Does economic policy uncertainty reduce financial inclusion?

Ozili, Peterson K

Central Bank of Nigeria

2022

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Peterson K. Ozili

Abstract

This paper examines whether economic policy uncertainty (EPU) reduces the level of financial inclusion. I predict that high EPU should have a negative effect on the level of financial inclusion. I argue that high EPU will discourage financial institutions from providing basic financial services to low end customers and unbanked adults, and this will lead to a decrease in the level of financial inclusion. Using a sample of 22 countries, I find that EPU does not have a significant impact on financial inclusion. None of the nine indicators of financial inclusion have a significant direct relationship with EPU. Also, I find some evidence that the combined effect of high EPU and high nonperforming loans reduces financial inclusion, particularly through bank branch contraction and a reduction in the use of electronic payments. Meanwhile, the use of formal accounts and credit cards increases in times of high credit supply and high EPU.

Keywords: Financial inclusion, policy uncertainty, economic policy uncertainty, business cycle, non-performing loan, cost efficiency, cost to income ratio, access to finance, formal account, credit cards, debit cards, mobile payments, electronic payment, borrowings, savings bank branch, unbanked adults.

JEL code: D14, D18, G21, G28.

January, 2022.

To cite: Ozili, P.K. (2022). International Journal of Banking and Finance, 17(1), 53 – 80.

1. Introduction

In recent years, economic policy uncertainty has become the focus of economic policy debates. Such debates are mostly focused on how policy uncertainty affects economic agents in the real and financial sectors. Economic policy uncertainty (EPU) is uncertainty about changes in fiscal, monetary and regulatory policies of the government (Baker et al, 2016). EPU may arise from whether there will be unexpected changes in existing government policies (Ashraf and Shen, 2019; Ng et al 2020). The recent literature documents that EPU affects corporate decisions, financial institutions and the real economy (e.g., Caglayan and Xu, 2019; Lee et al, 2017; Gulen and Ion, 2016). But the literature has not examined how EPU might affect access to finance or financial inclusion. This paper extends the literature by examining whether EPU reduces or improves the level of financial inclusion.

In the financial inclusion literature, financial inclusion is broadly defined as the provision of affordable formal financial services to households, individuals and small businesses (Ozili, 2018; Zins and Weill, 2016; Ozili, 2020b). The goal of financial inclusion is to reduce the number of unbanked adults, and it is mostly achieved by expanding financial services to unbanked adults in remote areas (Collard, 2007; Demirgüç-Kunt and Klapper, 2013; Neuberger, 2015; Ozili, 2020a). The international development community considers financial inclusion to be the most significant way to expand financial services in developed and emerging economies (Neuberger, 2015; Ozili, 2020a).

This study focuses on financial inclusion in developed and emerging countries for two reasons. One, individuals or households in developed and emerging countries are not immune to financial exclusion. The rising cost of basic financial services, low income, personal bankruptcy and the desire for financial privacy can lead to financial exclusion. Secondly, financial inclusion is a major component of the social inclusion programs in most developed and emerging countries. For instance, many social inclusion programs, such as having access to social welfare, community participation, infrastructure, housing, employment or education, are dependent on owning a formal account which individuals can use to receive welfare benefits or to make payment for services.

Understanding how financial inclusion is affected by EPU is important because individuals and households rely on financial institutions for the supply of basic financial services, and these financial institutions may be severely affected by high EPU which may affect their willingness to reach the unbanked adults and to serve existing low end customers in times of high EPU. In other words, uncertain economic policies can affect the level of financial inclusion through its effect on the financial sector. Recent studies document that high EPU negatively affects the financial sector. Such studies show that financial institutions will increase interest rates, re-price loans, reduce credit supply, and have liquidity shortages in times of high EPU (see, Bordo et al., 2016; Yung et al., 2019; García-Kuhnert et al, 2015). These effects may affect a financial institution's incentive to supply basic financial services to low-end customers and households in times of high EPU.

Financial institutions can increase the interest rate on loans and credit cards, and charge high fees for basic services such as ATM card maintenance fees and other fees, in response to high EPU in the business environment. Basic financial services will become costly and will severely affect low-income individuals and households, which can make them exit the formal financial sector, thereby reducing financial inclusion. More importantly, high EPU in the business environment can generate difficult business conditions for financial institutions such as fewer demand for loans, higher nonperforming loans and liquidity shortage. Due to these difficulties, financial institutions will have incentives to provide better financial services to high-end customers who can pay a premium for financial services and reduce the provision of financial services to low-end customers while ignoring its poorer customers who cannot afford to pay a premium for basic financial services induced by high EPU in the business environment. Therefore, financial inclusion is likely to be lower during periods of high EPU.

I predict that, if financial institutions perceive the high EPU in the business environment and take into account its expected depressive effects in the provision of basic financial services, financial institutions will reduce the supply of basic financial services, in which case, the level of financial inclusion should be negatively associated with EPU. On the other hand, if financial institutions do not take into account the expected depressive effects of EPU in the provision of basic financial services, then the level of financial inclusion should be positively associated with EPU. Using data for 22 countries from 2011 to 2017, the findings reveal that EPU has an insignificant effect on financial inclusion. None of the nine indicators of financial inclusion have a significant direct relationship with EPU. Also, the combined effect of high EPU and high nonperforming loans leads to bank branch contraction and a reduction in the use of electronic payments. Meanwhile, the use of formal accounts and credit cards increases in times of high credit supply and high EPU.

