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The Impact of Economic Policy Uncertainty on Banks' Non-Interest Income Activities

Whelsy Bounbou*, Charles Mawusi†

Abstract

In this paper, we investigate how banks adjust their business model amid rising global economic uncertainty. Specifically, we analyze the effect of economic policy uncertainty (EPU) on banks' non-interest income activities, using a large panel dataset of 3,913 banks operating in 9 countries over the period 2009-2018. We find no statistically significant effect of EPU on banks' net non-interest income (NNII). Further analysis shows that the lack of effect on NNII is due to a reduction in gross non-interest income which was offset by a reduction in gross non-interest expenses. Our results also suggest that the likelihood of banks to diversify income amid high EPU is conditional on the negative interest rate environment.

JEL Code: G21, G28, D81, E65.

Keywords: Economic Policy Uncertainty, Bank Diversification, Negative Interest Rate Environment.

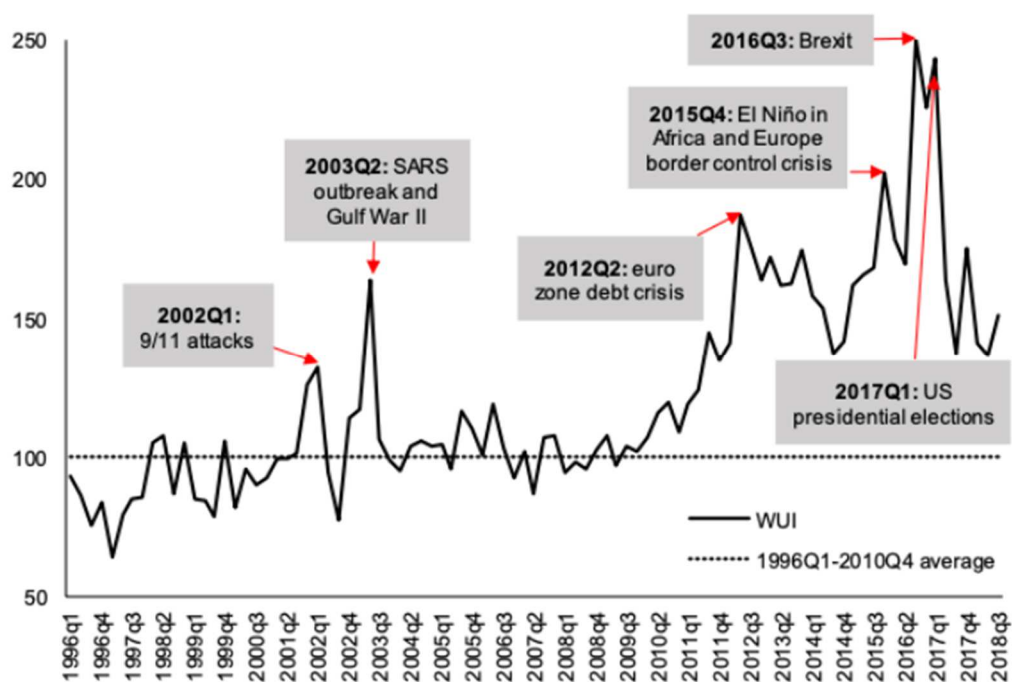
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1. Introduction

The economic implications of global uncertainty came into prominence after the 2007-2008 Global Financial Crisis (see, Baker and Bloom, 2013; Stock and Watson, 2012). Since the financial crisis, global uncertainty has increased markedly, spurred by events such as the European debt crisis, Brexit, and the trade war between the United States and China (see, Figure 1). This growing trend has significant implications for the growth of economies and the stability of financial systems. Besides, the ongoing novel coronavirus (Covid-19) pandemic has reinforced research interest in global uncertainty.

