Bank Lending in Dual Narratives: Economic Policy Uncertainty and Interest-Rate Derivatives

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This research aims to examine whether banks can employ interest-rate derivatives to mitigate or intensify the effects of economic policy uncertainty on bank lending. By testing two opposing hypotheses, it offers valuable insights into how the interplay between bank lending, interest-rate derivatives, and EPU can influence bank's loan growth. Using a sample of 1,285 Bank Holding Companies (BHCs) for the period from 1986 to 2017, panel regression analysis confirms a negative relationship between EPU and Commercial Industrial (C&I) loan growth. This negative association is not only statistically significant but also economically meaningful. Specifically, when EPU increases by one standard deviation, bank holding companies (BHCs) experience a decrease in loan growth rate by 91 basis points. While derivative users exhibit a significantly higher mean loan growth compared to non-users, the interaction term between interest-rate derivative usage and EPU is negative and statistically significant. This suggests that the usage of interest-rate derivatives aggravates the negative impact of EPU on bank lending.

Keywords: Economic Policy Uncertainty, bank lending, interest-rate derivatives, systemic risk

INTRODUCTION

The banking sector plays a pivotal role in the economic system. Bank lending is one of the gateways to real sector growth, to capital formation by firms, and to smoother consumption by households (Baker et al., 2013). It allows the economy to survive, grow, and flourish. On the contrary, economic policy uncertainty (EPU) is a channel through which political factors can derail the real economy (Dai and Zhang, 2019) and can lead to an epidemic of job cuts, investment halts, and consumption curtailment by firms and households (Bernanke, 1983, Baker et al., 2016; Gulen and Iron, 2016).

Financial risk management is a challenging task even under normal circumstances, but it becomes particularly complex when EPU is present (Hammoudeh and McAleer, 2015). This is especially true for the banking industry since it is highly susceptible to interest rate risk, which accentuates the importance of effective risk management during periods of elevated EPU (Tran et al., 2021). The literature contains well-documented empirical evidence showing that interest-rate derivatives are the primary tools used by banks to hedge interest rate risk (e.g., Akhigbe et al., 2018; Tran et al., 2021). Although there are numerous studies in the current literature on the impact of EPU on corporate activities (e.g., Julio and Yook 2012; Gulen and Ion 2016), there has been limited research exploring the interplay between bank lending, interest-rate derivatives, and EPU. This study aims to fill the research gap by investigating whether banks can utilize interest-rate derivatives to mitigate or intensify the effects of economic policy uncertainty on bank lending.

Using a sample of 1,285 Bank Holding Companies (BHCs) for the period from 1986 to 2017, I discover a notable negative relationship between EPU and Commercial Industrial (C&I) loan growth. This negative association is not only statistically significant but also economically meaningful. Specifically, when EPU increases by one standard deviation, BHCs experience a decrease in loan growth rate by 91 basis points. Furthermore, the findings indicate that BHCs employing interest-rate derivatives exhibit higher loan growth, aligning with previous studies that suggest the usage of interest-rate derivatives facilitates loan growth. While derivative users show a significantly higher mean loan growth compared to non-users, the interaction term between derivative usage and EPU is negative and statistically significant. This suggests that the usage of interest-rate derivatives aggravates the negative impact of EPU on bank lending. To address potential endogeneity issues, an instrumental variable approach is employed, and the main results remain robust and consistent.

This study intersects with two distinct strands of literature and contributes to both in several aspects. First, it extends previous research on derivative hedging by documenting a positive, significant relationship between interest-rate derivatives activities and loan growth in the presence of EPU for 1,285 BHCs between 1986 and 2017. Second, it contributes to the growing literature on EPU-bank lending by shedding light on the extent to which interest-rate derivative usage alleviate or worsen the impact of EPU on bank lending. To the best of my knowledge, this is the first paper studying how the use of interest-rate derivatives influences the impact of EPU on loan growth. By testing two opposing hypotheses, it offers valuable insights into how the interplay between bank lending, interest-rate derivatives, and EPU can influence bank lending behavior. Third, this research adds to the understanding of risk management strategies in the context of EPU and provides insights into the dynamics of bank lending in uncertain economic environments. The remainder of this paper unfold as follows: section 2 presents literature review and hypotheses development, section 3 discusses variables, and empirical specification, section 4 presents the empirical results and discussion, section 5 concludes the paper.

