Does economic policy uncertainty affect bank profitability?

Ozili, Peterson K and Arun, Thankom

2022

Does economic policy uncertainty affect bank profitability?

Peterson K. Ozili, *Central Bank of Nigeria*

Thankom G. Arun, *University of Essex, United Kingdom*

Abstract

Managers are concerned about how the macroeconomic environment affects business profit. Focusing on banks, this study investigates the effect of economic policy uncertainty (EPU) on bank profitability in 22 advanced countries. The measures of bank profitability are net interest margin, lending-deposit spread, non-interest income ratio, after-tax return on asset, before-tax return on asset, after-tax return on equity and before-tax return on equity. The findings reveal that high economic policy uncertainty (EPU) negatively affects bank non-interest income. Real GDP growth rate, nonperforming loans and regulatory capital ratio are negatively related to profitability in times of high EPU. The findings also reveal that high EPU has a positive effect on bank profitability in Asia and the region of the Americas as these regions witnessed high return on equity in times of high EPU. The implication of the findings is that, although economic policy uncertainty has a depressive effect on some indicators of bank profitability, regional characteristics can ameliorate the depressive effects of EPU on bank profitability.

Keywords: bank profitability, economic policy uncertainty, EPU, profitability determinants, banks, return on assets, return on equity, net interest margin, Asia, Europe, Africa.

JEL code: G21, G28. C53, E43, E52.

This version: August 2022

Published in: **International Journal of Managerial Finance**

1. Introduction

Economic policy uncertainty (EPU) is a hot topic and has been the focus of a recent heated debate in the economics and finance literature. EPU derives mostly from whether existing policies will change in the future or the unknown impact of new economic policies on the private sector. Some studies show that high economic policy uncertainty will compel banks to reprice their loan (Ashraf and Shen, 2019), reduce credit availability (Bordo et al, 2016), and may affect banking stability (Ozili, 2022). In this paper, we extend the literature by investigating the effect of economic policy uncertainty on banking sector profitability. We also examine whether regional characteristics influence the relationship between EPU and profitability. We predict that, in times of high EPU, banking markets will be unwilling to finance more debt because banks expect higher loan default, rising nonperforming loans and rising costs, which has depressive effects on bank profitability during times of high EPU. However, regional characteristics may weaken the effect of EPU on banking markets.

We focus on the banking sector because the recent debate in the literature suggests that economic policy uncertainty has some depressive effects on bank performance (Tran and Houston, 2021; Kim and Yasuda, 2021; Wang et al, 2022; Boungou and Mawusi, 2022). Existing studies show that bank profitability is affected by external economic factors such as monetary policy (Borio et al, 2017, Altavilla et al, 2018), the low interest rate environment (Bikker and Vervliet, 2018), inflation (Tan and Floros, 2012), market structure (Mirzaei et al, 2013), bank credit supply (Ryoo, 2013), gross domestic product (GDP) growth (Bonaccorsi di Patti and Palazzo, 2018), and productivity (Batten and Vo, 2019), among others. Although profitability is an important indicator of bank performance (Dietrich and Wanzenried, 2011), the literature has not extensively examined the effect of EPU on bank profitability. More importantly, no studies in the literature have examined whether regional characteristics affect the relationship between EPU and bank profitability in an effort to determine whether the effect of EPU on bank profitability is stronger or weaker along regional dimensions. We address this issue in this paper. We extend the literature by examining whether regional characteristics affect the relationship between EPU and bank profitability.

To study the link between EPU and bank profitability, we rely on the news-based economic policy uncertainty (EPU) index developed by Baker, Bloom and Davis (2016). The index consists of four

components: the news-related, tax code expirations, disagreement over consumer price index (CPI) forecasts and disagreement over government purchases forecasts components. The four components are then aggregated into a single aggregated EPU index. We use the aggregated EPU index and examine its effect on several indicators of bank profitability. Many recent studies have used the same EPU index to investigate the economic effects of economic policy uncertainty (e.g., Ashraf and Shen, 2019; Caglayan and Xu, 2019; Ozili, 2021b). Using country-level banking sector data from 22 countries and yearly data from 1998 to 2017, the findings reveal that EPU negatively affects bank non-interest income. Overhead costs are positively related to non-interest income in times of high EPU, while non-performing loans are inversely related to return on equity in times of high EPU. We also observe that the regulatory capital ratio is inversely related to the lending-to-deposit spread and return on asset in times of high EPU. The findings also reveal that high EPU has a positive effect on the return on equity of the banking sector in Asia and the region of the Americas.

Our study makes two contributions to the literature. First, the recent literature has focused on the economic consequences of EPU, particularly for firms and the economy (Aastveit et al., 2017; Fontaine et al., 2018). Other studies examined the implication of EPU for financial institutions. For instance, Chi and Li (2017) and Gissler et al (2016) find that high EPU negatively affects the banking system through the increase in nonperforming loans and a reduction in credit supply. Our study extends this literature by analyzing the role of regional characteristics in moderating the relationship between EPU and bank profitability. Prior studies did not examine how regional characteristics influence the relationship between EPU and bank profitability. We show that EPU has a positive effect on ROE in some regions.

Second, our paper contributes to the banking literature that explore the determinants of bank profitability. Bank profitability is the most important indicator of bank performance (Dietrich and Wanzenried, 2011). Prior studies have examined the determinants of bank profitability (e.g. Albertazzi and Gambacorta, 2010; Olson and Zoubi, 2011). Other studies focused on the economic factors or macro determinants of bank profitability, such as inflation (Tan and Floros, 2012), market structure (Mirzaei et al, 2013); GDP growth (Bonaccorsi di Patti and Palazzo, 2018), taxation (Albertazzi and Gambacorta, 2010) and productivity (Batten and Vo, 2019). We add to this literature by showing that economic policy uncertainty is another important macro determinant

of bank profitability. First, we show that the level of profitability, particularly non-interest income, is negatively affected by higher EPU after controlling for other contemporaneous bank-level and economic factors affecting bank profitability, and more importantly, we show that some profitability determinants are more strongly related to profitability in times of high EPU, and these findings are consistent with the debate that higher EPU may have depressive effects on the performance of financial institutions.

The remainder of this paper is organized as follows. Section 2 reviews the relevant literature and develops the hypotheses. Section 3 presents the research methodology. Section 4 discusses the results. Finally, section 5 concludes the paper.

2. Literature review and hypothesis development

2.1. Theoretical literature on policy uncertainty

Early theoretical contributions to policy uncertainty focused on the difficulty in measuring policy uncertainty and the policy making outcomes of policy makers. For instance, McGinnis and Williams (1993) recognized that uncertainty about policy outcomes is a necessary consequence of the dynamic nature of coalition formation among domestic groups and that even if some coalition of groups "capture" the State, there is no guarantee that members of a governing coalition will continue to agree among themselves, especially with regard to newly arising issues such as new policies. Rodrik (1991) argued that it is difficult to measure, identify and quantify the causal effects of policy uncertainty. Hlatshwayo (2017) showed that the empirical examination of the consequences of policy uncertainty is rare because of the difficulty in measuring its magnitude and changes over time. Other studies focused on the sources of policy uncertainty and its consequences. For example, Bernanke (1983) and Dixit et al (1994) showed that the primary channel through which economic policy uncertainty affects the economy is the decrease in investment and delayed investment as firms adopt a “wait and see” approach to irreversible investments. Aizenman and Marion (1993) supported this view and argued that policy uncertainty affects per capita economic growth through the investment channel particularly through capital flight or a reduction in investment capital. Alvarez et al (1998) did not consider the decrease in investment to be a direct source of policy uncertainty; rather Alvarez et al (1998) focused on tax

policy uncertainty, and argued that the expectation of a future tax cut causes the firm to accelerate optimal investment, while the expectation of a reduction in the tax base causes the firm to delay optimal investment. El-Shazly (2009) supported the view of Alvarez et al (1998). El-Shazly (2009) showed that a source of policy uncertainty is the future change in corporate profit tax where both the timing of this event and the size of the associated adjustment in the tax benefit of investing are random. Hellwig (2007) identified globalization or economic openness to be a source of policy uncertainty. Hellwig (2007) argued that globalization, or exposure to the world economy, obscures mass–elite linkages in developed democracies, such that the globalization-induced market interdependence sends a signal to citizens that the policymaking environment has become more complex, making it difficult for members of the public to evaluate policymakers' performance, and give rise to uncertainty in the policymaking environment. Jordà and Salyer (2003) did not consider tax policy uncertainty to be an important source of policy uncertainty. Rather, Jordà and Salyer (2003) focused on monetary policy uncertainty and show that greater uncertainty about monetary policy can lead to a decline in nominal interest rates because an increase in monetary policy uncertainty decreases the yield on short-term maturity bonds, as the household sector responds by increasing liquidity in the banking sector. Other studies attempted to measure policy uncertainty using several ideas. For example, Baker, et al (2016) constructed a news-based index of economic policy uncertainty and found that the news-based economic policy uncertainty index helps in predicting the swings in aggregate output and employment. Bloom et al (2007) used stock market volatility as a measure of economic uncertainty. In the context of international trade, IMF (2010) used exchange rate volatility as a measure of trade policy uncertainty. Also, Handley and Limão (2017) used the variation in policies, export values and prices across thousands of export products to estimate the effects of trade policy uncertainty.

2.2. Banks and economic policy uncertainty: empirical evidence

Some studies in the EPU literature examined the behavior of banks in response to high EPU, while only few studies examined how EPU affects bank performance. Some studies focused on the behavior of banks in response to high EPU. For instance, Danisman et al (2021) examined the effect of EPU on bank loan loss provisions. They analyzed 6,384 US banks from 2009 to 2019 and found that US banks increase their loan loss provisioning in times of higher EPU. They also observed that US banks use loan loss provisions to smooth their income in times of high EPU.

Although the findings of the study are interesting, Danisman et al (2021)'s study did not assess how bank managers' discretion over loan loss provision (LLP) affected the profitability determinants of US banks. In a related study, Tran and Houston (2021) analyzed 2,483 US bank holding companies and found that the positive relationship between EPU and discretionary loan loss provisions is contingent on the characteristics of the bank holding companies and stakeholder oversight. Another study focused on the earnings management behavior of banks. Kim and Yasuda (2021) examined the effect of EPU on earnings management in the context of banks in Japan. They found that managers reduce earnings management when EPU increases, and this behavior was less pronounced for firms with the main bank that holds equity in the firm. Kim and Yasuda (2021)'s study focused on accrual-based earnings management which is not an indicator of bank performance. Wang et al (2022) investigated whether EPU and country governance affect bank liquidity creation. They observed that EPU had a negative impact on bank liquidity creation, and country governance mitigated the negative impact of EPU on bank liquidity creation. They also found that high EPU decreased bank credit supply. Taken together, the above studies did not extend their analysis to examine how bank profitability is affected by the change in bank behavior during times of high EPU.