Figure 1: The evolution of global uncertainty



Source: Ahir et al. (2018)

Indeed, several recent empirical studies have examined the financial and economic implications of economic policy uncertainty (EPU). Heightened EPU has been found to reduce bank income (Boungou and Mawusi, 2021a), increase bank risk (Wu et al., 2020a), hamper credit growth (Nguyen et al., 2020), decrease non-cash asset holdings (Huang et al., 2019), lower firms' investment (Liu and Zhang, 2019), decrease financial stability (Hsieh, 2020), and impede economic growth (Ren et al., 2020). Much less explored is the relationship between EPU and banks' non-interest income activities (thereafter diversification) and in particular, the channels driving diversification. By extension, two main questions arise: (i) Do banks diversify in response to high economic policy uncertainty? (ii) Does the adoption of a negative interest rate policy (NIRP) influence the effect of EPU on bank diversification?

Theoretically, the effects of EPU on bank diversification are ambiguous. According to the real option value theory, uncertainty can increase the risk associated with bank

investments while increasing the real option value of diversifying financial assets. Diversification thus presents an opportunity for banks to reduce exposure of their financial assets to uncertainty induced risks. This prevents asset value from falling below liabilities and reduces the prospects of bank failure (see, Yang et al., 2020). Moreover, uncertainty could induce banks to allocate assets toward “high-yield” investments (Wu et al., 2020a). On the other hand, heightened economic policy uncertainty could increase the real option value of waiting, and in response, banks may decide against diversification and adopt a “*wait and see*” strategy as they are unsure of future economic conditions (see, Aastveit et al., 2017). Moreover, excessive diversification could lead to severe systemic risk when uncertainty is high (Yang et al., 2020).¹

This paper aims to assess empirically the effect of EPU on banks’ diversification. To do so, we use data from 3,913 banks located in 9 countries affected by NIRP over the period 2009-2018. We measure EPU using the country level Economic Policy Uncertainty Indices developed by Arbatli et al. (2019), Armelius et al. (2017), Baker et al. (2016), Ghirelli et al. (2019), Hardouvelis et al. (2018), Kroese et al. (2015) and Zalla (2016). All the indices follow the novel news based approach developed by Baker et al. (2013). This approach requires an extensive search, count, and normalization of the words “Economic”, “Policy”, “Uncertainty” and its related variants as reported in major newspapers of each country. Although the EPU index is highly correlated with other general measures of economic uncertainty, including the Volatility Index (VIX), it is quite unique in that it captures economic, policy, and general uncertainties at the country level. Besides, the EPU is robust to political slant (see, Baker et al. 2016). Given that banks non-interest income can be affected by several factors, this measure of economic uncertainty allows us to capture a more holistic effect of uncertainty on banks non-interest income and non-interest expense. Baum et al. (2020) also point out that an increase in EPU leads to a reduction in the availability of credit in the private sector and thus deterioration in the performance of banks. In doing so, EPU could increase the attractiveness of non-interest income generating activities. In this paper we attempt to address this issue.

Bank diversification on the other hand, is measured using non-interest flows, which consists of net non-interest income and its decomposition. These measures allow us to capture how banks adjust their non-interest income and non-interest expense in a high EPU environment. Our paper contributes to the existing literature in three main ways. To the best of our knowledge, we provide the first empirical evidence of the effects of EPU on banks’ diversification decisions. Second, we investigate whether the negative interest rate environment influences the effect of EPU on banks’ diversification. Finally, our dataset enables us to examine precisely the response channels of banks to EPU by decomposing net non-interest income into gross non-interest income and gross non-interest expense.

¹ Wu et al. (2020b) also argue that higher financial uncertainty is associated with lower bank risk-taking.

Our results show that EPU does not induce an increase in the banks' net non-interest income. This absence of effect on net non-interest income stems from the counter adjustments to banks' non-interest expenses. Indeed, EPU reduces banks' non-interest income (such as net fees and commissions, and other non-interest income). However, this reduction is offset by the reduction in banks' non-interest expenses, notably personnel expenses and other non-interest expenses.