This study contributes to the literature in three ways. Firstly, the study contributes to the EPU literature that explore the effects of EPU (Gulen and Ion, 2016; Karadima and Louri, 2020; Ozili, 2021a). This study extends to the EPU literature by focusing on how EPU affects the level of financial inclusion. I show that high EPU has some depressive effects for financial inclusion. Secondly, this study contributes to the financial inclusion literature (see, Mindra et al, 2017; Ozili, 2020a; Zins and Weill, 2016; Ozili, 2020b). I show that EPU is a potential determinant of the level of financial inclusion. This paper is the first in the literature to identify EPU to be a determinant of the level of financial inclusion. Finally, this study contributes to the literature that examine the effect of financial inclusion on financial institutions (see, Demetriades and Hook Law, 2006; King and Levine, 1993; Rioja and Valev, 2004; Ozili, 2021c). This paper contributes to this literature by arguing that EPU has implications for financial inclusion through its effect on banks, and the findings support this argument.

The rest of the paper is structured in the following way. Section 2 reviews the literature and develops the hypothesis. Section 3 presents the data and methodology. Section 4 presents the results. Section 5 concludes.

2. Literature review and hypothesis development

2.1. Determinants and consequences of financial inclusion

The literature documents some determinants and consequences of financial inclusion. For example, López and Winkler (2019) examine whether financial inclusion mitigates credit downturns and upturns. They find that higher levels of financial inclusion lead to a decrease in credit growth. Chen and Jin (2017) analyze data from the 2011 China Household Financial Survey, and observe that over half of the sample (53.21%) reported using credit, and only 19.77% of the sample used formal credit. They also observe that the use of formal credit was associated with being employed, educated, having high income, and having a high net-worth.

Evans and Alenoghena (2017) test whether GDP per capita translates to higher financial inclusion. They examine 15 African countries from 2005 to 2014. They find that GDP per capita has a positive relationship with financial inclusion but the relationship is not significant. Omar and Inaba (2020) investigate the impact of financial inclusion on poverty reduction. They use GDP per capita to measure poverty. They find that per capita real GDP has a positive influence on the level of financial inclusion in developing countries. Ozili (2020b) investigates financial inclusion along the business cycle. The study use GDP growth rate to measure the state of the business cycle. The study document evidence of increased formal savings and active formal account ownership in periods of economic prosperity, and a decrease in formal savings and active formal account ownership in recessionary periods.

Vo et al (2019) investigate the linkages between financial inclusion and macroeconomic stability for 22 emerging and frontier economies from 2008 to 2015. They find a negative relationship between the size of NPL and the number of bank branches. Similarly, Machdar (2020) analyze the effect of financial inclusion on the financial stability of banks in Indonesia, and find a negative relationship between financial inclusion and NPL. Morgan and Pontines (2018) examine the relationship between financial stability and financial inclusion. They find that increased lending to small and medium-sized enterprises (SMEs) reduces NPLs and lowers the probability of default by financial institutions. Ozili (2021b) show that greater levels of financial inclusion improve the cost efficiency of the financial sector in developing countries. Markose et al (2020) examine the economic viability of financial inclusion programs in India, and show that higher financial inclusion programs, under the PMJDY scheme, leads to cost inefficiency among public sector banks.

2.2. EPU and financial institutions

A body of literature examine the effects of economic policy uncertainty (EPU) on financial firms, and their response to policy uncertainty. Nguyen et al (2020) examine the impact of EPU on aggregate bank credit growth at domestic and global levels. They examine 22 countries from 2001 to 2015 using different measures of EPU, and document evidence that high EPU leads to low credit growth, and the negative impact is stronger in emerging economies than in advanced economies. Ashraf and Shen (2019) examine the effect of government economic policy uncertainty on banks' loan pricing from 17 countries from 1998 to 2012. They find that banks reprice loans by charging higher interests in times of high EPU. The implication of their findings is that EPU is an economically important risk factor that banks take into account when making loan pricing decisions. Bordo et al (2016) examine the impact of EPU on bank credit growth for a 50-year period from 1961 Q4 to 2014 Q3. They find that policy uncertainty has a significant negative effect on bank credit growth through its effect on loan supply. Hu and Gong (2019) empirically tests the association between bank lending and EPU. They find that high EPU reduces credit growth, and the negative effect is greater for larger-sized banks and riskier banks. Luo and Zhang (2020) examine the impact of EPU on firm-specific crash risk among Chinese listed firms. They find that high EPU increases the likelihood of firms experiencing stock price crash. Karadima and Louri (2020) investigate the effect of EPU on nonperforming loans. They find that high EPU leads to an increase in nonperforming loans. Caglayan and Xu (2019) examine the effect of EPU on loan loss provisions for 18 countries. They find that high EPU is associated with increase in loan loss provisions. Berger et al (2020) finds that high EPU leads to liquidity hoarding by banks.

2.3. Hypothesis development

In developed and emerging countries, financial institutions are the main agents of financial inclusion (Chakrabarty, 2011; Ghosh, 2013; Brown et al, 2016). Uncertain economic conditions and uncertainty about economic policies can present difficult business conditions for financial institutions, which can dampen their incentive to supply basic financial services to unbanked adults and low end customers. When faced with high EPU, financial institutions may become unwilling to serve poor individuals and households in order to reduce operating cost and manage risks. Rising operating costs, high nonperforming loans, inefficiencies in the distribution of financial services and diseconomies of scale, can hurt financial institutions and create a disincentive to supply financial services to low end customers and unbanked adults in remote communities, thereby reducing the level of financial inclusion. Therefore, I predict that high EPU will reduce the level of financial inclusion.