Other studies focused on how EPU affects bank credit decisions. For instance, Biswas and Zhai (2021) focused on the impact of domestic EPU on cross-border syndicated lending. They find that banks increased cross-border syndicated lending when domestic EPU is high, and the effect is strongest for banks with diverse income and when banks face fiercer competition. Although the findings of the study are interesting, Biswas and Zhai (2021)'s study did not assess the impact of EPU on the profitability of banks that are involved in cross-border syndicated lending. Orden-Cruz et al (2022) analyzed the impact of EPU on the credit risk of US banks. They analyzed 2,994 US commercial banks from 2017 to 2019. They found a significant positive relationship between EPU and the credit risk of US commercial banks, and the effect of EPU on credit risk is more significant in banks that are less profitability and less solvent. While the findings are important, Orden-Cruz et al (2022)'s study did not assess whether the increase in credit risk affected the profitability of US commercial banks. Demir and Danisman (2021) examined the effects of economic uncertainty and geopolitical risks on bank credit growth. They analyzed 2,439 banks from 19 countries from 2010 to 2019 and found that economic uncertainty causes a significant decrease in bank credit growth. While the findings are important, Demir and Danisman (2021)'s study did not assess

whether the decrease in credit growth affected the profitability of the US banks in their sample. Ozili (2021a) conducted a review of existing EPU studies and found that economic policy uncertainty affects banks through loan re-pricing and a reduction in credit supply. Taken together, the above studies did not extend their analysis to examine how changes in bank credit affect bank profit in times of high EPU.

Very few studies examined how EPU affects the performance of financial institutions. For instance, Phan et al (2021) investigated the impact of EPU on financial stability. They used data for 23 countries from 1996 to 2016. They found that an increase in EPU decreases financial stability, and the negative impact of EPU on financial stability is stronger for countries with higher competition, lower regulatory capital and smaller financial systems. But the study of Phan et al (2021) did not focus on how EPU affects bank profitability. Athari (2021) examined the effect of global EPU on the profitability of Ukrainian banks. The author found that global EPU has a significant negative effect on the profitability of banks in Ukraine. However, Athari (2021) examined only a single country case. The study did not extend the analysis to multiple countries, and the study analyzed only one indicator of bank profitability. Boungou and Mawusi (2022) analyzed the effect of EPU on banks' non-interest income activities. They analyzed 3,913 banks operating in 9 countries from 2009 to 2018. They did not find a significant effect of EPU on banks' non-interest income. However, Boungou and Mawusi (2022)'s study analyzed few countries, and the study did not examine how EPU affect several indicators of bank profitability.

Taken together, the review of empirical EPU literature above shows that the literature has not extensively examined the effect of EPU on bank profitability. More importantly, no studies in the literature have examined whether regional characteristics affect the relationship between EPU and bank profitability. We address this issue in this paper. Accordingly, we investigate the relationship between banking sector profitability and economic policy uncertainty to determine whether an increase in EPU leads to an increase or decrease in several profitability indicators. We also extend the literature by examining whether regional characteristics affect the relationship between EPU and bank profitability.

2.3. External determinants of bank profitability

There are diverse bank profitability determinants and there is no consensus about which bank profitability determinants are more important or less important. For instance, Borio et al (2017)

investigate the effect of monetary policy on bank profitability using data for 109 large international banks from 14 advanced economies during 1995 to 2012. They find a positive relationship between short-term monetary policy rates and bank profitability particularly return on assets. One weakness of the findings of Borio et al (2017) is that the link between the monetary policy rate and bank profitability is indirect and it has a lag effect. Tan and Floros (2012) investigate the determinants of bank profitability in China. They focused on the effect of inflation on bank profitability while controlling for bank-specific and industry-specific variables. They analyze 101 banks from 2003 to 2009 and find a positive relationship between bank profitability, cost efficiency, banking sector development, stock market development and inflation in China. They also observe that low profitability can be explained by a higher volume of non-traditional activity and higher taxation. Despite the findings of Tan and Floros (2012), inflation may have a negative effect on bank profitability through an increase in the cost of banking operations when inflation is rising. Mirzaei et al (2013) empirically investigate the effect of market structure on bank performance. They find that greater market power leads to higher bank profitability in advanced economies. One implication of the findings of Mirzaei et al (2013) is that market power may not increase bank profitability in developing economies.

Other studies report other determinants of bank profitability. For instance, Batten and Vo (2019) investigate the determinants of bank profitability in Vietnam from 2006 to 2014. They find that bank size, capital adequacy, risk, expense and productivity have strong impacts on profitability. They also find that bank industry characteristics and macroeconomic variables affect bank profitability. Ryoo (2013) developed a stock-flow-consistent macroeconomic model where bank profitability and bank leverage play a crucial role in the determination of firms' liability structure. The model assumes that banks' credit supply depends on bank profitability as well as firms' profit–interest ratio. Their analysis suggests that a strong expansionary effect of bank profitability on credit supply tends to destabilize the economy, leading to cycles driven by the interaction between firms' and banks' financial behavior. Bonaccorsi di Patti and Palazzo (2018) investigate the impact of macroeconomic conditions on the profitability of EU banks under different business models. They group banks into three business models using a hierarchical cluster analysis and find that GDP growth, credit growth and the risk-free yield curve influence profitability but the effect of GDP growth is only significant for banks that have a high and medium share of assets invested in loans and not for banks that hold large portfolios of securities.

Other studies show conflicting evidence for the effect of monetary policy on bank profitability. For instance, Bikker and Vervliet (2018) investigate the impact of the unusually low interest rate environment on the profitability and risk-taking of banks in the United States. They find that the low interest rate environment impaired bank performance and compressed the net interest margins of US banks. Lopez et al (2020) explore the impact of negative policy rates on banks for 5200 banks from 27 advanced European and Asian countries during the 2010 to 2017 period. They find that banks offset losses under negative rates with lower deposit expenses and gains in non-interest income, including fees and capital gains. They also observe that banks respond to negative rates by increasing lending activity and raising their share of deposit funding. Altavilla et al (2018) analyze the impact of standard and non-standard monetary policy on bank profitability using both proprietary and commercial data on individual euro area bank balance sheets and market prices. They find that a monetary policy easing – a decrease in short-term interest rates and/or a flattening of the yield curve – is not associated with lower bank profits. The above studies show that the effect of monetary policy on bank profitability depends on the structure of the banking sector and the policy environment. Taken together, these studies did not consider EPU to be an external determinant of bank profitability. We extend the literature by investigating the effect of EPU on bank profitability. We also extend the literature by investigating whether regional characteristics affect the relationship between EPU and bank profitability.

2.4 Hypothesis development

The theoretical literature show that firms often face uncertainty and it affects business decisions regarding costs, demand and profitability (see, for example, Handley and Limao, 2015; Bernanke, 1983; Dixit and Pindyck, 1994). For instance, Handley and Limao (2015) argued that uncertainty can arise from policy shocks such as sudden changes in monetary and fiscal policies and changes in tax and regulatory reforms. They argued that uncertainty about future business conditions can compel firms to make costly irreversible investments or force firms to delay investment decisions and wait until current conditions are sufficiently good before they invest or wait until future uncertainty is sufficiently low before they invest. Bernanke (1983) and Dixit and Pindyck (1994) argued that firms can reduce investment and wait until new information about a more certain future emerges. But the delay in investment is costly because it can reduce the output of firms and lead to an economic slowdown (Bernanke, 1983).

In the context of financial institutions, Caglayan and Xu (2019) and Kang et al (2014) argued that uncertainty can compel financial institutions to reduce credit supply and delay investment decision which can reduce the performance of financial institutions. Based on the propositions of Caglayan and Xu (2019) and Kang et al (2014), we predict that high EPU would reduce bank profitability. The channel through which this happens is through the rise in loan default, high cost, high interest rate and reduced bank lending in times of high, which have depressive effects on the profitability of the banking sector (Caglayan and Xu, 2019; Brewer III et al, 2014; Ozili, 2022).

H1: EPU has a negative effect on banking sector profitability

Also, we predict that regional factors, such as regional economic cooperation, structure of regional banking markets and regulation, may exert a significant influence on the relationship between EPU and bank profitability. Regional factors might explain why EPU has an immediate effect on bank performance in some regions and have a lagged or indirect effect on banks in other regions. Regional characteristics may also dampen the depressive effect of EPU on bank profitability.

Therefore, we predict that regional characteristics may have a significant influence on the relationship between EPU and bank profitability.

H2: Regional characteristics have a significant effect on the relationship between EPU and bank profitability

3. Research Methodology

3.1. Data

Data for banking sector profitability determinants were collected from the global financial development database of the World Bank. Data for economic policy uncertainty (EPU) index were collected from the EPU database at: https://www.policyuncertainty.com. The EPU database provides indices of economic policy uncertainty for major countries of the world. The EPU index was constructed based on Baker et al (2016)'s methodology. Data were collected for 22 countries, namely, Australia, Brazil, Canada, Chile, China, Colombia, France, Germany, Greece, India, Ireland, Italy, Japan, Korea, Mexico, Netherland, Russia, Singapore, Spain, Sweden, UK and US. The sample period is from 1998 to 2017. The period 1998 to 2017 was chosen for two reasons. First, the sample period of 1998 to 2017 was chosen because data for most countries were abundantly available for this period, and data are lacking for some countries from 2018 to 2021. Second, the sample period was chosen to isolate the effect of COVID so that it won't contaminate our analysis and to allow us focus on the changes in economic policy uncertainty prior to the COVID pandemic. Finally, information about data source and variable description are reported in table 11.

3.2. Model specification

To test the impact of EPU on bank profitability, we used a baseline model which is a modified model from the model used in Dietrich and Wanzenried (2011) and Saona (2016). In the models, we introduced two EPU variables as determinants of bank profitability while controlling for other bank profitability determinants.

$$\pi i,t = \beta 1 + \beta 2\boldsymbol{EPUD}i,t + \beta 3NPLi,t + \beta 4CARi,t + \beta 5OCTi,t + \beta 6BCONi,t + \beta 7MKPi,t + \beta 8GDPRi,t + ei,t \ldots\ldots equation\ (1)$$

$$\pi i,t = \beta 1 + \beta 2\boldsymbol{EPUA}i,t + \beta 3NPLi,t + \beta 4CARi,t + \beta 5OCTi,t + \beta 6BCONi,t + \beta 7MKPi,t + \beta 8GDPRi,t + ei,t \ldots\ldots equation\ (2)$$

where the subscript i,t represents country i, in year t. π is a vector of bank profitability indicators which are net interest margin (NIM), lending-deposit spread (LDS), non-interest income to total income ratio (NII), after-tax return on asset (ROAAT), before-tax return on asset (ROABT), after-tax return on equity (ROEAT) and before-tax return on equity (ROEBT). The explanatory variables are the EPUD, EPUA, BCON, OCT, CAR, MKP, GDPR and NPL variables, where EPUD = EPU index, year-end (December) values, EPUA = EPU index, 12-month average values, BCON = bank concentration, OCT = bank overhead costs to total assets, CAR = bank regulatory capital to risk-weighted assets ratio, MKP = Lerner index, GDPR = real GDP growth rate and NPL = non-performing loan to gross loan ratio. Finally, the models are estimated using country and year panel fixed effect regression estimation.