In addition to examining the impact of EPU on bank diversification, this paper also analyzes whether the negative interest rate environment changes the direction or magnitude of this impact. As the literature on NIRP suggests, negative interest rates impact banks' diversification (Boungou and Hubert, 2021) and hence risk-taking decisions (Boungou, 2020). Our findings show that the negative interest rate environment influences the effect of EPU on banks. We find that in the pre-NIRP period, an increase in EPU implied an increase in bank net non-interest income. However, the fall of interest rates below zero helped to moderate the effects of EPU on banks. While the reduction in non-interest income was greater during the NIRP introduction period, banks' responses in terms of non-interest expense differed before and after the implementation of negative interest rates. Indeed, our findings highlight that in a high EPU environment banks first reduce their other non-interest expense (especially during the pre-NIRP period) and then reduced their personnel expense (post-NIRP period). These adjustments thus make it possible to compensate for the effects of EPU on non-interest income.

The remainder of the paper is organized as follows. Section 2 describes our data and empirical methodology. Section 3 presents our empirical findings. Section 4 concludes.

2. Data and empirical methodology

2.1. Sample and data description

In this paper, we analyze the effect of EPU on banks' income diversification decisions. We collect banking data from the Fitch Connect database and macroeconomic data from the OECD and Datastream. Our database consists of 3,913 banks located in 9 countries (i.e. France, Germany, Greece, Ireland, Italy, Japan, the Netherlands, Spain, and Sweden) over the period from 2009 to 2018. The overall data comprises more than 27,700 observations. We winsorized the data at the 1st and 99th percentile levels to ensure that outliers do not bias our results. Table A1 (in the Appendix) presents detailed descriptive statistics for our measures of bank diversification. In addition, Table A2 provides an aggregated time series of net non-interest income, gross non-interest income and expense to visualize the evolution of these variables over the sample period.

Our country-level measure of EPU comes from the novel indices developed by Arbatli et al. (2019), Armelius et al. (2017), Baker et al. (2016), Ghirelli et al. (2019), Hardouvelis

et al. (2018), Kroese et al. (2015) and Zalla (2016).² Since our banking data are annual frequency data, we calculate the annual average of the monthly EPU.³ We measure banks' non-interest income activities using net non-interest income that we decompose into gross non-interest income and gross non-interest expense.⁴ To explore the different channels through which banks adjust their balance sheets in response to increased economic policy uncertainty, we decompose gross non-interest incomes into net fees and commissions, and other non-interest income (such as net gains (losses) on trading and derivatives, net gains (losses) on other securities, and net insurance income). Secondly, we break down gross non-interest expenses into personnel expenses (such as salaries and employee benefits) and other non-interest expenses (such as information technology costs, marketing, and telecommunication services). All non-interest flows are scaled by total assets.

In our estimates, we include both bank-specific and country-specific controls. Regarding bank-specific controls, we include the natural logarithm of banks' total assets, liquid asset to total asset ratio, equity to asset ratio, and customer deposits to total asset. We include also Herfindahl-Hirschman index, inflation rate, real GDP growth rate, and the slope of the yield curve (the difference between long-term and short-term interest rates) as country-specific controls.

2.2. Empirical methodology

To analyze the effect of EPU on bank diversification, we employ the following model:

$$Divers_{i,k,t} = c + \alpha_1 EPU_{k,t} + \alpha_2 Y_{i,k,t} + \theta_t + \lambda_i + \varepsilon_{i,k,t} \quad (1)$$

Where $Divers_{i,k,t}$ denotes net non-interest income (and its decomposition) of the bank i located in country k in year t . $EPU_{k,t}$ is the economic policy uncertainty index for country k in year t .⁵ $Y_{i,k,t}$ refers to both bank-specific and country-specific controls. θ_t , λ_i , $\varepsilon_{i,k,t}$, denote the time fixed-effects, bank fixed-effects, and idiosyncratic error, respectively. To take into account heteroscedasticity and autocorrelation in our data, standard errors are robust and clustered at the bank-level.⁶ To mitigate endogeneity problems, we lag the EPU variable and bank-specific controls by one year (see, Chi and Li, 2017, Wu et al., 2020b, Boungou and Mawusi, 2021a).⁷

² For more details on how the EPU is calculated, please visit this website: <http://www.policyuncertainty.com>

³ To test the robustness of this specification, we use the natural logarithm of the EPU index. Even with this additional specification, our baseline result remains unchanged (not reported but available on request).