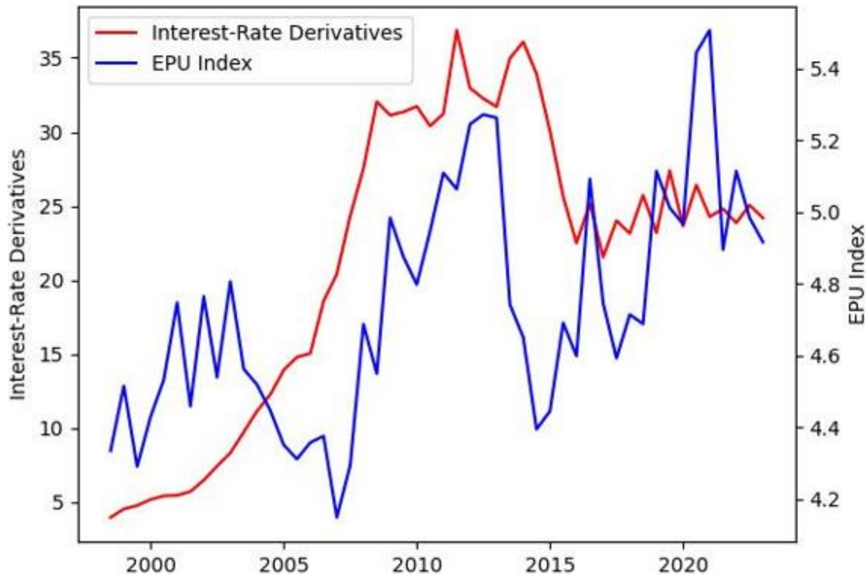
LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Literature sparkles with ample evidence of how EPU impact the real economic activities including corporate investment (e.g., Julio and Yook 2012; Baker et al., 2016; Gulen and Ion 2016); corporate debt financing costs (Waisman et al., 2015); merger and acquisition activities (Bonaime et al., 2018; Nguyen and Phan 2017); stock risk premium (Pastor and Veronesi 2012 and 2013); and option pricing (Kelly et al., 2016).

After the pioneering study by Bordo et al. (2016), a line of research on EPU-linked impact on bank-credit-growth has emerged. Bordo et al. (2016) provide the first broad look at US-based bank credit growth at both the aggregate and bank level using time series of EPU and finds a negative impact of EPU on bank liquidity creation. Subsequent research by Hu and Gong (2018) casts a spotlight on international evidence, accounting for cross-sectional variation in EPU, for the credit restraining effect of EPU through bank-lending channel. Their findings mirror the broad look of Bordo et al. (2016), with a special focus on confounding factors such as bank characteristics and prudential regulations at the national level. Specifically, they find that EPU's negative impact on loan growth is greater for larger banks and often for banks with riskier loans, while limited for banks that are more liquid and diversified. Additional research on the effect of EPU on banking behavior reveals that high EPU leads to increased loan loss provisions (Danisman et al. 2021), more reserved deposited funds (Lee et al., 2017); and weakened loan growth (Chi and Li, 2017).

To investigate the connection between interest-rate derivatives and EPU, I plotted the notional value of interest-rate derivatives as a percentage of U.S. Gross Domestic Product (GDP) and EPU between 1998 and 2022. As shown in Figure 1, the two variables seems to move in the same direction most of the time. This illustration could serve as initial evidence of hedging demand by the market participants, including lending institutions, during periods of high uncertainty.

FIGURE 1
PLOTS THE NOTIONAL VALUE OF INTEREST-RATE DERIVATIVES AS A PERCENTAGE OF GDP AGAINST NATURAL LOGARITHM OF EPU INDEX



The theoretical foundation of interest-rate derivatives as an effective hedging mechanism has been established in Diamond's theory of financial intermediation (Diamond 1984). In this model, Diamond demonstrates that, as a third form of contracting, derivative contracts promote the intermediary role of banks by reducing their exposure to systemic risk in the loan portfolio. This reduction allows banks to scale down the delegation cost and intermediate in a more efficient manner. Aimed at reducing systemic risk, derivative usage is empirically effective in mitigating the interest-rate uncertainty in bank lending and improving bank's stability and resilience.

Previous literature extensively documents the empirical evidence regarding the use of interest-rate derivatives. Expanding on Diamond's framework, Brewer et al. (2000) provide support by demonstrating that banks engaged in interest-rate derivatives exhibit higher loan portfolio growth compared to banks that do not participate in derivative activities. Purnanandam (2007) documents that the derivative user's lending volume exhibits less sensitivity to monetary policy shocks compared to non-users, as the derivative users can remain insulated from external shocks. Brewer et al. (2014) demonstrate that loan growth is less sensitive to core deposit growth for derivative-using banks, as interest-rate derivatives mitigate the adverse effects of interest rate uncertainty on lending. Moreover, Zhao and Moser (2017) find a direct relationship between interest-rate derivative usage and commercial and industrial loan portfolios by all FDIC-insured U.S. commercial banks with total assets greater than $300 million. They observe that this relationship holds for various types of interest-rate derivatives, including futures, forwards, and options. Furthermore, Nguyen et al. (2018) study the link between EPU and firm hedging decisions. They point out that derivative instruments could be utilized as effective risk management tools to hedge against interest-rate fluctuations and economic policy uncertainty.