3.3. Variable justification

The dependent variables are the bank profitability variables: NII, LDS, NIM, ROABT, ROAAT, ROEAT and ROEBT. The focal explanatory variables are the two economic policy uncertainty (EPU) index variables which are the EPUD and EPUA variables. The main EPU variable is the EPUD variable, while the EPUA variable is introduced for robustness purposes. The EPUD variable is measured as the year-end value of the monthly EPU index, i.e. the December value of the monthly EPU index while the EPUA variable is the average of the monthly EPU index values. A negative relationship between the economic policy uncertainty variables (i.e. EPUD and EPUA) and the profitability variables is expected because high economic policy uncertainty will negatively affect financial institutions' performance (Caglayan and Xu, 2019).

The control variables are the OCT, NPL, GDPR, BCON, CAR and MKP variables. With respect to NPL, a negative relationship between NPL and profitability is expected because when loan losses materialize, banks will lose the interest income associated with the loan; thus, decreasing bank profit. Khan et al (2020) also find a negative relationship between NPL and profitability. The regulatory capital ratio (CAR) variable measures the capital that banks are required to set aside for the risks they take and to absorb unexpected losses. A positive relationship between CAR and profitability is expected because bank supervisors will require banks to keep higher regulatory capital ratios when they take higher risks intended to improve their profitability. If the regulatory capital ratio of banks is commensurate with the risk banks take, then higher CAR will be associated with higher profitability due to the positive relationship between risk and return (Ozili, 2017). Real

gross domestic product growth rate (GDPR) variable has been used by several studies to control for the impact of fluctuating economic cycles on bank profitability (Bolt et al, 2012). A positive relationship between GDPR and profitability is expected because in good economic times, borrowers will be able to generate income from their business activities and will repay their debt to banks which will increase banks' profit in good times and vice versa. (Bolt et al, 2012). Consistent with this argument, we introduced the GDPR variable into the model to detect whether economic cycle fluctuations affect bank profitability. The OCT variable is overhead costs to total asset ratio. High overhead costs will increase banks' total operating costs and reduce banks' profits (Mirzaei et al., 2013); therefore, a negative relationship between OCT and profitability is expected. The MKP variable is the banking sector's market power which is measured using the Lerner index. In theory, high market power is associated with greater monopoly benefits such as greater profitability for banks (Maudos and De Guevara, 2007; Buch et al, 2013), therefore, a positive relationship between MKP and profitability is expected. The BCON variable is bank concentration. A high bank concentration ratio is associated with low competition, and low competition leads to high profitability. Studies such as Ozili and Uadiale (2017) find a positive association between bank profitability and bank concentration, thus, a positive relationship between bank concentration and profitability is expected. Finally, the regression model was estimated using the fixed effect regression model. We performed a Hausman test (table 12 and 13) and the p-value was less than 0.05 which leads us to reject the null hypothesis that the random effect model is appropriate. We, therefore, accept the alternative hypothesis that the fixed effect model is appropriate for the analysis. Hence, the panel fixed effect regression method was used to estimate the effect of EPU on bank profitability.

3.4. Descriptive statistics

Table 1 reports the summary of the descriptive statistics of the variables. NIM is 2.7% on average and is higher in Brazil, Mexico and Colombia and is much lower in France and Ireland. The LDS ratio is 6.4% on average and is lower in the Netherlands and Spain and higher in Brazil and Russia. On average, NII is 39% and is higher for the banking sector of Russia, UK and France and much lower in Japan and Korea Republic. The ROAAT and ROABT ratios are 0.7% and 0.8%, respectively, and are higher in Mexico, Chile and Brazil, and lower in Greece, Ireland and Japan. The ROEAT and ROEBT ratios are 8.5% and 8.6% respectively, and are higher in Sweden,

Mexico and India, and lower in Greece and Ireland. The two economic policy uncertainty variables (EPUD and EPUA) are higher in the UK, France, Korea and Russia, and lower in Sweden and India. The mean values of the control variables are reported in table 1 but are not interpreted.

Table 1. Descriptive statistics

Country	NIM	LDS	NII	ROAAT	ROABT	ROEAT	ROEBT	EPUD	EPUA	BCON	OCT	CAR	MKP	GDPR	NPL
Australia	1.9	3.3	33.3	0.8	1.1	11.9	16.9	97	100	71	1.3	11	0.1	3.1	0.9
Brazil	6.3	37.1	36.1	1.4	1.7	15.2	17.9	151	143	52	4.8	16	0.2	2.3	4.4
Canada	2.04	3.1	49.7	0.7	0.9	10.1	14.2	135	136	66	2.1	13	0.3	2.8	0.9
Chile	4.2	3.7	28.2	1.4	1.7	16.8	19.8	128	108	48	2.6	13	0.2	3.7	1.7
China	2.8	3.2	15.2	0.9	1.2	15.2	22.2	131	121	51	1.2	11	0.3	9.1	8.6
Colombia	5.9	7.3	51.7	0.7	1.2	7.7	13.0	104	101.	63	7.4	15	0.3	3.3	5.2
France	0.9	3.9	51.1	0.3	0.3	8.2	8.9	162	159	59	1.0	13	0.1	1.6	4.1
Germany	1.0	6.6	49.5	0.1	0.2	2.8	4.6	126	128	70	1.3	14	0.04	1.4	3.6
Greece	2.5	5.6	30.4	-0.8	-1.1	-6.6	-8.6	97	100	72	2.5	12	0.2	0.6	16.3
India	3.2	-	33.0	0.8	1.2	13.7	19.7	99	97	32	2.1	12	0.2	6.7	6.8
Ireland	0.9	3.6	47.0	0.02	0.07	-2.2	-1.6	141	112	73	0.7	15	0.2	5.3	8.1
Italy	1.8	5.1	44.8	0.3	0.4	3.8	5.5	105	107	59	1.9	11	0.1	0.5	10.2
Japan	1.1	1.3	26.8	0.02	0.1	-0.1	1.6	105	109	40	0.8	12	0.3	0.8	3.2
Korea	2.2	1.7	26.1	0.3	0.5	4.2	7.4	142	122	71	1.5	12	0.3	4.01	2.4
Mexico	6.5	5.3	29.7	1.4	1.8	13.1	16.5	101	95	57	4.3	15	0.2	2.3	3.5
Netherland	1.2	1.1	37.4	0.6	0.6	8.3	7.6	102	97	82	1.15	14	0.2	1.8	2.5
Russia	4.9	8.9	62.5	1.3	1.9	11.8	16.2	142	118	36	12.8	15	0.2	3.5	7.0
Spain	1.8	2.03	35.3	0.5	0.6	7.5	8.8	105	102	68	1.5	12	0.3	2.1	3.5
Singapore	1.7	4.8	34.8	1.03	1.2	11.3	13.4	121	115	91	0.8	16	0.7	5.0	2.9
Sweden	1.4	3.4	41.3	0.7	0.9	16.3	20.6	85	91	94	1.3	13	0.2	2.5	1.1
UK	1.5	2.7	55.4	0.6	0.6	9.4	10.5	169	175	50	1.7	14	0.3	2.1	2.3
US	3.6	-	39.6	1.01	1.5	10.2	15.1	123	118	30	3.0	13	0.2	2.2	1.9
Mean	2.7	6.4	39.1	0.638	0.8	8.5	8.6	121	116	61	2.7	14	0.2	3.1	4.6
Median	2.01	3.7	36.9	0.7	0.9	10.6	10.6	105	106	61	1.7	13	0.2	2.9	2.8
S.D	1.9	9.2	14.9	1.3	1.4	13.6	13.6	68	56	19	4.83	3.1	0.1	3.5	5.7
Min	1.9	0.2	7.9	-10.7	-10.1	-101.5	-101.5	15	27	100	0.04	2.5	-0.1	25.2	0.1
Max	8.9	58.4	95.3	6.8	8.2	36.6	42.3	468	543	21	81.9	26	1.1	-9.1	45.6
Obs.	440	284	439	440	440	440	440	435	435	432	440	426	346	440	425

***S.D. = Standard deviation. Min = minimum value. Max = maximum value. Obs = number of observations. NIM = Bank net interest margin (%). LDS = Bank lending-deposit spread (%). NII = Bank noninterest income to total income (%). ROAAT = Bank return on assets (%, after tax). ROABT = Bank return on assets (%, before tax). ROEAT = Bank return on equity (%, after tax). ROEBT = Bank return on equity (%, before tax). EPUD = EPU index, year-end (December) values. EPUA = EPU index, 12-month average values. BCON = Bank concentration (%). OCT = Bank overhead costs to total assets (%). CAR = Bank regulatory capital to risk-weighted assets (%). MKP = Lerner index. GDPR = real GDP growth rate (%). NPL = nonperforming loan to gross loan (%).

4. Discussion of Results

The coefficients of the variables are considered to be significant and robust if the variables are both significant in the EPUD model and the EPUA model. The results are considered to be inconclusive if the coefficients of the variables report mixed signs or are not equally significant in the EPUD model and the EPUA model.

4.1. Impact of EPU on banking sector profitability

In this section, we identify the impact of EPU on bank profitability after controlling for bank-specific factors, financial structure and some macroeconomic determinants of bank profitability. The results are reported in table 2 and 3. The coefficients of the variables are considered to be significant and robust if the variables are both significant in table 2 and 3.

The EPUD coefficient is significant and negatively related to bank non-interest income in table 2 and 3. This suggests that high economic policy uncertainty has a negative impact on bank non-interest income. This result supports the first hypothesis (H1) that EPU is inversely related to bank profitability. The findings also support the results of Ashraf and Shen (2019) and Caglayan and Xu (2019) who show that EPU has a depressive effect on the performance of financial institutions using a different set of performance indicators. This result implies that banks will lose some non-interest income in times of high EPU because bank customers may be reluctant to patronize banks during times of high EPU due to the economic difficulty they experience, and because they know that banks will charge higher fees for services during periods of high EPU. This further contributes to the depressive effect of high EPU on bank non-interest income. For the control variables, the NPL coefficient is negatively related to before-tax (and after-tax) ROA and ROE as expected. The GDPR coefficient is positively related to before-tax (and after-tax) ROA and ROE as expected. The CAR coefficient is significant and positively related to LDS, NIM and ROA. The BCON coefficient is significant and negatively related to ROA in table 2 and 3 as expected. The MKP coefficient is negatively related to LDS and ROEBT, ROABT and ROAAT. Overall, most of the control variables report the expected signs which are consistent with our predictions.