H1: Economic policy uncertainty reduces the level of financial inclusion

3. Research design

3.1. Sample

Financial inclusion data was extracted from the global financial development indicators. Financial inclusion information was available only for 2011, 2014 and 2017 in the database. This is because the World bank's financial inclusion survey is conducted triennially (i.e., every three years). Information on EPU index was extracted from the EPU database at: https://www.policyuncertainty.com. The EPU database develops indices of economic policy uncertainty for major developed and emerging countries of the world. The EPU index was constructed based on the methodology described in the Baker, Bloom and Davis (2016) model. Macroeconomic data was extracted from the World Bank database. The sample period covers 2011 to 2017. The sample consist of 22 countries. The countries include Australia, Brazil, Canada, Chile, China, Colombia, France, Germany, Greece, India, Ireland, Italy, Japan, Korea, Mexico, Netherland, Russia, Singapore, Spain, Sweden, UK and US. Table 1 shows the description of the variables.

3.2. Method

3.2.1. Model

The model expresses financial inclusion as a function of financial institution's performance, macro-financial linkage, and the macroeconomic variable.

$$FIit = EPUDit + NPLit + OCTAit + DCPit + GDPRit + NPL * EPUDit + OCTA * EPUDit + DCP * EPUDit + GDPR * EPUDit + eit \ldots\ldots\ldots\ldots (1)$$

FI is a vector of dependent variables. FI includes: ATM, BBPA, MPB, ELP, ACC, DC, CC, SAV and BOR. Specifically, ACC = adults that own a formal account. DC = debit card ownership. CC = credit card ownership. SAV = adults that have formal savings. BOR = adults that have formal borrowings. ATM = ATMs per 100,000 adults. BBPA = Bank branches per 100,000 adults. MPB = adults using a mobile phone to pay bills. ELP = adults that use electronic payments used to make payments. For the explanatory variables, EPUD = year-end value of the EPU index. NPL = ratio of nonperforming loans to gross loans. OCTA = the ratio of bank overhead cost to total asset ratio. DCP = credit supply to the private sector by banks to GDP ratio. GDPR = real GDP growth rate.

3.2.2. Variable justification

The dependent variables are the financial inclusion variables, namely: ATM, BBPA, MPB, ELP, ACC, DC, CC, SAV and BOR. These variables are commonly used in the literature to measure financial inclusion (see, Imaeva et al, 2014; Chakrabarty, 2011; Ozili, 2018; Célerier and Matray, 2019). The explanatory variables are: EPUD, NPL, DCP, OCTA and GDPR. The EPU variables

(i.e., EPUD and EPUA) and the associated interaction variables (in equation 1) are the explanatory variables of interest in the model.

The EPU variables are the EPUD and EPUA variables. 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. The EPUA variable is the average of the monthly EPU index values. A negative relationship between the EPUD and EPUA variables and the financial inclusion variables is expected because high economic policy uncertainty will negatively affect financial institutions' performance which can compel them to adjusted their business decisions to reduce costs (Caglayan and Xu, 2019; Lee et al, 2017), which will affect the supply of basic financial services to individuals and households possibly through the closure of bank branches, discontinuation of certain financial services, higher fees for services, high interest rates etc. Thus, a negative sign on the EPUD or EPUA coefficient would indicate that high EPU in the business environment leads to lower levels of financial inclusion.

NPL is a control variable that measures the asset quality of the banking sector. A negative relationship between NPL and financial inclusion is expected because NPLs will negatively affect bank profitability (Ghosh, 2015; Ozili, 2019). Banks with high NPLs will expect low profits levels, and can proactively take steps to reduce costs possibly by reducing the supply of costly financial services such as the reducing the cost of maintaining bank branches and closing some branches in some rural and urban areas, thus, leading to lower financial inclusion.

The third explanatory variable is the OCTA variable which is measured as the ratio of bank overhead cost to total asset ratio. OCTA was introduced into the model to capture whether the propensity to supply financial services by banks is driven by overhead cost considerations. A negative relationship between OCTA and the financial inclusion variables is expected because high overhead costs will negatively affect bank profitability (Camanho and Dyson, 2005; Perera et al, 2007), and banks that have high overhead costs will take proactive steps to reduce overhead costs possibly by closing bank branches, thereby, leading to lower financial inclusion.

The fourth explanatory variable is the DCP variable which measures credit supply to the private sector by banks. A positive relationship between DCP and the financial inclusion variables is expected because high supply of bank credit to the private sector will stimulate the growth of credit-related financial services that are beneficial to households, individuals and small businesses such as payday loans, instant loans, overdraft, etc.

The fifth variable is the GDPR variable which measures real GDP growth rate. It captures fluctuations in the business cycle. Ozili (2020b) find evidence for a positive effect of GDPR on financial inclusion.

Finally, all models are estimated using fixed effect regression. All the regression estimations include country and year fixed effects. A number of studies on financial inclusion use the fixed effect regression approach to investigate the determinants and/or consequences of financial

inclusion such as such as Markose et al (2020), Oz-Yalaman (2019), Anson et al (2013) and Le et al (2020). Accordingly, I use the fixed effect approach.