⁴ Net non-interest income is the difference between gross non-interest income and gross non-interest expense.

⁵ Using the "World Economic Uncertainty Index" introduced by Ahir et al. (2018), we obtain similar results (available on request).

⁶ Since our sample of countries is relatively short and EPU is measured at the country level, we perform an alternative specification, namely by clustering standard errors at the country level, to demonstrate the robustness of our analysis. Our baseline result remains unchanged even with the clustering of standard errors at the country level. The results of this additional specification have not been reported, but are available on request.

⁷ We also use panel data techniques with the two-step system GMM estimators and find similar results (not reported but available on request).

3. Empirical findings

3.1. EPU and bank non-interest flows

Table 1 presents results of the relationship between EPU and banks' net non-interest income. Columns I and II of Table 1 report the results considering only bank-specific controls and country-specific controls respectively. Column III presents the results of our baseline model including both bank- and country-specific controls. The results in column III show a negative and non-significant relationship between EPU and banks' net non-interest income⁸. In other words, it seems that amid high economic policy uncertainty, banks prefer to adopt a "wait and see" strategy.⁹ Indeed, we would be tempted to say that if there has been no increase or decrease in diversification decisions. But, is this the case?

Table 1. The relationship between EPU and bank diversification

	Net non-interest income		
	(I)	(II)	(III)
EPU_t-1	-2.45e-05 [9.92e-06]	4.32e-04 [1.45e-05]	-2.54e-04 [1.03e-05]
R2(within)	0.003	0.003	0.007
Bank controls_t-1	Yes	No	Yes
Country controls	No	Yes	Yes
Observations	26736	28199	26736
Number of banks	3754	3913	3754

Note: EPU_t1 refers to Economic Policy Uncertainty index lagged by one year. All estimates include bank fixed-effects and year fixed-effects. The controls include both bank-specific controls (natural logarithm of total assets, liquid assets to total assets ratio, equity to assets ratio, customer deposits to total assets) and country-specific controls (Herfindahl-Hirschman index, inflation rate, real GDP growth rate, yield curve). Robust standard errors are in brackets. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

Based on our previous result, it then seems interesting to investigate the response channels of banks, justifying the absence of a significant effect of EPU on net non-interest income. In other words, we examine how banks adjust their business model to circumvent the potential undesirable effects of a high EPU environment. To do so, we go further by decomposing net non-interest income into gross non-interest income (see Table 2) and gross non-interest expense (Table 3). This decomposition allows us to better understand the effects of increased economic policy uncertainty on banks' ability to diversify their income.

Table 2 presents estimates between EPU and banks' non-interest income. We find a negative and statistically significant relationship between EPU and banks' gross non-interest income. Our results indicate that increasing EPU by 1 percentage point (pp)

⁸ To check that the lack of a significant effect does not stem from our choice of specification, we consider other specifications. The results of this additional analysis are reported in Table A3. The results qualitatively remained unchanged.

⁹ To check that the lack of effect of EPU on banks' net non-interest income is not related to an artifact of the timing choices in the model, we include two additional lags of the EPU index as robustness checks. The results of this robustness analysis support our baseline (not reported but available on request).

leads to a reduction in gross non-interest income by 0.003pp. This reduction in gross non-interest income comes from a reduction in net fees and commissions by 0.001pp and other non-interest income by 0.002pp. This result highlights that in the presence of high EPU, banks struggle to diversify their non-income related activities, justifying a reduction of both net fees and commissions and other non-interest income. Our findings are consistent with the assertion that in the presence of increased uncertainty, banks prefer to wait and see how the situation progresses, instead of taking more risk (Aastveit et al., 2017). These results are also consistent with findings in Tran (2020) which suggest that banks adopt more precautionary behaviors during periods of increased uncertainty.