Table 2. Impact of EPUD on bank profitability

	NII	LDS	NIM	ROEAT	ROEBT	ROABT	ROAAT
Variable	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)
c	34.414***	-1.310	1.475***	4.219	6.376	-0.282	-0.273
	(6.83)	(-0.49)	(3.13)	(0.63)	(0.87)	(-0.45)	(-0.46)
EPUD	-0.021*	-0.003	0.002	-0.010	-0.011	-0.009	-0.001
	(-1.91)	(-0.45)	(1.59)	(-0.69)	(-0.67)	(-0.67)	(-0.43)
NPL	0.816***	0.664***	-0.012	-1.997***	-2.200***	-0.164***	-0.145***
	(3.69)	(4.72)	(-0.56)	(-6.79)	(-6.88)	(-5.99)	(-5.64)
OCT	0.604***	-0.102**	-0.002	0.119	0.163	0.003	0.006
	(5.69)	(-2.35)	(-0.18)	(0.83)	(1.06)	(0.24)	(0.45)
BCON	0.081*	-0.033	-0.016***	0.004	0.001	-0.019***	-0.019***
	(1.69)	(-1.49)	(-3.52)	(0.07)	(0.02)	(-3.23)	(-3.31)
MKP	-9.283	5.642*	0.809	21.521	29.452***	2.668***	2.061***
	(-1.40)	(1.81)	(1.31)	(2.44)	(3.07)	(3.26)	(2.66)
GDPR	-0.146	-0.184	0.026	0.865***	0.953***	0.165***	0.162***
	(-0.58)	(-1.59)	(1.11)	(2.64)	(2.67)	(5.42)	(5.65)
CAR	0.059	0.599***	0.136***	0.388	0.355	0.144***	0.126***
	(0.19)	(3.86)	(4.69)	(0.94)	(0.79)	(3.76)	(3.48)
Adjusted R^2	69.96	91.37	85.39	39.97	44.03	51.01	45.88
F-statistic	17.99	53.18	43.78	5.87	6.75	8.62	7.20
Observation	322	208	323	323	323	323	323

The regression includes country and year fixed effects. The explanatory variables are defined as follows: BCON = Bank concentration (%). OCT = Bank overhead costs to total assets (%). CAR = Bank regulatory capital to risk-weighted assets (%). MKP = Lerner index. GDPR = real GDP growth rate (%). NPL = nonperforming loan to gross loan (%). EPUD = EPU index, year-end (December) values. T-statistics are reported in parenthesis. ***, **, * represent significance at 1%, 5% and 10% levels.

.

Table 3. Impact of EPUA on bank profitability

	NII	LDS	NIM	ROEAT	ROEBT	ROABT	ROAAT
Variable	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)
c	36.266***	-0.529	1.293***	4.118***	6.491	-0.350	-0.371
	(7.07)	(-0.19)	(2.69)	(5.99)	(0.87)	(-0.55)	(-0.61)
EPUA	-0.039**	-0.008	0.003**	-0.010	-0.013	-0.0003	0.0003
	(-2.55)	(-0.98)	(2.36)	(-0.48)	(-0.56)	(-0.18)	(0.17)
NPL	0.841***	0.654***	-0.014	-1.993***	-2.194***	-0.164***	-0.146***
	(3.82)	(4.64)	(-0.67)	(-6.77)	(-6.84)	(-5.98)	(-5.65)
OCT	0.592***	-0.103**	-0.001	0.117	0.160	0.003	0.006
	(5.59)	(-2.38)	(-0.07)	(0.83)	(1.04)	(0.25)	(0.47)
BCON	0.077*	-0.035	-0.016***	0.003	0.0003	-0.019***	-0.019***
	(1.62)	(-1.56)	(-3.46)	(0.05)	(0.004)	(-3.23)	(-3.31)
MKP	-10.377	5.286*	0.922	21.735**	29.513***	2.731***	2.141***
	(-1.57)	(-1.69)	(1.49)	(2.45)	(3.06)	(3.32)	(2.75)
GDPR	-0.169	-0.192*	0.028	0.868***	0.952***	0.166***	0.164***
	(-0.67)	(-1.67)	(1.22)	(2.64)	(2.66)	(5.45)	(5.69)
CAR	0.101	0.596***	0.132***	0.388	0.359	0.143***	0.124***
	(0.33)	(3.86)	(4.57)	(0.94)	(0.79)	(3.72)	(3.42)
Adjusted R^2	70.27	91.41	85.55	39.91	44.01	50.94	45.85
F-statistic	18.24	53.45	55.33	5.86	6.75	8.59	7.19
Observation	322	208	323	323	323	323	323

The regression includes country and year fixed effects. The explanatory variables are defined as follows: BCON = Bank concentration (%). OCT = Bank overhead costs to total assets (%). CAR = Bank regulatory capital to risk-weighted assets (%). MKP = Lerner index. GDPR = real GDP growth rate. NPL = nonperforming loan to gross loan. EPUA = EPU index, year average (12-month average EPU index values). T-statistics are reported in parenthesis. ***, **, * represent significance at 1%, 5% and 10% levels.

4.2. Interaction analysis: Profitability determinants during policy uncertainty

In this section, we conducted some interaction analyses to determine the specific determinants that predict bank profitability in times of changing economic policy uncertainty. The results are reported in table 4 and 5. The coefficients of the variables are considered to be significant and robust if the variables are both significant in table 4 and 5.

The EPUD*NPL coefficient is significant and negatively related to before-tax (and after-tax) ROE. This suggests that the banking sector's non-performing loans are inversely related to return on equity in times of high EPU. This indicates that the nonperforming loan ratio has a negative relationship with profitability (ROE) in times of high EPU. This result is expected because, in times of high EPU, debtors will experience difficulty in repaying the loans issued to them by banks. This will reduce the profitability of banks in times of high EPU and reduce the profit paid out to bank shareholders.

The EPUD*OCT coefficient is significant and positively related to NII in table 4 and 5, which indicates that overhead costs are positively related to non-interest income in times of high EPU. This implies that overhead cost has a positive relationship with profitability (NII) in times of high EPU. This result is expected because, in times of high EPU, banks will incur higher operating cost due to uncertainty in the business environment that make banking operations costlier. Therefore, as banks experience higher profitability, their overhead cost will also increase due to rising economic policy uncertainty.

The EPUD*GDPR coefficient is significant and negatively related to before-tax (and after-tax) ROA in table 4 and 5, which suggest that the banking sector experience lower profitability during economic expansions and during high economic policy uncertainty, combined. This implies that GDP growth has a negative relationship with profitability (ROA) in times of high EPU. This result is expected because, in times of high EPU, recessionary pressures are higher in the business environment. Bank customers will experience difficulty in generating revenue from their own businesses, and they may experience difficulty in meeting their loan repayment obligation and other fee obligation to banks. This will lead to a decline in bank profitability. The EPUD*CAR coefficient is significant and negatively related to LDS, ROABT and ROAAT in table 4 and 5, which suggest that the banking sector's regulatory capital ratio is inversely related to the lending-to-deposit spread and return on asset in times of high EPU. This result implies that regulatory capital ratio has a negative relationship with profitability (LDS, ROABT and ROAAT) in times of high EPU. This result is expected because, in times of high EPU, banks will have incentives to reduce their capital requirements so that they can increase lending to profitable sectors in order to boost profitability in times of high EPU.

Table 4. Profitability determinants during policy uncertainty (using EPUD)

	NII	LDS	NIM	ROEAT	ROEBT	ROABT	ROAAT
Variable	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)
c	39.366***	-5.850	0.100	-15.259	-12.859	-3.224***	-3.070
	(4.31)	(-1.29)	(0.12)	(-1.29)	(-0.99)	(-2.87)	(-1.12)
EPUD	-0.108	0.061	0.015**	0.151	0.143	0.023**	-0.002
	(-1.47)	(1.57)	(2.18)	(1.59)	(1.38)	(2.60)	(-1.23)
EPUD*NPL	-0.005	-0.004	0.0002	-0.027***	-0.027***	-0.001	-0.001*
	(-1.27)	(1.37)	(0.65)	(-5.28)	(-4.72)	(-1.43)	(-1.68)
EPUD*OCT	0.012***	0.001	-0.0002	0.015***	0.015***	0.001*	0.001*
	(3.33)	(0.47)	(-0.64)	(3.18)	(2.98)	(1.65)	(1.94)
EPUD*BCON	0.001	-0.0001	0.0001	-0.0003	-0.0005	-0.0001	-0.0001
	(0.81)	(-0.27)	(0.11)	(-0.38)	(-0.58)	(-1.01)	(-0.89)
EPUD*MKP	-0.081	0.048	0.018**	-0.021	-0.007	0.006	0.005
	(-1.09)	(1.27)	(2.59)	(-0.22)	(-0.07)	(0.70)	(0.62)
EPUD*GDPR	0.004	0.001	-0.0005	0.0005	-0.002	-0.001**	-0.001**
	(0.97)	(0.83)	(-1.46)	(0.09)	(-0.29)	(-2.56)	(-2.42)
EPUD*CAR	0.004	-0.005**	-0.001***	-0.006	-0.005	-0.001**	-0.001**
	(0.88)	(-2.25)	(-2.97)	(-1.14)	(-0.84)	(-2.49)	(-2.54)
NPL	1.461***	1.027***	-0.035	1.059*	0.787	-0.089	-0.062
	(3.03)	(3.76)	(-0.78)	(1.71)	(1.16)	(-1.51)	(-1.10)
OCT	-0.863*	-0.198	0.027	-1.665***	-1.676***	-0.083	-0.090*
	(-1.92)	(-0.77)	(0.65)	(-2.87)	(-2.63)	(-1.49)	(-1.73)
BCON	0.032	-0.023	-0.016**	0.033	0.048	-0.013	-0.014
	(0.42)	(-0.57)	(-2.26)	(0.35)	(0.45)	(-1.43)	(-1.58)
MKP	1.593	-1.536	-1.458	16.390	23.544	1.876	1.368
	(0.15)	(-0.28)	(-1.42)	(1.16)	(1.52)	(1.39)	(1.08)
GDPR	-0.547	-0.261	0.092**	0.811	1.081*	0.284***	0.268***
	(-1.27)	(-1.29)	(2.26)	(1.46)	(1.77)	(5.34)	(5.36)
CAR	-0.034	0.955***	0.254***	1.369*	1.259	0.317***	0.294***
	(-0.06)	(3.84)	(4.89)	(1.92)	(1.60)	(4.64)	(4.56)
Adjusted R^2	70.83	91.52	85.79	45.67	48.32	53.01	48.27
F-statistic	16.59	47.57	39.91	6.41	7.02	8.26	7.01
Observation	322	208	323	323	323	323	323

This regression includes both country and year fixed effect. The explanatory variables are defined as follows: BCON = Bank concentration (%). OCT = Bank overhead costs to total assets (%). CAR = Bank regulatory capital to risk-weighted assets (%). MKP = Lerner index. GDPR = real GDP growth rate. NPL = nonperforming loan to gross loan. EPUD = EPU index, year-end (December) values. T-statistics are reported in parenthesis. ***, **, * represent significance at 1%, 5% and 10% levels.