3.3. Descriptive statistics and correlations

3.3.1. Descriptive results

NPL averages 5.5% of gross loans. NPL ratio is double-digit higher in Greece, Ireland and Italy, and much lower in Canada, Korea and Sweden. The DCP ratio is 105%, but exhibit substantial differences across countries in the sample. For instance, DCPs are much lower in Mexico, Russia and Colombia, and higher in the US, UK and Japan. On average, GDPR is 2.5% and is higher for banks in China, Ireland and India, and lower in Greece and Italy. The OCTA ratio is 2.3% on average, and is higher in Russia and Colombia, and lower in Japan, Singapore and Australia. EPUD and EPUA are higher in the UK, Brazil and France compared to Mexico and Italy. Overall, the mean of the explanatory variables is higher than the median values except for DCP. Finally, all the financial inclusion vector variables are higher in Australia, Canada and Japan compared to other countries in the sample.

Table 1: Descriptive statistics (mean values of the variables)

Country	NPL	DCP	GDPR	EPUD	EPUA	OCTA	ELP	MPB	ACC	ATM	BBPA	CC	DC	SAV	BOR
Australia	1.3	130	2.7	135	120	0.9	93.3	19.4	99	164	29	61	84	61	20
Brazil	2.9	63	0.3	236	220	3.8	46.6	1.5	68	127	21	36	58	17	11
Canada	0.8	101	2.5	187	188	1.8	95.4	14.7	90	197	22	68	82	53	22
Chile	1.8	110	3.7	187	131	2.1	49.3	3.4	58	54	16	24	44	17	11
China	1.5	131	7.2	175	172	1.8	43.8	5.3	67	59	9	13	45	33	9
Colombia	3.2	56	3.1	152	131	4.5	25.0	0.7	45	49	19	16	32	16	14
France	3.8	95	1.5	252	251	1.0	89.8	3.4	96	108	34	40	79	51	16
Germany	4.8	85	0.1	153	162	1.4	94.1	4.0	95	113	17	39	82	51	15
Greece	30.0	103	-0.5	127	118	1.5	31.1	0.9	77	54	26	11	44	14	7
India	7.5	60	6.1	125	111	1.6	16.7	0.4	57	27	15	10	26	19	8
Ireland	17.5	77	6.8	172	151	1.5	86.2	11.5	91	91	27	47	74	44	15
Italy	14.3	98	-0.1	114	124	1.6	71.2	2.1	84	99	48	39	51	32	10
Japan	1.5	159	1.6	130	118	0.7	82.5	0.8	96	149	31	64	62	56	8
Korea	0.9	123	2.9	157	131	1.9	85.1	6.9	84	246	16	51	59	44	16
Mexico	2.5	42	2.5	62	56	3.2	24.6	1.7	43	51	15	18	35	17	9
Netherland	3.3	103	1.6	115	107	3.7	96.6	10.5	91	59	18	33	89	51	11
Russia	6.8	62	1.7	245	185	7.8	48.6	2.9	67	150	30	19	41	20	10
Singapore	1.7	128	3.1	143	140	0.9	85.1	3.9	96	72	20	38	68	51	12
Spain	6.0	127	1.4	132	128	1.3	89.7	4.6	96	110	62	50	78	46	16
Sweden	1.4	136	1.9	131	120	1.1	97.6	14.2	99	50	20	48	95	67	23
UK	2.3	147	1.9	284	298	1.7	95.2	12.4	96	128	27	59	89	51	17
US	2.2	189	2.1	143	135	2.7	88.4	17.6	91.	-	33	61	74	53	22
Mean	5.5	105	2.5	162	150	2.3	69	6.5	81	103	25	39	64	40	14
Median	2.71	111	2.2	142	137	1.6	84	3.7	94	96	21	38	69	48	13
S.D.	7.8	42	3.3	84	72	2.5	27	6.9	22	63	15	20	27	21	6
Observations	145	147	154	154	154	154	88	88	154	147	149	154	154	154	154

ACC = adults that own a formal account. DC = debit card ownership. CC = credit card ownership. SAV = adults that have formal savings. BOR = adults that have formal borrowings. ATM = ATMs per 100,000 adults. BBPA = Bank branches per 100,000 adults. MPB = adults using a mobile phone to pay bills. ELP = adults that use electronic payments used to make payments. EPUD = year-end value of the monthly EPU index. EPUA = average value of the monthly EPU index. NPL = nonperforming loans ratio. OCTA = the ratio of bank overhead cost to total asset ratio. DCP = credit supply to the private sector by banks to GDP ratio. GDPR = real GDP growth rate.

3.3.2. Correlation analysis

Table 2 reports the Pearson correlation results. NPL is negatively correlated with EPUD and EPUA. This indicate that high NPL is associated with low EPU. GDPR is negatively correlated with EPUD and EPUA. GDPR is significantly correlated with EPUA which suggest that high EPU is associated with economic downturns. DCP is positively correlated with EPUD and EPUA but the correlation coefficient is insignificant. Similarly, OCTA is positively correlated with EPUD and EPUA but the correlation coefficient is insignificant. Overall, the correlations are low, and indicates that multi-collinearity is not a problem in the analysis.

