088 *** (0.000)	0.120 *** (0.000)	0.108 *** (0.000)
Inflation	0.061 *** (0.006)	0.066 *** (0.003)	0.056 *** (0.005)	0.061 *** (0.002)
Developing countries dummy	1.232 *** (0.000)	1.323 *** (0.000)	1.142 *** (0.000)	1.171 *** (0.000)
Crises dummy	−0.787 *** (0.003)	−0.983 *** (0.000)	−0.312 *** (0.000)	−0.379 *** (0.000)
Year FE	Yes	Yes	No	No
Constant	7.385 *** (0.000)	7.018 *** (0.000)	7.798 *** (0.000)	7.906 *** (0.000)
Observations	20,149	20,149	20,149	20,149
R-squared	0.820	0.819	0.819	0.818

There are two important points to consider while interpreting these results. First, the WUI and EPU measure different aspects of uncertainty. The EPU measures economic policy uncertainty while the WUI index represents overall economic uncertainty and is broader in definition. Usually, governments and central banks consider global trends to set their fiscal and monetary policies. On the other hand, country-specific economic events that create uncertainty are more local in nature. Second, such time dependence of the EPU index is less likely to affect the results of those empirical studies that control their models with time fixed-effects.

5. Conclusions

In this paper, we examine the impact of economic uncertainty on bank loan pricing. We represent aggregate country-level economic uncertainty with the world uncertainty index (WUI) of [Ahir et al. \(2018\)](#). Using a cross-country bank-level dataset from 88 countries over the period 1998–2017, we find that banks increase interest rates on loans in response to heightened economic uncertainty. Specifically, a one-standard-deviation increase in WUI leads to a 20.67-basis-points increase in interest-income-to-gross-loans ratio. Our results are robust when we use the alternative proxy of uncertainty, include additional controls in our model, and use alternative estimation methods. We further find that the WUI index is better in measuring local economic uncertainty as compared to the EPU index. Our findings imply that policy uncertainty is an important risk factor in bank loan pricing and increases funding cost for firms and households.

Policy uncertainty might increase in response to a crisis (i.e., financial, banking, or the pandemic as was the case with the outbreak of Covid-19 in early 2020) when a government has to choose among various possible potential policies. Though we control for the effect of crises in our regressions, future research may consider how policy uncertainty and crises interact to affect bank loan interest rates.

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