Table 5. Profitability determinants during policy uncertainty (using EPUA)

	NII	LDS	NIM	ROEAT	ROEBT	ROABT	ROAAT
Variable	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)
c	38.787***	-8.083	0.503	-20.595	-14.914	-3.918***	-3.846***
	(3.49)	(-1.53)	(0.48)	(-1.38)	(-0.91)	(-2.87)	(-2.97)
EPUA	-0.111	0.104*	0.011	0.212	0.176	0.033***	0.032***
	(-1.15)	(1.99)	(1.23)	(1.63)	(1.24)	(2.76)	(2.86)
EPUA*NPL	-0.005	-0.011***	-0.00001	-0.023***	-0.024***	-0.0001	0.0002
	(-0.87)	(-3.07)	(-0.01)	(-3.35)	(-3.09)	(-0.09)	(0.04)
EPUA*OCT	0.012***	0.005**	-0.0001	0.009	0.009	0.0001	0.0002
	(2.64)	(2.38)	(-0.18)	(1.43)	(1.32)	(0.14)	(0.37)
EPUA*BCON	0.0001	0.00003	0.0001	-0.0005	-0.0006	-0.00004	-0.00003
	(0.14)	(0.08)	(0.79)	(-0.49)	(-0.56)	(-0.45)	(-0.34)
EPUA*MKP	-0.101	0.101*	0.012	-0.023	0.013	0.001	0.003
	(-0.99)	(1.82)	(1.19)	(-0.17)	(0.08)	(0.12)	(0.27)
EPUA*GDPR	0.012**	0.002	-0.0009**	0.003	-0.005	-0.002***	-0.002***
	(2.58)	(0.67)	(-2.12)	(0.45)	(-0.65)	(-3.38)	(-3.35)
EPUA*CAR	0.003	-0.009***	-0.001	-0.009	-0.006	-0.002***	-0.002***
	(0.56)	(-2.76)	(-1.58)	(-1.21)	(-0.70)	(-2.75)	(-2.99)
NPL	1.510**	1.688***	-0.019	0.608	0.394	-0.176**	-0.164**
	(2.49)	(4.99)	(-0.33)	(0.75)	(0.44)	(-2.36)	(-2.33)
OCT	-0.692	-0.663***	-0.007	-0.811	-0.774	-0.0007	-0.009
	(-1.41)	(-2.70)	(-0.15)	(-1.23)	(-1.07)	(0.01)	(-0.16)
BCON	0.065	-0.049	-0.021**	0.046	0.052	-0.015	-0.016
	(0.72)	(-0.99)	(-2.45)	(0.38)	(0.39)	(-1.39)	(-1.50)
MKP	2.900	-10.167	-0.591	11.241	20.485	2.538	1.777
	(0.21)	(-1.37)	(-0.45)	(0.60)	(1.01)	(1.49)	(1.11)
GDPR	-1.401***	-0.251	0.126**	1.219*	1.425*	0.356***	0.342***
	(-2.73)	(-1.06)	(2.58)	(1.77)	(1.89)	(5.63)	(5.74)
CAR	0.077	1.412***	0.218***	1.594*	1.261	0.353***	0.339***
	(0.12)	(4.13)	(3.49)	(1.80)	(1.31)	(4.36)	(4.46)
Adjusted R^2	71.30	91.92	85.51	41.33	44.94	53.46	48.82
F-statistic	16.95	50.06	39.31	5.54	6.26	8.39	7.14
Observation	322	208	323	323	323	323	323

This regression includes both country and year fixed effect. The explanatory variables are defined as follows: BCON = Bank concentration (%). OCT = Bank overhead costs to total assets (%). CAR = Bank regulatory capital to risk-weighted assets (%). MKP = Lerner index. GDPR = real GDP growth rate. NPL = nonperforming loan to gross loan. EPUA = EPU index, year average (12-month average EPU index values. T-statistics are reported in parenthesis. ***, **, * represent significance at 1%, 5% and 10% levels.

4.3. Regional effects: impact of EPU on profitability

In the literature, there is the argument that policy uncertainty is higher in some regions than in other regions due to regional politics, economic regulation and other regional differences. Consequently, EPU may have a dissimilar effect on financial institutions operating in different regions (see Colombo, 2013). In this section, we test the effect of EPU on bank profitability for countries in the European Union region, Asian region and the region of the Americas, to determine whether the impact of EPU on bank profitability is stronger or weaker in one region compared to other regions. The EU, AS and RAM binary variables were introduced into the model and then interacted with the two EPU variables (EPUD and EPUA). The EU binary variable equals one if the country is a member of the European Union and zero otherwise. The EU countries in our sample are: France, Germany, Greece, Ireland, Italy, Netherlands, Spain, Sweden and the UK. The AS binary variable equals one if the country is in the Asian region and zero otherwise. The Asian countries in our sample are China, India, Japan, Korea and Singapore. The RAM binary variable equals one if the country is in the region of the Americas and zero otherwise. The region of the Americas is a combination of North America and South America regions. The countries in the region of the Americas in our sample are Brazil, Canada, Chile, Colombia, Mexico and the United States.

The results are reported in table 6 and 7. The coefficients of the variables are considered to be significant and robust if the variables are both significant in table 6 and 7. The EU*EPUD coefficient is not significant in table 6 and 7. The AS*EPUD coefficient is significant and positively related to bank profitability (NIM and ROEBT) in table 6 and 7, which suggests that the Asian banking sector has high net interest margin and high before-tax return on equity in times of high EPU. This is possible because Asian banks increase the interest charged on loans to increase their profit levels in response to high EPU in the business environment. However, this occurrence can also be attributed to the unique structure of the Asian banking sector. Similarly, the RAM*EPUD coefficient is also significant and positively related to bank profitability (ROEAT and ROEBT) in table 6 and 7, which suggest that the banking sector of the region of the Americas experiences high before-tax (and after-tax) return on equity in times of high EPU. Overall, the results suggest that EPU does not have a depressive effect on bank profitability in the Asia and America regions. Rather, high EPU has a positive effect on bank profitability in Asia and the

region of America as these regions witnessed higher net interest margin and high return on equity in times of high EPU. These findings support our second hypothesis that regional characteristics have a significant influence on the relationship between EPU and bank profitability. The findings confirm the argument that regional characteristics can mitigate the depressive effect of economic policy uncertainty on the performance of financial institutions.

Table 6. Regional analysis - impact of EPUD on bank profitability

	NII	LDS	NIM	ROEAT	ROEBT	ROABT	ROAAT
Variable	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)
c	28.326***	-18.841***	0.916	14.364**	20.643**	0.480	0.185
	(4.86)	(-3.66)	(1.46)	(2.54)	(3.29)	(0.92)	(0.38)
EPUD	0.031	-0.007	-0.005**	-0.039*	-0.048**	-0.004**	-0.003*
	(1.43)	(-0.28)	(-2.06)	(-1.88)	(-2.09)	(-2.23)	(-1.77)
EU*EPUD	-0.0122	0.002	-0.0001	-0.038	-0.040	-0.001	-0.001
	(-0.43)	(0.05)	(-0.04)	(-1.40)	(-1.34)	(-0.41)	(-0.61)
AS*EPUD	-0.045	0.035	0.010**	0.065	0.074*	0.005	0.004
	(-1.07)	(0.89)	(2.31)	(1.61)	(1.65)	(1.36)	(1.04)
RAM*EPUD	-0.047-	0.016	0.001	0.059**	0.062*	0.003	0.003
	(-1.59)	(0.56)	(0.41)	(2.05)	(1.94)	(1.18)	(1.29)
EU	-3.292	0.089	-1.025**	3.295	3.153	0.001	0.218
	(-0.89)	(0.02)	(-2.59)	(0.92)	(0.79)	(0.34)	(0.71)
AS	-12.815***	-2.392	-2.107***	-13.293***	-14.115**	-1.351***	-1.055**
	(-2.46)	(-0.50)	(-3.76)	(-2.63)	(-2.52)	(-2.89)	(-2.42)
RAM	-0.783	4.999	1.282***	-8.054**	-7.252*	-0.525	-0.577*
	(-0.20)	(1.50)	(3.09)	(-2.16)	(-1.75)	(-1.52)	(-1.79)
NPL	0.567**	1.0794***	0.151***	-1.021***	-1.046***	-0.109***	-0.092***
	(2.45)	(4.79)	(6.06)	(-4.55)	(-4.21)	(-4.36)	(-4.78)
OCT	0.777***	-0.271**	0.037**	0.038	0.108	0.023	-0.001
	(5.73)	(-2.56)	(2.52)	(0.29)	(0.74)	(0.91)	(-0.08)
BCON	-0.008	-0.022	-0.015***	-0.094***	-0.113***	-0.017***	-0.016***
	(-0.22)	(-0.63)	(-3.71)	(-2.63)	(-2.87)	(-5.45)	(-5.12)
MKP	7.117	-12.465**	0.032	4.121	5.368	0.223	0.698
	(1.14)	(-2.01)	(0.05)	(0.68)	(0.80)	(0.44)	(1.34)
GDPR	-0.399	0.154	0.139***	1.475***	1.800***	0.171***	0.164***
	(-1.51)	(0.72)	(4.93)	(5.80)	(6.38)	(7.35)	(7.47)
CAR	0.809**	1.882***	0.180***	0.377	0.179	0.172***	0.123***
	(2.38)	(6.37)	(4.93)	(1.14)	(0.49)	(6.03)	(4.35)
Adjusted R^2	34.96	36.82	58.39	31.21	33.47	41.65	40.45
F-statistic	6.95	5.16	16.58	6.04	6.59	10.19	8.54
Observation	322	208	323	323	323	323	323

The regression in this table includes only year fixed effects. The explanatory variables are defined as follows: BCON = Bank concentration (%). OCT = Bank overhead costs to total assets (%). CAR = Bank regulatory capital to risk-weighted assets (%). MKP = Lerner index. GDPR = real GDP growth rate. NPL = nonperforming loan to gross loan. EPUD = EPU index, year-end (December) values. AS = a binary variable that equal 'one' if the country is in the Asian continent, and 'zero' otherwise. EU = a binary variable that equal 'one' if the country is a member of the European Union, and 'zero' otherwise. RAM = a binary variable that equal 'one' if the country is in the region of the Americas, and 'zero' otherwise. T-statistics are reported in parenthesis. ***, **, * represent significance at 1%, 5% and 10% levels.