Table 2: Correlation of EPU and the explanatory variables (Pearson correlation)

Variables	EPUD	EPUA	NPL	GDPR	DCP	OCTA
EPUD	1.000					

EPUA	0.839***	1.000				
	(0.00)	-----				
NPL	-0.079	-0.065	1.000			
	(0.35)	(0.44)	-----			
GDPR	-0.121	-0.156*	-0.205**	1.000		
	(0.15)	(0.06)	(0.02)	-----		
DCP	0.046	0.093	-0.129	-0.188***	1.000	
	(0.59)	(0.27)	(0.13)	(0.03)	-----	
OCTA	0.071	0.023	-0.027	0.020	-0.463***	1.000
	(0.41)	(0.78)	(0.74)	(0.81)	(0.00)	-----

P-value is reported in parenthesis. ***, **, * represent statistical significance at the 1%, 5% and 10% levels. EPUD = year-end value of the monthly EPU index. EPUA = average value of the monthly EPU index. NPL = nonperforming loans ratio. OCTA = the ratio of bank overhead cost to total asset ratio. DCP = credit supply to the private sector by banks to GDP ratio. GDPR = real GDP growth rate.

Table 3 report the Pearson correlation result for each of the financial inclusion variables. The two EPU variables (i.e., EPUD and EPUD) are significant and negatively correlated with ATM, which suggest that higher economic policy uncertainty is associated with lower supply of ATMs per 100,000 adults. On the other hand, EPUD and EPUA are positively correlated with some BOR, CC and BBPA and the correlation is insignificant. Similarly, EPUD and EPUA are negatively correlated with SAV and the correlation is insignificant. The remaining dependent variables (MPB, ELP, ACC and DC) report conflicting signs when correlated with EPUD and EPUA. Overall, the correlations are low, and indicates that multi-collinearity is not a problem in the analysis.

Table 3: Correlation of EPU and the dependent variables (Pearson correlation)

Variable	EPUD	EPUA	ATM	BBPA	MPB	ELP	ACC	CC	DC	SAV	BOR
EPUD	1.000										

EPUA	0.79***	1.000									
	(0.00)	-----									
ATM	0.30**	0.316***	1.000								
	(0.01)	(0.00)	-----								
BBPA	0.03	0.032	0.225**	1.000							
	(0.79)	(0.77)	(0.04)	-----							
MPB	-0.12	0.022	0.269**	-0.079	1.000						

	(0.29)	(0.85)	(0.02)	(0.48)							
ELP	-0.02	0.12	0.42***	0.24**	0.572***	1.000					
	(0.85)	(0.28)	(0.00)	(0.03)	(0.00)	-----					
ACC	-0.01	0.13	0.38***	0.27**	0.463***	0.870***	1.000				
	(0.91)	(0.25)	(0.00)	(0.01)	(0.00)	(0.00)	-----				
CC	0.01	0.14	0.66***	0.32***	0.504***	0.848***	0.725***	1.000			
	(0.94)	(0.23)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	-----			
DC	-0.05	0.13	0.29**	0.19*	0.551***	0.951***	0.919***	0.791***	1.000		
	(0.66)	(0.27)	(0.01)	(0.08)	(0.00)	(0.00)	(0.00)	(0.00)	-----		
SAV	-0.15	-0.02	0.33***	0.103	0.578***	0.903***	0.837***	0.810***	0.878***	1.000	
	(0.16)	(0.89)	(0.00)	(0.35)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	-----	
BOR	0.03	0.10	0.38***	0.101	0.580***	0.646***	0.471***	0.654***	0.579***	0.626***	1.000
	(0.75)	(0.36)	(0.00)	(0.37)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	-----

P-values are reported in parenthesis. ***, **, * represent significance at the 1%, 5% and 10% level. ACC = adults that own a formal account. DC = debit card ownership. CC = credit card ownership. SAV = adults that have formal savings. BOR = adults that have formal borrowings. ATM = ATMs per 100,000 adults. BBPA = Bank branches per 100,000 adults. MPB = adults using a mobile phone to pay bills. ELP = adults that use electronic payments used to make payments. EPUD = year-end value of the monthly EPU index. EPUA = average value of the monthly EPU index

4. Regression results

4.1. Effect of EPU on financial inclusion

The results are reported in table 4 and 5. Only the significant results are interpreted. EPUD coefficient is insignificant in columns 1 to 9 in table 4 and 5. This indicates that economic policy uncertainty is not significantly related to the nine financial inclusion indicators.

Regarding the control variables, the NPL coefficient is negative as expected in six of the nine models. This confirms the prediction that NPL has a negative relationship with financial inclusion. Specifically, high NPL leads to a decrease in ATM supply and bank branch contraction. In contrast, high NPL is associated with an increase in formal accounts and the use of electronic payments. GDPR coefficient is significant and negatively related to CC in column 7. This suggest that the use of credit cards is higher during periods of economic prosperity. DCP coefficient is significant and positively related with ACC and BBPA. This result supports the apriori expectation, and indicates that higher supply of credit to the private sector leads to a significant increase in ATM supply and bank branch expansion, thereby, increasing financial inclusion. In contrast, DCP coefficient is significant and negatively related with ELP and CC, which indicates that higher supply of credit to the private sector leads to a significant decrease in the number of adults using electronic payments and a decrease in credit card usage, thereby, decreasing financial inclusion. OCTA coefficient is significant and negatively related with ATM, ACC and CC. This result supports the apriori expectation, and indicates that high overhead costs in banks leads to a significant decrease in ATM supply, formal account ownership and credit card usage, thereby, decreasing financial inclusion. In contrast, OCTA coefficient is significant and positively related with BBPA, which indicates that high overhead costs in banks lead to a significant increase in the number of bank branch.