Table 2. The influence of EPU on banks' gross non-interest income (and its decomposition)

	Gross non-interest income	Net fees & commissions	Other non- interest income
	(I)	(II)	(III)
EPU_t-1	-0.003*** [1.21e-05]	-0.001*** [6.00e-06]	-0.002*** [9.31e-06]
R2(within)	0.004	0.002	0.005
Controls	Yes	Yes	Yes
Observations	27425	27453	27758
Number of banks	3830	3830	3880

Note: All dependent variables are scaled by total assets. EPU_t1 refers to Economic Policy Uncertainty index lagged by one year. All estimates include bank fixed-effects and year fixed-effects. The controls include both bank-specific controls (natural logarithm of total assets, liquid assets to total assets ratio, equity to assets ratio, customer deposits to total assets) and country-specific controls (Herfindahl-Hirschman index, inflation rate, real GDP growth rate, yield curve). Robust standard errors are in brackets. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

Now, we analyze how banks adjust their non-interest expense following the reduction of non-interest income amidst high EPU. Table 3 reports the results of the effects of EPU on banks' non-interest expense. We highlight a negative relationship between EPU and bank non-interest expense. We find that a 1pp increase in EPU induces a 0.004pp reduction in gross non-interest expense. This reduction in gross non-interest expense comes from the reduction in both personnel expense and other non-interest expenses. We note that the reduction in gross non-interest income (-0.003) is offset by a reduction in gross non-interest expense (-0.004), thus justifying the non-significant effect of EPU on banks' net non-interest income. Indeed, in the face of rising uncertainties, banks reduce their costs, especially salary charges and operating costs to limit the reduction in their non-interest income.

Overall, we find that the EPU has no significant impact on banks' net non-interest income. Indeed, it seems that in the context of high EPU, banks reduce their non-interest expenses to compensate for the reduction in non-interest income.

Table 3. The influence of EPU on banks' gross non-interest expense (and its decomposition)

	Gross non-interest	Personnel	Other non-interest
	expense	expense	expense
	(I)	(II)	(III)
EPU_t-1	-0.004***	-9.42e-04***	-0.003***
	[1.22e-05]	[3.59e-06]	[9.35e-06]
R2(within)	0.009	0.008	0.007
Controls	Yes	Yes	Yes
Observations	27009	27133	27648
Number of banks	3789	3830	3874

Note: All dependent variables are scaled by total assets. EPU_t1 refers to Economic Policy Uncertainty index lagged by one year. All estimates include bank fixed-effects and year fixed-effects. The controls include both bank-specific controls (natural logarithm of total assets, liquid assets to total assets ratio, equity to assets ratio, customer deposits to total assets) and country-specific controls (Herfindahl-Hirschman index, inflation rate, real GDP growth rate, yield curve). Robust standard errors are in brackets. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

3.2. EPU and bank non-interest flows in time of negative interest rates

In this section, we compare the effects of EPU on bank diversification before and during the period of negative interest rates. In other words, we examine whether the negative interest rate environment influence the effects of EPU on banks. Indeed, negative interest rate policy (NIRP) could plunge banks into a period of uncertainty since this is the first time that central banks have introduced negative interest rates. This unprecedented monetary policy tool could thus influence banks' decisions. Indeed, several studies agree that NIRP has squeezed banks' margins (e.g. Boungou and Mawusi, 2021b). In response to this reduction in margins, banks had to adjust their business models, for instance by reducing their costs (Boungou and Hubert, 2021). Since our country sample is composed only of countries that have adopted NIRP, it is easier to distinguish the effects of EPU during the pre-NIRP (2009-2013) and post-NIRP (2014-2018) periods.