Table 7. Regional analysis - impact of EPUA on bank profitability

	NII	LDS	NIM	ROEAT	ROEBT	ROABT	ROAAT
Variable	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)
c	27.645*** (4.48)	-19.404*** (-3.43)	0.916 (1.46)	16.065*** (2.65)	22.964*** (3.42)	0.614 (1.10)	0.232 (0.45)
EPUA	0.039 (1.37)	-0.003 (-0.09)	-0.005** (-2.06)	-0.049* (-1.76)	-0.063** (-2.06)	-0.005** (-1.95)	-0.003 (-1.30)
EU*EPUA	0.009 (0.23)	-0.022 (-0.37)	-0.0001 (-0.04)	-0.016 (-0.44)	-0.014 (-0.33)	0.001 (0.33)	0.0001 (0.04)
AS*EPUA	-0.047 (-0.91)	0.028 (0.59)	0.010** (2.31)	0.099** (1.98)	0.116** (2.09)	0.008* (1.69)	0.006 (1.29)
RAM*EPUA	-0.062 (-1.38)	0.034 (0.79)	0.001 (0.41)	0.081* (1.85)	0.090* (1.86)	0.002 (0.61)	0.002 (0.59)
EU	-5.488 (-1.22)	2.367 (0.40)	-1.025** (-2.59)	0.475 (0.11)	-0.249 (-0.05)	-0.144 (-0.36)	0.033 (0.09)
AS	-12.818** (-2.08)	-1.640 (-0.29)	-2.107*** (-3.76)	-17.209*** (-2.85)	-18.803*** (-2.81)	-1.670*** (-3.01)	-1.284** (-2.48)
RAM	0.464 (0.08)	3.069 (0.67)	1.282*** (3.09)	-10.203** (-2.01)	-10.042* (-1.79)	-0.443 (-0.95)	-0.465 (-1.07)
NPL	0.543** (2.32)	1.105*** (4.79)	0.151*** (6.06)	-1.003*** (-4.38)	-1.025*** (-4.04)	-0.089*** (-4.28)	-0.092*** (-4.69)
OCT	0.807*** (5.93)	-0.280*** (-2.66)	0.037** (2.52)	0.034 (0.25)	0.099 (0.68)	0.005 (0.44)	-0.001 (-0.07)
BCON	-0.008 (-0.19)	-0.021 (-0.58)	-0.015*** (-3.71)	-0.092** (-2.55)	-0.111*** (-2.78)	-0.019*** (-5.79)	-0.016*** (-5.07)
MKP	8.201 (1.29)	-13.166** (-2.07)	0.032 (0.05)	4.556 (0.73)	5.695 (0.83)	1.112* (1.94)	0.813 (1.52)
GDPR	-0.377 (-1.42)	0.169 (0.79)	0.139*** (4.93)	1.468*** (5.67)	1.787*** (6.22)	0.189*** (7.93)	0.163*** (7.35)
CAR	0.777** (2.28)	1.894*** (6.39)	0.180*** (4.93)	0.311 (0.93)	0.109 (0.29)	0.127*** (4.15)	0.117*** (4.09)
Adjusted R^2	35.14	37.05	58.39	29.79	32.19	43.87	39.59
F-statistic	6.99	5.20	16.58	5.71	6.27	9.68	8.28
Observation	322	208	323	323	323	323	323

The regression in this table includes only year fixed effects. The explanatory variables are defined as follows: BCON = Bank concentration (%). OCT = Bank overhead costs to total assets (%). CAR = Bank regulatory capital to risk-weighted assets (%). MKP = Lerner index. GDPR = real GDP growth rate. NPL = nonperforming loan to gross loan. EPUA = EPU index, year average (12-month average EPU index values). AS = a binary variable that equal 'one' if the country is in the Asian continent, and 'zero' otherwise. EU = a binary variable that equal 'one' if the country is a member of the European Union, and 'zero' otherwise. RAM = a binary variable that equal 'one' if the country is in the region of the Americas, and 'zero' otherwise. T-statistics are reported in parenthesis. ***, **, * represent significance at 1%, 5% and 10% levels.

4.4. Combined effect of banking crises and EPU on profitability

In the literature, there is the argument that policy uncertainty increases during a banking crisis (Bordo et al, 2016; Chi and Li, 2017). We test this argument to determine whether banking crises and economic policy uncertainty affect bank profitability. The results are reported in table 8 and 9. The coefficients of the variables are considered to be significant and robust if the variables are both significant in table 8 and 9. The CRISIS coefficient is negatively related to the profitability measures in table 8 and 9, and is positively related to LDS in table 8 and 9. The EPUD*CRISIS coefficient is significant and negatively related to ROEAT in table 8 but the result is not significant for the EPUA*CRISIS coefficient in table 9. Also, the EPUA*CRISIS coefficient is negatively related to LDS, NIM, ROABT and ROAAT in table 9 but the result is not consistent with the EPUD*CRISIS coefficient in table 8; therefore, the result is inconclusive. Despite the inconclusive result in table 8 and 9, the result shows that economic policy uncertainty and banking crises have a combined negative impact on non-interest income, lending-deposit spread and return on equity. However, the negative effects are not significant. In contrast, economic policy uncertainty and banking crises have a combined positive impact on net interest income and return on assets. However, the positive effects are not significant.

Table 8. Combined effect of banking crises and EPUD on profitability

	NII	LDS	NIM	ROEAT	ROEBT	ROABT	ROAAT
Variable	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)
c	36.019***	-1.359	1.574***	7.895	11.111	0.242	0.189
	(7.02)	(-0.51)	(3.26)	(1.21)	(1.56)	(0.39)	(0.32)
EPUD*CRISIS	-0.011	-0.039	0.003	-0.071*	-0.064	0.006	0.005
	(-0.38)	(-0.96)	(1.26)	(-1.90)	(-1.57)	(1.55)	(1.41)
EPUD	-0.022*	-0.003	0.001	-0.007	-0.009	-0.002	-0.001
	(-1.87)	(-0.47)	(1.25)	(-0.51)	(-0.57)	(-1.18)	(-0.89)
CRISIS	-2.920	3.851	-0.494	-3.199	-6.244	-1.639***	-1.439***
	(-0.66)	(0.76)	(-1.19)	(-0.57)	(-1.03)	(-3.09)	(-2.85)
NPL	0.937***	0.676***	-0.014	-1.614***	-1.771***	-0.145***	-0.129***
	(4.14)	(4.59)	(-0.65)	(-5.59)	(-5.67)	(-5.30)	(-4.96)
OCT	0.577***	-0.098**	-0.002	0.038	0.069	-0.002	0.001
	(5.43)	(-2.25)	(-0.18)	(0.27)	(0.47)	(-0.16)	(0.08)
BCON	0.079*	-0.035	-0.016***	-0.002	-0.006	-0.019***	-0.019***
	(1.65)	(-1.56)	(-3.51)	(-0.04)	(-0.09)	(-3.38)	(-3.45)
MKP	-9.829	5.354*	0.829	19.717**	27.477***	2.606***	2.005***
	(-1.49)	(1.71)	(1.33)	(2.35)	(3.02)	(3.27)	(2.65)
GDPR	-0.369	-0.176	0.018	0.283	0.248	0.107***	0.111***
	(-1.33)	(-1.35)	(0.73)	(0.82)	(0.67)	(3.27)	(3.58)
CAR	0.026	0.613***	0.134***	0.318	0.261	0.132***	0.115***
	(0.08)	(3.94)	(4.58)	(0.81)	(0.61)	(3.52)	(3.24)
Adjusted R^2	70.33	91.34	85.37	45.60	49.74	53.58	48.32
F-statistic	17.54	50.64	41.85	6.86	7.93	9.08	7.54
Observation	322	208	323	323	323	323	323

The regression in this table includes only year fixed effects. The explanatory variables are defined as follows: BCON = Bank concentration (%). OCT = Bank overhead costs to total assets (%). CAR = Bank regulatory capital to risk-weighted assets (%). MKP = Lerner index. GDPR = real GDP growth rate. NPL = nonperforming loan to gross loan. EPUD = EPU index, year-end (December) values. CRISIS = Banking crisis dummy (1=banking crisis, 0=none). T-statistics are reported in parenthesis. ***, **, * represent significance at 1%, 5% and 10% levels.

Table 9. Combined effect of banking crises and EPUA on profitability

	NII	LDS	NIM	ROEAT	ROEBT	ROABT	ROAAT
Variable	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)
c	37.119***	-0.639	1.421***	9.067	12.625*	0.267	0.185
	(7.15)	(-0.23)	(2.90)	(1.34)	(1.74)	(0.42)	(0.31)
EPUA*CRISIS	-0.058	-0.069**	0.006*	-0.030	-0.014	0.013***	0.012***
	(-1.53)	(-2.15)	(1.83)	(-0.62)	(-0.26)	(2.75)	(2.69)
EPUA	-0.034**	-0.003	0.003*	-0.010	-0.015	-0.002	-0.001
	(-2.09)	(-0.35)	(1.72)	(-0.48)	(-0.68)	(-1.12)	(-0.75)
CRISIS	-2.739	6.762*	-0.829*	-8.954	-13.057*	-2.454***	-2.236***
	(-0.54)	(1.79)	(-1.74)	(-1.37)	(-1.85)	(-4.01)	(-3.85)
NPL	0.979***	0.644***	-0.016	-1.654***	-1.810***	-0.146***	-0.130***
	(4.37)	(4.42)	(-0.75)	(-5.71)	(-5.78)	(-5.38)	(-5.07)
OCT	0.577***	-0.101**	0.0002	0.036	0.068	-0.001	0.003
	(5.43)	(-2.34)	(0.02)	(0.26)	(0.46)	(-0.05)	(0.21)
BCON	0.073*	-0.039*	-0.015***	-0.004	-0.008	-0.019***	-0.019***
	(1.65)	(-1.75)	(-3.42)	(-0.07)	(-0.11)	(-3.34)	(-3.40)
MKP	-10.942*	4.795	0.929	20.338**	27.921***	2.653***	2.072***
	(-1.67)	(1.54)	(1.50)	(2.39)	(3.04)	(3.34)	(2.75)
GDPR	-0.327	-0.138	0.018	0.216	0.166	0.099***	0.104***
	(-1.19)	(-1.08)	(0.70)	(0.62)	(0.44)	(3.06)	(3.37)
CAR	0.066	0.596***	0.131***	0.274	0.225	0.132***	0.116***
	(0.21)	(3.81)	(4.54)	(0.69)	(0.52)	(3.58)	(3.28)
Adjusted R^2	70.88	91.58	85.62	44.88	49.25	54.32	49.20
F-statistic	17.98	52.15	42.68	6.70	7.79	9.32	7.78
Observation	322	208	323	323	323	323	323

The regression in this table includes only year fixed effects. The explanatory variables are defined as follows: BCON = Bank concentration (%). OCT = Bank overhead costs to total assets (%). CAR = Bank regulatory capital to risk-weighted assets (%). MKP = Lerner index. GDPR = real GDP growth rate. NPL = nonperforming loan to gross loan. EPUA = EPU index, year average (12-month average EPU index values). CRISIS = Banking crisis dummy (1=banking crisis, 0=none). T-statistics are reported in parenthesis. ***, **, * represent significance at 1%, 5% and 10% levels.