Table 4: Effect of EPU on financial inclusion

	(1)	(2)	(3)	(4)
Variable	ATM	BBPA	MPB	ELP
c	70.068***	11.577***	-3.323	70.109***
	(7.57)	(3.76)	(-0.53)	(8.56)
EPUD	**0.018**	**-0.0005**	**0.001**	**0.011**
	(1.31)	**(-0.10)**	**(0.13)**	**(1.29)**
NPL	-0.628**	-0.343**	-0.184	1.673***
	(-2.29)	(-4.12)	(-0.84)	(5.79)
GDPR	0.260	-0.074	0.040	0.135
	(0.74)	(-0.68)	(0.25)	(0.65)
DCP	0.266***	0.151***	0.101	-0.149*
	(3.21)	(5.73)	(1.66)	(-1.86)
OCTA	-1.400***	0.438***	-0.185	-0.107
	(-2.89)	(2.93)	(-0.68)	(-0.29)
Adjusted R^2	98.05	97.73	85.06	98.54
F-statistic	218.90	183.42	16.05	179.68
Observation	131	134	75	75

Regression in table 4 includes country and year fixed effect. T-statistic is reported in parenthesis. *, **, *** represent significance level at 10%, 5% and 1% level. ATM = ATMs per 100,000 adults. BBPA = Bank branches per 100,000 adults. MPB = adults using a mobile phone to pay bills. ELP = adults that use electronic payments used to make payments. EPUD = year-end value of the monthly EPU index. NPL = nonperforming loans ratio. OCTA = the ratio of bank overhead cost to total asset ratio. DCP = credit supply to the private sector by banks to GDP ratio. GDPR = real GDP growth rate.

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Table 5: Effect of EPU on financial inclusion

	(5)	(6)	(7)	(8)	(9)
Variable	ACC	DC	CC	SAV	BOR
c	74.817***	57.946***	45.921***	43.506***	16.309***
	(13.18)	(3.28)	(10.43)	(8.79)	(6.54)
EPUD	**0.012**	**-0.006**	**0.005**	**-0.005**	**0.003**
	(1.51)	**(-0.31)**	**(0.71)**	**(-0.70)**	**(0.73)**
NPL	0.486***	0.445	-0.016	-0.139	-0.142
	(3.00)	(1.18)	(-0.13)	(-0.99)	(-1.99)
GDPR	-0.223	-0.225	-0.501***	-0.143	-0.091
	(-1.06)	(-0.46)	(-3.09)	(-0.79)	(-0.99)
DCP	0.024	0.012	-0.074*	-0.032	-0.019
	(0.49)	(0.11)	(-1.97)	(-0.76)	(-0.92)
OCTA	-0.685**	0.416	-0.573**	-0.095	-0.089
	(-2.36)	(0.62)	(-2.55)	(-0.37)	(-0.70)
Adjusted R^2	95.99	84.95	96.57	96.33	87.86
F-statistic	107.01	25.94	125.77	117.01	32.97
observation	138	138	138	138	138

Regression in table 5 includes country and year fixed effect. T-statistics is reported in parenthesis. *, **, *** represent significance level at 10%, 5% and 1% level. ACC = adults that own a formal account. DC = debit card ownership. CC = credit card ownership. SAV = adults that have formal savings. BOR = adults that have formal borrowings. EPUD = year-end value of the monthly EPU index. NPL = nonperforming loans ratio. OCTA = the ratio of bank overhead cost to total asset ratio. DCP = credit supply to the private sector by banks to GDP ratio. GDPR = real GDP growth rate.

4.2. Interaction analysis - effect of EPU on financial inclusion

The interaction results are reported in table 6 and 7. Only the significant results are interpreted. NPL*EPUD coefficient is significant and negatively related to BBPA and ELP in columns 2 & 4. This suggest that the combined effect of high economic policy uncertainty and high nonperforming loans lead to bank branch contraction and a reduction in the use of electronic payments, thereby reducing financial inclusion. GDPR*EPUD coefficient is significant and positively related with ELP, and negatively related to ACC in columns 4 and 5, respectively. This suggest that high EPU in times of economic boom leads to higher electronic payments and a decrease in formal account ownership. DCP*EPUD coefficient is significant and negatively related to ELP, and positively related with ACC and CC in columns 4, 5 and 7, respectively. This suggest that high credit supply in times of high EPU leads to higher formal account ownership, higher credit card usage and a decrease in the use of electronic payments. OCTA*EPUD coefficient is significant and positively related to ATM, ACC and CC in columns 1, 5 and 7, respectively. This suggest that high overhead costs in banks in times of high EPU leads to higher formal account ownership, greater ATM supply and higher credit card usage.