Table 4. EPU and bank net non-interest income in NIRP environment

	Net non-interest income	
	Pre-NIRP	Post-NIRP
	EPU_t-1	0.004**
	[1.45e-05]	[1.50e-05]
R2(within)	0.020	0.004
Controls	Yes	Yes
Observations	12926	13810
Number of banks	3592	3385

Note: EPU_t1 refers to Economic Policy Uncertainty index lagged by one year. All estimates include bank fixed-effects and year fixed-effects. The controls include both bank-specific controls (natural logarithm of total assets, liquid assets to total assets ratio, equity to assets ratio, customer deposits to total assets) and country-specific controls (Herfindahl-Hirschman index, inflation rate, real GDP growth rate, yield curve). Robust standard errors are in brackets. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

Table 4 shows the results of the effects of EPU on bank net non-interest income before and during the period of negative interest rates. We find that the effects of EPU on net non-interest income are of opposite magnitude and direction. During the period before the implementation of negative interest rates, we find a positive and significant relationship between EPU and net non-interest income. An increase in EPU of 1pp increases the net non-interest income by 0.004pp. This result highlights that, during the period preceding the introduction of NIRP, and in the face of increased uncertainty, banks diversify their sources of income. This result is consistent with previous work (among others Wu et al., 2020a, b) which points out that the low-interest rate and high EPU environments were accompanied by an increase in risk-taking by banks.¹⁰ Conversely, when we focus on the NIRP implementation period, we find that the increase in EPU has no significant effect on banks' net non-interest income. This result undoubtedly underlines the moderating role of negative interest rate policy in banks' diversification and especially risk-taking decisions (Boungou, 2020). For instance, Boungou (2020) shows that banks located in NIRP-adopter countries took less risk compared to those not affected by this policy.

Now we complement our previous result by analyzing whether banks' response channels are the same before and during the period of negative interest rates. In other words, we investigate how NIRP influences the effects of EPU on banks' non-interest income (results reported in Table 5) and non-interest expense (Table 6).

In Table 5, we find a negative relationship between EPU and bank non-interest income before and during the period of negative interest rates. However, this relationship is only statistically significant in the period following the implementation of NIRP. The results in Table 5 suggest that the effects of EPU on banks' non-interest income (reported in Table 1 and discussed in section 3.1) stem mainly from the period of implementation of negative interest rates. An increase in EPU of 1pp during the implementation of NIRP reduced the gross non-interest income of banks by 0.004pp. This reduction is proportionally distributed between net fees and commissions (0.002pp) and other non-interest income (0.002pp). This result also supports the idea of the moderating role played by NIRP in the banks' search for yield.

¹⁰ This is consistent with the risk-taking channel of monetary policy in a low interest rate environment (see Borio and Zhu, 2012).

Table 5. EPU and bank non-interest income in NIRP environment

	Gross non-interest income		Net fees & commissions		Other non-interest income	
	Pre-NIRP	Post-NIRP	Pre-NIRP	Post-NIRP	Pre-NIRP	Post-NIRP
EPU_t-1	-0.002 [1.81e-05]	-0.004* [1.94e-05]	-2.53e-04 [6.58e-06]	-0.002** [7.16e-06]	-0.002 [1.45e-05]	-0.003* [1.48e-05]
R2(within)	0.051	0.008	0.054	0.006	0.032	0.009
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13266	14159	13283	14170	13406	14352
Number of banks	3665	3455	3665	3455	3713	3497

Note: All dependent variables are scaled by total assets. EPU_t1 refers to Economic Policy Uncertainty index lagged by one year. All estimates include bank fixed-effects and year fixed-effects. The controls include both bank-specific controls (natural logarithm of total assets, liquid assets to total assets ratio, equity to assets ratio, customer deposits to total assets) and country-specific controls (Herfindahl-Hirschman index, inflation rate, real GDP growth rate, yield curve). While Pre-NIRP refers to the period before the implementation of negative interest rates, Post-NIRP refers to the periods after the implementation of negative interest rates. Robust standard errors are in brackets. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

The results presented in Table 6 shows how banks adjust their non-interest expense in a high EPU environment. We find that banks reduced their gross non-interest expense in response to the high EPU. We show that this reduction was smaller during the NIRP period (-0.004) compared to the pre-NIRP period (-0.006). However, our findings indicate that the reduction in gross non-interest expense (-0.004) was sufficient to offset the reduction in gross non-interest income (-0.004) during the same period.