4.5. Robustness checks

Finally, we performed a robustness test using the Arellano Bond Generalized Method of Moments (GMM) regression method. This test allows us to control for potential endogeneity as there might be reverse effects of banking performance on economic policy uncertainty. We re-estimate only the significant results using the GMM regression method, to determine whether the results remain significant or robust. Table 10 shows that EPUA and EPUD are inversely related to non-interest income (NII), which indicates that the result is robust and confirms the earlier results in table 2 and 3. Table 10 also shows that the AS*EPUD, AS*EPUA, RAM*EPUD and RAM*EPUA coefficients are positively related to ROEBT, which indicates that the result is robust and confirms the earlier results in table 6 and 7. Taken together, the GMM results confirm that EPU reduces the non-interest income of banks, and increases the return on equity of banks in Asia and the region of the Americas.

Table 10. Robustness test: Arellano-Bond GMM regression results

	NII	NII	ROEBT	ROEBT	ROEBT	ROEBT
Variable	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)
NII(lag)	0.398 (6.91)	0.392 (6.24)				
ROEBT(lag)			0.506*** (8.05)	0.512*** (15.46)	0.465*** (7.48)	0.485*** (8.53)
EPUD	-0.031*** (-2.51)			-0.003 (-0.13)	-0.018 (-0.63)	
EPUA		-0.022* (-1.79)	-0.001 (-0.02)			-0.002 (-0.03)
AS*EPUD				0.123*** (2.68)		
AS*EPUA			0.121** (2.30)			
RAM*EPUD					0.035 (0.41)	
RAM*EPUA						0.081* (1.73)
NPL	0.028 (0.09)	0.559** (2.16)	-0.161 (-0.34)	-0.377 (-0.46)	-1.081 (-0.96)	-1.544** (-2.13)
OCT	1.349* (1.85)	0.363*** (3.94)	-0.275 (-0.21)	-1.252 (-0.94)	-1.225 (-0.42)	0.466 (0.26)
BCON	0.054** (2.19)	0.008 (0.11)	0.219*** (3.07)	0.251** (2.25)	0.232 (1.54)	0.279*** (3.09)
MKP	-25.613* (-1.82)	-10.348 (-1.27)	86.047*** (3.82)	81.726*** (3.32)	72.057 (1.40)	64.893*** (3.53)
GDPR	0.035 (0.29)	0.113 (0.63)	0.783 (1.16)	0.598 (0.87)	0.423 (0.49)	0.626 (0.96)
CAR	-0.458 (-1.26)	-0.076 (-0.24)	-1.630**** (-1.98)	-2.013*** (-2.86)	-1.642** (-2.29)	-1.288*** (-2.14)

J-statistic	12.86	139.82	15.26	14.79	15.63	14.22
Prob (J-Statistic)	0.54	0.09	0.292	0.320	0.27	0.35
AR(1)	0.07	0.001	0.08	0.027	0.013	0.002
AR(2)	0.14	0.014	0.192	0.216	0.045	0.232

The GMM instruments are the lagged dependent variable and lagged independent variables. T-statistics are reported in parenthesis. ***, **, * represent significance at 1%, 5% and 10% levels.

5. Conclusion

This study examined the impact of economic policy uncertainty on bank profitability. The findings revealed that high economic policy uncertainty negatively affects bank non-interest income. Overhead costs are positively related to non-interest income in times of high EPU. Non-performing loans are inversely related to return on equity in times of high EPU. The regulatory capital ratio is inversely related to the lending-to-deposit spread and return on asset in times of high EPU. The findings also revealed that high EPU has a positive effect on the profitability of the banking sector in Asia and the region of America as these regions witnessed higher return on equity in times of high EPU. The findings are insightful and they present a breakthrough in the debate on how to mitigate the depressive effect of EPU on bank profitability.

Regarding the finding that high EPU decreases bank non-interest income, the economic implication is that banks will lose a segment of their market during times of high economic policy uncertainty. This is because economic agents and bank customers anticipate the increase in bank fees during times of high EPU. They respond to high EPU by avoiding bank fees or reducing the number of fee-based transactions they do with banks during times of high EPU. This suggests that high EPU not only affects banks through a reduction in non-interest income, it also affects bank customers and economic agents that banks rely on to generate higher non-interest income.

Regarding the finding that high EPU increases bank return on equity in Asia and the Americas, the economic implication of the findings is that, although high economic policy uncertainty has a depressive effect on some indicators of bank profitability, the depressive effect is mitigated by regional characteristics. In other words, some regions, such as Asia and the Americas, have unique characteristics such as a unique banking structure or favorable regulatory policies that ensure that the banking sector generates higher profit for shareholders during times of high economic policy uncertainty. It signals the presence of a regional banking structure or regulation framework that

preserves the wealth of bank shareholders even during times of high EPU. The preservation of shareholders' wealth is crucial for banks' survival and stability. Even though high EPU will negatively affect some profitability indicators, banks in the Asian and the Americas regions will have incentives to take actions to minimize the effect of EPU on their return on equity in order to satisfy their shareholders and maximize their executive compensation.

Therefore, policy makers and regulators should implement market-enabling regulatory policies in the banking sector, and introduce a banking structure that can mitigate the depressive effect of economic policy uncertainty on banking sector profitability as this is essential to promote banking stability in times of high EPU. More importantly, bank regulators and supervisors should pay closer attention to the EPU-profitability relationship so that they can identify the bank profitability indicators that are most affected by changes in EPU. This is important because it can help bank regulators and supervisors to know the regulations that need to be introduced, or discontinued, to improve bank profitability in time of rising EPU.

A limitation of the study is that the study did not examine how bank profitability is affected by the four components of the economic policy uncertainty index proposed by the Baker, Bloom and Davis (2016). This limitation is due to the non-availability of data on the EPU index components for all the countries in the sample, and the data is only available for the United states.

Future research can explore how bank profitability is affected by the four components of the economic policy uncertainty index proposed by Baker, Bloom and Davis (2016). Future research can also investigate whether strong regulation in times of high economic policy uncertainty has a positive or negative effect on bank profitability. Finally, the analysis in this paper can be extended by investigating whether institutional quality dampens the depressive effect of EPU on banking sector profitability.

Reference

Aastveit, K. A., Natvik, G. J., & Sola, S. (2017). Economic uncertainty and the influence of monetary policy. *Journal of International Money and Finance*, 76, 50-67.

Aizenman, J., & Marion, N. P. (1993). Policy uncertainty, persistence and growth. *Review of International Economics*, 1(2), 145-163.

Albertazzi, U., & Gambacorta, L. (2010). Bank profitability and taxation. *Journal of Banking & Finance*, 34(11), 2801-2810.

Alvarez, L. H., Kanniainen, V., & Södersten, J. (1998). Tax policy uncertainty and corporate investment: A theory of tax-induced investment spurts. *Journal of Public Economics*, 69(1), 17-48.

Altavilla, C., Boucinha, M., & Peydró, J. L. (2018). Monetary policy and bank profitability in a low interest rate environment. *Economic Policy*, 33(96), 531-586.

Ashraf, B. N., & Shen, Y. (2019). Economic policy uncertainty and banks' loan pricing. *Journal of Financial Stability*, 44, 100695.

Athari, S. A. (2021). Domestic political risk, global economic policy uncertainty, and banks' profitability: evidence from Ukrainian banks. *Post-Communist Economies*, 33(4), 458-483.

Baker, S. R., Bloom, N., & Davis, S. J. (2016). Measuring economic policy uncertainty. *The Quarterly Journal of Economics*, 131(4), 1593-1636,

Batten, J., & Vo, X. V. (2019). Determinants of bank profitability - evidence from Vietnam. *Emerging Markets Finance and Trade*, 55(6), 1417-1428.

Bernanke, B. S., (1983). Irreversibility, Uncertainty, and Cyclical Investment. *The Quarterly Journal of Economics*, 98 (1), 85–106.

Bikker, J. A., & Vervliet, T. M. (2018). Bank profitability and risk-taking under low interest rates. *International Journal of Finance & Economics*, 23(1), 3-18.

Biswas, S., & Zhai, W. (2021). Economic policy uncertainty and cross-border lending. *Journal of Corporate Finance*, 67, 101867.

Bloom, N., Bond, S., & Van Reenen, J. (2007). Uncertainty and investment dynamics. *The Review of Economic Studies*, 74(2), 391-415.

Bolt, W., De Haan, L., Hoeberichts, M., Van Oordt, M. R., & Swank, J. (2012). Bank profitability during recessions. *Journal of Banking & Finance*, 36(9), 2552-2564.

Bonaccorsi di Patti, E., & Palazzo, F. (2020). Bank profitability and macroeconomic conditions: Are business models different? *Economic Notes*, 49(2), e12155.

Bordo, M. D., Duca, J. V., & Koch, C. (2016). Economic policy uncertainty and the credit channel: Aggregate and bank level US evidence over several decades. *Journal of Financial Stability*, 26, 90-106.

Borio, C., Gambacorta, L., & Hofmann, B. (2017). The influence of monetary policy on bank profitability. *International Finance*, 20(1), 48-63.

Boungou, W., & Mawusi, C. (2022). The impact of economic policy uncertainty on banks' non-interest income activities. *International Economics*, 169, 89-97.

Brewer III, E., Deshmukh, S., & Opiela, T. P. (2014). Interest-rate uncertainty, derivatives usage, and loan growth in bank holding companies. *Journal of Financial Stability*, 15, 230-240.

Buch, C. M., Koch, C. T., & Koetter, M. (2013). Do banks benefit from internationalization? Revisiting the market power–risk nexus. *Review of Finance*, 17(4), 1401-1435.

Caglayan, M., & Xu, B. (2019). Economic policy uncertainty effects on credit and stability of financial institutions. *Bulletin of Economic Research*, 71(3), 342-347.

Chi, Q., & Li, W. (2017). Economic policy uncertainty, credit risks and banks' lending decisions: Evidence from Chinese commercial banks. *China Journal of Accounting Research*, 10(1), 33-50.

Colombo, V. (2013). Economic policy uncertainty in the US: Does it matter for the Euro area? *Economics Letters*, 121(1), 39-42.

Danisman, G. O., Demir, E., & Ozili, P. (2021). Loan loss provisioning of US banks: Economic policy uncertainty and discretionary behavior. *International Review of Economics & Finance*, 71, 923-935.