Table 6. Interaction analysis - effect of EPU on financial inclusion

	(1)	(2)	(3)	(4)
Variable	ATM	BBPA	MPB	ELP
c	93.949***	11.381**	3.789	68.598***
	(6.92)	(2.59)	(0.36)	(6.18)
EPUD	-0.099**	0.004	-0.021	0.012
	(-2.14)	(0.27)	(-0.67)	(1.13)
NPL	-0.395	-0.254**	-0.233	1.820***
	(-1.39)	(-2.58)	(-0.93)	(5.86)
GDPR	-0.411	0.022	0.014	0.237
	(-0.94)	(0.14)	(0.06)	(1.07)
DCP	0.157	0.152***	0.070	-0.077
	(1.36)	(4.21)	(0.79)	(-1.21)
OCTA	-6.008***	0.266	-1.894	0.077
	(-6.19)	(0.81)	(-1.24)	(0.91)
NPL*EPUD	**-0.002**	**-0.001***	**0.0001**	**-0.003***
	(-1.13)	**(-1.85)**	**(0.11)**	**(-1.83)**
GDPR*EPUD	**0.005**	**-0.001**	**-0.0004**	**0.005****
	(1.52)	**(-0.99)**	**(-0.21)**	**(2.17)**
DCP*EPUD	**0.0005**	**-0.0001**	**0.0001**	**-0.001****
	(1.42)	**(-0.001)**	**(0.44)**	**(-2.09)**
OCTA*EPUD	**0.023*****	**0.001**	**0.006**	**0.004**
	(5.18)	**(0.49)**	**(1.15)**	**(0.62)**
Adjusted R^2	98.46	97.73	84.49	98.68
F-statistic	246.03	164.75	13.59	174.32
Observation	131	134	75	75

Regression in table 4 includes country and year fixed effect. T-statistic is reported in parenthesis. *, **, *** represent significance level at 10%, 5% and 1% level. ATM = ATMs per 100,000 adults. BBPA = Bank branches per 100,000 adults. MPB = adults using a mobile phone to pay bills. ELP = adults that use electronic payments used to make payments. EPUD = year-end value of the monthly EPU index. NPL = nonperforming loans ratio. OCTA = the ratio of bank overhead cost to total asset ratio. DCP = credit supply to the private sector by banks to GDP ratio. GDPR = real GDP growth rate.

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Table 7: Interaction analysis - effect of EPU on financial inclusion

	(5)	(6)	(7)	(8)	(9)
Variable	ACC	DC	CC	SAV	BOR
c	90.816***	65.705***	55.823***	46.677***	16.465***
	(10.89)	(3.28)	(8.49)	(6.17)	(4.32)
EPUD	-0.049*	-0.028	-0.039	-0.019	0.001
	(-1.77)	(-0.41)	(-1.75)	(-0.78)	(0.09)
NPL	0.345*	0.452	-0.018	-0.108	-0.017
	(1.85)	(1.01)	(-0.12)	(-0.64)	(-1.99)
GDPR	-0.036	-0.072	-0.604**	-0.260	-0.099
	(-0.12)	(-0.10)	(-2.65)	(-0.99)	(-0.75)
DCP	-0.096	-0.077	-0.142***	-0.057	-0.019
	(-1.41)	(-0.47)	(-2.63)	(-0.92)	(-0.62)
OCTA	-1.718***	0.994	-1.475***	-0.268	-0.103
	(-2.76)	(0.67)	(-3.00)	(-0.48)	(-0.36)
NPL*EPUD	**0.001**	**-0.001**	**-0.0001**	**-0.0004**	**0.0003**
	(1.10)	**(-0.25)**	**(-0.15)**	**(-0.44)**	**(0.68)**
GDPR*EPUD	**-0.003***	**-0.003**	**-0.0001**	**0.0005**	**0.0002**
	(-1.64)	**(-0.68)**	**(-0.08)**	**(0.29)**	**(0.18)**
DCP*EPUD	**0.0004****	**0.0004**	**0.0003***	**0.0001**	**-0.00001**
	(2.15)	**(0.77)**	**(1.83)**	**(0.71)**	**(-0.07)**
OCTA*EPUD	**0.005***	**-0.003**	**0.004****	**0.001**	**0.0001**
	(1.96)	**(-0.45)**	**(2.03)**	**(0.29)**	**(0.10)**
Adjusted R^2	96.19	84.58	96.63	96.23	87.45
F-statistic	99.89	22.48	113.31	100.82	28.26
observation	138	138	138	138	138

Regression in table 5 includes country and year fixed effect. T-statistics is reported in parenthesis. *, **, *** represent significance level at 10%, 5% and 1% level. ACC = adults that own a formal account. DC = debit card ownership. CC = credit card ownership. SAV = adults that have formal savings. BOR = adults that have formal borrowings. EPUD = year-end value of the monthly EPU index. NPL = nonperforming loans ratio. OCTA = the ratio of bank overhead cost to total asset ratio. DCP = credit supply to the private sector by banks to GDP ratio. GDPR = real GDP growth rate.

4.3. Additional analysis

An additional analysis was performed in this section. The EPUA variable – the average of the 12-month EPU index – was introduced into the model as a time-sensitive alternative proxy of economic policy uncertainty.

$$FIit = EPUAit + NPLit + OCTAit + DCPit + GDPRit + NPL * EPUAit + OCTA * EPUAit + DCP * EPUAit + GDPR * EPUAit + eit \ldots\ldots\ldots\ldots (2)$$

The results are reported in table 8. The NPL*EPUA coefficient is significant and negatively related to BBPA in column 3 of table 8, and is consistent with the earlier result for NPL*EPUD reported in column 2 of table 6. OCTA*EPUA coefficient is also significant and positively related to ATM in column 2 of table 6, and is consistent with the earlier result for OCTA*EPUD reported in column 1 of table 4. The GDPR*EPUA coefficient is significant and positively related to ELP in column 9 of table 8, and is consistent with the earlier result for GDPR*EPUD reported in column 4 of table

6. Also, the GDPR*EPUA coefficient is significant and negatively related to ACC in column 5 of table 8, and is consistent with the earlier result for GDPR*EPUD reported in column 5 of table 7. On the other hand, the remaining results for the interaction analyses report conflicting signs when the EPUD and EPUA variables are used as alternative proxies for economic policy uncertainty (EPU).