Table 6. EPU and bank non-interest expense in NIRP environment

	Gross non-interest expense		Personnel expense		Other non-interest expense	
	Pre-NIRP	Post-NIRP	Pre-NIRP	Post-NIRP	Pre-NIRP	Post-NIRP
EPU_t-1	-0.006** [2.22e-05]	-0.004** [2.20e-05]	7.27e-04 [5.90e-06]	-0.002*** [5.51e-06]	-0.007*** [1.67e-05]	-0.002 [1.79e-05]
R2(within)	0.052	0.010	0.042	0.009	0.049	0.007
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13033	13976	13117	14016	13328	14320
Number of banks	3620	3415	3621	3418	3708	3490

Note: All dependent variables are scaled by total assets. EPU_t1 refers to Economic Policy Uncertainty index lagged by one year. All estimates include bank fixed-effects and year fixed-effects. The controls include both bank-specific controls (natural logarithm of total assets, liquid assets to total assets ratio, equity to assets ratio, customer deposits to total assets) and country-specific controls (Herfindahl-Hirschman index, inflation rate, real GDP growth rate, yield curve). While Pre-NIRP refers to the period before the implementation of negative interest rates, Post-NIRP refers to the periods after the implementation of negative interest rates. Robust standard errors are in brackets. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

The results of the breakdown of gross non-interest expenses show that the reduction in personnel expenses related to high EPU was greater in the context of negative interest rates and, conversely, the reduction in other non-interest expenses was greater before NIRP. This seems to suggest that banks compensate for the reduction in non-interest income by reducing other non-interest expenses (in the period pre-NIRP) and by reducing staff costs (in the period post-NIRP). One explanation could be that faced with the combination of a high EPU and negative interest rates, banks reduce their staff

costs with ambitions more oriented towards digital transformation (see, Bounou and Hubert, 2021).

4. Conclusion

In this paper, we investigate whether economic policy uncertainty (EPU) leads banks to adjust their non-interest income activities (i.e. diversification decisions), and if the adoption of a negative interest rate policy (NIRP) influences the effect of EPU on banks. Using bank-level data comprising 3,913 banks in 9 countries over the period 2009-2018, we find that there exists a negative relationship between EPU and banks' non-interest income activities (proxy with gross non-interest income and expense).

Using an aggregate measure of bank diversification (proxied as net non-interest income), we find no significant effect of EPU. To document the absence of effect at the aggregate level, we decompose net non-interest income into gross non-interest income and gross non-interest expenses. In doing so, two results emerge: (i) a high EPU reduces the gross non-interest income of banks (such as net fees and commissions, and others non-interest income); (ii) banks reduce their gross non-interest expenses (i.e. personnel expenses and others non-interest expenses) sufficiently to compensate for the decrease in gross non-interest expenses. These results highlight the cautionary behavior of banks in times of high uncertainty.

Finally, we assess the role of NIRP on the dynamics between EPU and the banks' business model. We find that in a negative interest rate environment, the impact of EPU on banks' diversification decisions is lower, compared to the period before the introduction of NIRP. In addition, given the current health crisis affecting the global economy, a possible extension to our analysis could be to extend the coverage of our data beyond 2018 in order to analyze the behavior of banks in the face of rising uncertainties related to the Covid-19 crisis.

Overall, our results are important on at least two levels: (i) while the existing literature focuses on the overall impact of uncertainty on the real economy, the empirical results of this paper provide additional insights to better understand the role of financial intermediaries, in particular banks, in transmitting uncertainty shocks to the real economy; (ii) the cross-country analysis conducted in this paper contributes to the discussion on the increasing uncertainties and negative shocks more commonly observed in the global economy, especially after the Global Financial Crisis.

Compliance with Ethical Standards

No institutional or other funding has been provided for this article. As a result, there is no conflict of interest. Moreover, this article does not contain any studies with human participants or animals performed by any of the authors.