Demir, E., & Danisman, G. O. (2021). The impact of economic uncertainty and geopolitical risks on bank credit. *The North American Journal of Economics and Finance*, 57, 101444.

Dietrich, A., & Wanzenried, G. (2011). Determinants of bank profitability before and during the crisis: Evidence from Switzerland. *Journal of International Financial Markets, Institutions and Money*, 21(3), 307-327.

Dixit, A. K., Dixit, R. K., & Pindyck, R. S. (1994). Investment under uncertainty. Princeton University Press. New Jersey.

El-Shazly, A. (2009). Investment under tax policy uncertainty: A neoclassical approach. *Public Finance Review*, 37(6), 732-749.

Fontaine, I., Razafindravaosolonirina, J., & Didier, L. (2018). Chinese policy uncertainty shocks and the world macroeconomy: Evidence from STVAR. *China Economic Review,* 51, 1-19.

Gissler, S., Oldfather, J., & Ruffino, D. (2016). Lending on hold: regulatory uncertainty and bank lending standards. *Journal of Monetary Economics*. 81, 89-101.

Handley, K., & Limão, N. (2017). Policy uncertainty, trade, and welfare: Theory and evidence for China and the United States. *American Economic Review*, 107(9), 2731-83.

Handley, K., & Limao, N. (2015). Trade and investment under policy uncertainty: theory and firm evidence. *American Economic Journal: Economic Policy*, *7*(4), 189-222.

Hellwig, T. (2007). Economic openness, policy uncertainty, and the dynamics of government support. *Electoral Studies*, 26(4), 772-786.

Hlatshwayo, S. (2017). New Perspectives on Policy Uncertainty (Doctoral dissertation, UC Berkeley).

IMF. (2010). Getting the Balance Right: Transitioning out of Sustained Current Account Surpluses. In *World Economic Outlook*. Washington, DC: *International Monetary Fund.*

Jordà, Ò., & Salyer, K. D. (2003). The response of term rates to monetary policy uncertainty. *Review of Economic Dynamics*, 6(4), 941-962.

Kang, W., Lee, K., & Ratti, R. A. (2014). Economic policy uncertainty and firm-level investment. *Journal of Macroeconomics*, 39, 42-53.

Khan, M. A., Siddique, A., & Sarwar, Z. (2020). Determinants of non-performing loans in the banking sector in developing state. *Asian Journal of Accounting Research*, 5(1), 135-145.

Kim, H., & Yasuda, Y. (2021). Economic policy uncertainty and earnings management: evidence from Japan. *Journal of Financial Stability*, 56, 100925.

Lopez, J. A., Rose, A. K., & Spiegel, M. M. (2020). Why have negative nominal interest rates had such a small effect on bank performance? Cross country evidence. *European Economic Review*, 124, 103402.

Maudos, J., & De Guevara, J. F. (2007). The cost of market power in banking: Social welfare loss vs. cost inefficiency. *Journal of Banking & Finance*, 31(7), 2103-2125.

McGinnis, M. D., & Williams, J. T. (1993). Policy uncertainty in two-level games: Examples of correlated equilibria. *International Studies Quarterly*, 37(1), 29-54.

Mirzaei, A., Moore, T., & Liu, G. (2013). Does market structure matter on banks' profitability and stability? Emerging vs. advanced economies. *Journal of Banking & Finance*, 37(8), 2920-2937.

Olson, D., & Zoubi, T. A. (2011). Efficiency and bank profitability in MENA countries. *Emerging Markets Review*, 12(2), 94-110.

Orden-Cruz, C., Paule-Vianez, J., & Lobão, J. (2022). The effect of Economic Policy Uncertainty on the credit risk of US commercial banks. *International Journal of Finance & Economics*.

Ozili, P. K. (2017). Bank profitability and capital regulation: Evidence from listed and non-listed banks in Africa. *Journal of African Business*, 18(2), 143-168.

Ozili, P. K., & Uadiale, O. (2017). Ownership concentration and bank profitability. *Future Business Journal*, 3(2), 159-171.

Ozili, P. K. (2021a). Economic policy uncertainty in banking: a literature review. *Handbook of Research on Financial Management during Economic Downturn and Recovery*, 275-290. IGI Global, Pennsylvania.

Ozili, P. K. (2021b). Economic policy uncertainty: are there regional and country correlations? *International Review of Applied Economics*, 35(5), 714-728.

Ozili, P. K. (2022). Economic policy uncertainty, bank nonperforming loans and loan loss provisions: are they correlated? *Asian Journal of Economics and Banking*, 6(2), 221-235.

Phan, D. H. B., Iyke, B. N., Sharma, S. S., & Affandi, Y. (2021). Economic policy uncertainty and financial stability–Is there a relation? *Economic Modelling*, 94, 1018-1029.

Rodrik, Dani. (1991). Policy Uncertainty and Private Investment in Developing Countries. *Journal of Development Economics*, 36(2), 229-242.

Ryoo, S. (2013). Bank profitability, leverage and financial instability: a Minsky–Harrod model. *Cambridge Journal of Economics*, 37(5), 1127-1160.

Saona, P. (2016). Intra-and extra-bank determinants of Latin American Banks' profitability. *International Review of Economics & Finance*, 45, 197-214.

Tan, Y., & Floros, C. (2012). Bank profitability and inflation: the case of China. *Journal of Economic Studies*, 39(6), 675-696.

Tran, D. V., & Houston, R. (2021). The effects of policy uncertainty on bank loan loss provisions. *Economic Modelling*, 102, 105575.

Wang, C. W., Lee, C. C., & Chen, M. C. (2022). The effects of economic policy uncertainty and country governance on banks' liquidity creation: International evidence. *Pacific-Basin Finance Journal*, 71, 101708.

Appendix

Table 11. Information about variable definition and source

Variable	Description	Source
EPUA	EPU index, year average (12-month average EPU index values)	https://www.policyuncertainty.com/
EPUD	EPU index, end-of-year December values	https://www.policyuncertainty.com/
NII	Bank noninterest income to total income (%)	Global financial development indicator, World Bank.
LDS	Bank lending-deposit spread (i.e. difference between interest charged on loans and interest paid on deposits)	Global financial development indicator, World Bank.
NIM	Bank net interest margin (%)	Global financial development indicator, World Bank.
ROAAT	Bank return on assets (%, after tax)	Global financial development indicator, World Bank.
ROABT	Bank return on assets (%, before tax)	Global financial development indicator, World Bank.
ROEAT	Bank return on equity (%, after tax)	Global financial development indicator, World Bank.
ROEBT	Bank return on equity (%, before tax)	Global financial development indicator, World Bank.
OCT	Bank overhead costs to total assets (%).	Global financial development indicator, World Bank.
BCON	Bank concentration (%).	Global financial development indicator, World Bank.
CAR	Bank regulatory capital to risk-weighted assets (%).	Global financial development indicator, World Bank.
CRISIS	Banking crisis dummy (1=banking crisis, 0=none).	Global financial development indicator, World Bank.
MKP	Lerner index. GDPR = real GDP growth rate.	Global financial development indicator, World Bank.
NPL	Nonperforming loan to gross loan.	Global financial development indicator, World Bank.
GDPR	Real gross domestic product growth rate	World Economic Forum

Table 12. **Hausman test with the EPUA variable**

Correlated Random Effects - Hausman Test
Equation: Untitled
Test period random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	15.066160	7	**0.0352**

** WARNING: estimated period random effects variance is zero.

Period random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
EPUA	0.010174	-0.019570	0.000174	0.0240
NPL	0.385997	0.432768	0.005420	0.5252
OCTA	0.895231	0.854999	0.000642	0.1124
BCON	0.059174	0.060265	0.000028	0.8354
MKP	-13.754424	-18.563281	3.491601	0.0101
GDPR	-0.803895	-0.478006	0.018564	0.0168
CAR	1.550955	1.277343	0.011202	0.0097

Period random effects test equation:
Dependent Variable: NII
Method: Panel Least Squares
Date: 06/22/22 Time: 03:36
Sample (adjusted): 1998 2014
Periods included: 17
Cross-sections included: 22
Total panel (unbalanced) observations: 322

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	16.31245	5.665364	2.879330	0.0043
EPUA	0.010174	0.022315	0.455949	0.6488
NPL	0.385997	0.232234	1.662100	0.0975
OCTA	0.895231	0.141385	6.331875	0.0000
BCON	0.059174	0.035924	1.647173	0.1006
MKP	-13.75442	5.664873	-2.428020	0.0158
GDPR	-0.803895	0.267749	-3.002425	0.0029
CAR	1.550955	0.331031	4.685227	0.0000

Effects Specification

Period fixed (dummy variables)

R-squared	0.306966	Mean dependent var	39.81213
Adjusted R-squared	0.253477	S.D. dependent var	14.42828
S.E. of regression	12.46626	Akaike info criterion	7.955539
Sum squared resid	46311.49	Schwarz criterion	8.236872
Log likelihood	-1256.842	Hannan-Quinn criter.	8.067856
F-statistic	5.738837	Durbin-Watson stat	0.483121
Prob(F-statistic)	0.000000		

Table 13. Hausman test with the EPUD variable

Correlated Random Effects - Hausman Test
Equation: Untitled
Test period random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	14.745099	7	**0.0394**

Period random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
EPUD	0.004159	-0.015269	0.000096	0.0468
NPL	0.387810	0.420755	0.005281	0.6503
OCTA	0.890125	0.860322	0.000588	0.2190
BCON	0.058324	0.059714	0.000021	0.7627
MKP	-13.902064	-18.687782	3.406134	0.0095
GDPR	-0.813895	-0.456025	0.020094	0.0116
CAR	1.557322	1.273472	0.012411	0.0108

Period random effects test equation:
Dependent Variable: NII
Method: Panel Least Squares
Date: 06/22/22 Time: 03:41
Sample (adjusted): 1998 2014
Periods included: 17
Cross-sections included: 22
Total panel (unbalanced) observations: 322

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	16.98817	5.395980	3.148301	0.0018
EPUD	0.004159	0.016280	0.255470	0.7985
NPL	0.387810	0.232270	1.669654	0.0960
OCTA	0.890125	0.140779	6.322840	0.0000
BCON	0.058324	0.035866	1.626185	0.1050
MKP	-13.90206	5.662060	-2.455301	0.0146
GDPR	-0.813895	0.266538	-3.053585	0.0025
CAR	1.557322	0.331075	4.703836	0.0000

Effects Specification

Period fixed (dummy variables)

R-squared	0.306634	Mean dependent var	39.81213
Adjusted R-squared	0.253119	S.D. dependent var	14.42828
S.E. of regression	12.46924	Akaike info criterion	7.956018
Sum squared resid	46333.65	Schwarz criterion	8.237351
Log likelihood	-1256.919	Hannan-Quinn criter.	8.068335
F-statistic	5.729895	Durbin-Watson stat	0.481766
Prob(F-statistic)	0.000000		