Table 8: Effect of EPU on financial inclusion - additional analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Variable	ATM	BBPA	MPB	ELP	ACC	DC	CC	SAV	BOR
c	73.375***	11.147***	0.189	77.78***	82.029***	60.825***	48.564***	43.383**	14.117***
	(7.67)	(3.33)	(0.03)	(8.88)	(13.14)	(4.10)	(9.85)	(7.75)	(5.09)
EPUA	-0.014	0.006	-0.013	-0.013	-0.012	-0.007	-0.007	-0.006	0.013
	(-0.59)	(0.68)	(-1.03)	(-0.84)	(-0.82)	(-0.19)	(-0.63)	(-0.43)	(1.92)
NPL	-0.278	-0.261**	-0.273	1.534***	0.420**	0.493	-0.039	-0.078	-0.176
	(-0.97)	(-2.72)	(-1.08)	(4.82)	(2.27)	(1.12)	(-0.27)	(-0.47)	(-2.14)
GDPR	-0.144	0.025	0.073	-0.363	0.092	-0.001	-0.499**	-0.212	-0.075
	(-0.33)	(0.17)	(0.34)	(-1.35)	(0.33)	(-0.002)	(-2.26)	(-0.84)	(-0.61)
DCP	0.315***	0.151***	0.099	-0.125	-0.031	-0.041	-0.089**	-0.032	-0.008
	(3.57)	(5.21)	(1.45)	(-1.45)	(-0.56)	(-0.32)	(-2.04)	(-0.64)	(-0.32)
OCTA	-4.851***	0.269	-1.128	-3.199**	-1.178**	1.294	-1.039**	-0.061	-0.023
	(-5.99)	(0.96)	(-0.89)	(-2.01)	(-2.23)	(1.03)	(-2.49)	(-0.13)	(-0.09)
NPL*EPUA	-0.003**	-0.001*	-0.0005	-0.002	0.0003	-0.001	-0.001	-0.0008	0.0005
	(-2.06)	(-1.78)	(-0.46)	(-1.34)	(0.33)	(-0.46)	(-0.91)	(-0.83)	(1.16)
GDPR*EPUA	0.005	-0.001	-0.001	0.005*	-0.003*	-0.003	-0.0002	0.0005	0.0003
	(1.51)	(-0.98)	(-0.45)	(1.99)	(-1.69)	(-0.70)	(-0.14)	(0.25)	(0.31)
DCP*EPUA	-0.0001	0.0001	0.00004	-0.0001	0.0002	0.0002	0.0008	0.00003	-0.0001
	(-0.62)	(0.12)	(0.33)	(-0.54)	(1.48)	(0.83)	(0.84)	(0.27)	(-1.01)
OCTA*EPUA	0.017***	0.001	0.003	0.009**	0.003	-0.005	0.002	-0.0003	-0.0004
	(4.89)	(0.56)	(0.85)	(2.05)	(1.25)	(-0.84)	(1.03)	(-0.13)	(-0.35)
Adjusted R^2	98.39	97.74	84.71	98.62	96.19	84.57	96.54	96.21	87.88
F-statistic	235.54	165.42	13.81	166.09	99.89	22.45	110.37	100.40	29.38
observation	131	134	75	75	138	138	138	138	138

Regression in table 6 includes country and year fixed effects. T-statistics are reported in parenthesis. *, **, *** represent significance level at 10%, 5% and 1%. ACC = adults that own a formal account. DC = debit card ownership. CC = credit card ownership. SAV = adults that have formal savings. BOR = adults that have formal borrowings. ATM = ATMs per 100,000 adults. BBPA = Bank branches per 100,000 adults. MPB = adults using a mobile phone to pay bills. ELP = adults that use electronic payments used to make payments. EPUA = average value of the monthly EPU index. NPL = nonperforming loans ratio. OCTA = the ratio of bank overhead cost to total asset ratio. DCP = credit supply to the private sector by banks to GDP ratio. GDPR = real GDP growth rate.

5. Conclusion

This paper analysed the effect of EPU on the level of financial inclusion. There are three main findings. One, EPU does not have a significant impact on financial inclusion. None of the nine indicators of financial inclusion have a significant direct relationship with EPU. Two, the combined effect of high EPU and high nonperforming loans leads to bank branch contraction and a reduction in the use of electronic payments. Meanwhile, the use of formal accounts and credit cards increases in times of high credit supply and high EPU.

The implication of the findings is that economic policy uncertainty affects financial inclusion through its effect on financial institutions. As financial institutions intensify their effort to reduce cost in times of high EPU, such cost reduction can affect the supply of basic financial services to customers and unbanked adults, thereby reducing financial inclusion.

Policy makers should design policies that promote high levels of financial inclusion in times of rising EPU. Policy makers, particularly bank regulators, should formulate policies that prevent banks from closing rural bank branches in bad times. However, the effect of such policy in individual countries may differ due to differences in national financial inclusion strategy, current level of financial inclusion, the number of bank branch networks, level of financial development and regulatory frameworks.

The main limitation of the study is the sample period. The sample period is small, and this was due to the few number of reported data in the existing database.

Future studies can investigate the impact of each EPU component on the level of financial inclusion. Future studies can also examine whether strong bank supervision in times of high EPU has positive or negative effects for financial inclusion. Finally, the analysis in this paper can be extended by investigating how EPU affects the propensity for women to use financial services.

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