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Appendix

Table A1. Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Net non-interest income	31581	-0.01	0.124	-3.395	6.008
Gross non-interest income	32696	0.054	0.273	-2.328	9.587
Net fees and commissions	32737	0.022	0.13	-1.907	4.787
Other non-interest income	33678	0.037	0.177	-2.328	13.224
Gross non-interest expense	32311	0.068	0.207	-0.01	4.144
Personnel expense	32460	0.021	0.071	0	1.9
Other non-interest expense	33616	0.048	0.165	-0.021	14.622

Table A2. The evolution of bank diversification over the sample period

	Net non-interest income	Gross non-interest income	Gross non-interest expense
2009	-0.201	0.031	0.052
2010	-0.168	0.035	0.052
2011	-0.01	0.055	0.064
2012	-0.011	0.058	0.069
2013	-0.008	0.062	0.07
2014	-0.006	0.065	0.071
2015	-0.006	0.064	0.07
2016	-0.007	0.061	0.068
2017	-0.005	0.059	0.064
2018	-0.011	0.029	0.04

Note: This table reports the mean values of net non-interest income, gross non-interest income and gross non-interest expense for each year between 2009 and 2018. All these variables are scaled by total assets.

Table A3. The relationship between EPU and bank diversification: Other specifications

	Net non-interest income											
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
EPU_t-1	1.39E-05 [9.57e-06]	8.82E-06 [9.79e-06]	8.57E-06 [1.47e-05]	7.30E-06 [1.40e-05]	4.81E-06 [1.46e-05]	4.39E-06 [1.48e-05]	-2.45E-07 [9.92e-06]	-8.33E-06 [1.09e-05]	2.40E-06 [1.24e-05]	-3.75E-06 [1.07e-05]	-1.37E-05 [1.62e-05]	-2.54E-06 [1.03e-05]
Size_t-1				0.002 [0.00]	0.005 [0.01]	0.005 [0.01]	0.008 [0.01]	0.008 [0.01]	0.007 [0.01]	0.007 [0.01]	0.009 [0.01]	0.008 [0.01]
Capitalization_t-1					0.031 [0.04]	0.032 [0.04]	0.023 [0.04]	0.023 [0.04]	0.02 [0.04]	0.02 [0.04]	0.029 [0.04]	0.022 [0.04]
Liquidity_t-1						-0.005 [0.02]	-0.002 [0.01]	-0.002 [0.01]	0.001 [0.01]	0.001 [0.01]	-0.002 [0.01]	0.001 [0.01]
Funding_t-1							0.003 [0.01]	0.004 [0.01]	0.003 [0.01]	0.003 [0.01]	0.007 [0.01]	0.004 [0.01]
HHI								-0.095 [0.09]	0.048 [0.11]	0.025 [0.07]	-0.004 [0.05]	0.024 [0.07]
GDP									-0.002 [0.00]	-0.002 [0.00]	-0.001 [0.00]	-0.002 [0.00]
Inflation											-0.001 [0.00]	4.53E-05 [0.00]
Yield curve												0.001 [0.00]
Constant	-0.012*** [0.00]	-0.010*** [0.00]	-0.009*** [0.00]	-0.022 [0.03]	-0.046 [0.04]	-0.046 [0.04]	-0.072 [0.05]	-0.064 [0.05]	-0.07 [0.06]	-0.065 [0.05]	-0.078 [0.05]	-0.074 [0.06]
Observations	28199	28199	28199	27648	27607	27605	26736	26736	26736	26736	26736	26736
Number of banks	3913	3913	3913	3899	3898	3898	3754	3754	3754	3754	3754	3754
Bank FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
R2(within)	0	0	0.001	0.001	0.002	0.002	0.003	0.003	0.007	0.007	0.004	0.007

Note: EPU_t1 refers to Economic Policy Uncertainty index lagged by one year. Size refers to the natural logarithm of total assets. Liquidity is liquid assets to total assets ratio. Capitalization is equity to assets ratio. Funding is customer deposits to total assets. HHI is the Herfindahl-Hirschman index. Inflation is the yearly consumer price index. GDP is the real GDP growth rate. Yield curve is the difference between 10 year government bond and short term interest rate. Robust standard errors are in brackets. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.