Building on Diamond's (1984) diversification theory and existing empirical research, the following hypothesis is proposed:

H1: *Interest-rate derivatives usage mitigates the negative impact of EPU on bank lending.*

In the last few decades, the US banking industry has exhibited an increasing trend of derivative usage. According to the Quarterly Report on Bank Derivatives prepared by the Office of the Comptroller of the Currency (OCC), U.S. banks held notional derivatives amounts to $16.86 trillion in the fourth quarter of

1995 and $ $203.8 trillion in the first quarter of 2018, demonstrating accelerated growth during this period. In contrast, the total assets of banks that are engaged in derivative activities reveal far less growth than the gross notional value of derivatives. According to Bliss et al. (2018), in 2014, the notional derivatives positions exceeded the on-balance sheet assets of banks with derivatives by a factor of 17.5. This discrepancy implies the presence of significant complexities and risks associated with derivative usage (e.g., Tran et al., 2021).

Indeed, there are a separate body of research focusing on the direct relationship between total bank risk and derivative usage. For instance, Biais et al. (2016) argue that derivative activities, driven by the desire to share risk, have the potential to foster risk-taking by financial institutions. Moreover, empirical evidence (e.g., Angbazo, 1997) reveals a significant relationship between interest-rate risk, liquidity risks, and off-balance-sheet derivative activities. Chernenko and Faulkender (2011) also point out that derivative usage, when not effectively managed, can introduce risks that amplify the effects of uncertainty. For example, studies have shown that derivative usage could exacerbate loan loss provisions (LLPs) (Minton and Williamson, 2009), increase bank's credit risk exposure (Froot and Stein, 1998); and lead to increased counterparty risk (Deng el al., 2017). Additionally, Danisman and Ozili (2021) document a positive relationship between economic policy uncertainty (EPU) and bank's loan loss provisions, which could contribute to tightening lending conditions. Furthermore, it is important to recognize that while interest-rate derivatives may hedge against interest rate fluctuations and other uncertainties caused by EPU, it is also vital to acknowledge that EPU could pose challenges to borrowers' ability to repay loans in ways that derivative markets are unable to fully assess and protect against (e.g., Bordo et al. 2016; Karadima and Louri, 2021). Therefore, the complexities and risks introduced by derivative usage may interact with EPU, potentially negatively impacting the loan growth. As a result, the following hypothesis is proposed:

H2: *Interest-rate derivatives usage aggravates the negative impact of EPU on bank lending.*

DATA, VARIABLES, AND EMPIRICAL SPECIFICATION

To measure the key variable of interest EPU, I employ the EPU index developed by Baker et al., 2016[1]. The EPU index comprises three dimensions: (1) recurrence counts of newspaper wording of EPU, (2) uncertainty surrounded tax code expiration, (3) Dispute about forecasts on the major economic variables such as inflation and government spending. The sample consists of quarterly observations on U.S. bank holding companies (BHCs), spanning from 1986 to 2017. The data is obtained from Federal Reserve's Bank Holding Company (FR Y-9C) Reports. State employment data is collected from the U.S. Department of Labor Bureau of Labor Statistics. I narrow my focus to interest-rate derivatives usage, as they dominate the OTC derivative markets at an aggregate level [2], distinct from other derivative positions. Due to the tiered structure of U.S. bank holding companies [3], only the highest-tier BHCs are included in the sample (Brewer et al., 2014). Variable names and definitions are detailed in Table 1.

TABLE 1
VARIABLE DEFINITIONS

Variable	Definition
CILGA	The quarterly change in Commercial and Industrial (C&I) loans relative to the previous' period's total assets
CARATIO	the ratio of a bank's total equity capital to its total assets in the preceding period (t-1)
CILCOFA	the ratio of commercial and industrial (C&I) loan charge-offs in the preceding period (t-1) to the total assets in the same period (t-1)
CILGALAG	The fist lag of the dependent variable
DERIV	A dummy variable that takes the value of one if the BHC engages in any interest-rate derivative activity, zero otherwise
EPU	The BBD index constructed by Baker et al. (2016). The monthly index is converted into quarterly data to match BHC's quarterly data. The EPU variable equals natural log of quarterly value
EMPGR	The state (where the BHCs' headquarters are located) employment growth rate)
EDINTER	The interaction term between EPU and Interest-rate Derivative Activities

For the dependent variable, the total commercial industrial loans (C&I), I exclude BHC quarters with non-positive values. Moreover, BHCs with fewer than five observations are omitted from the data sample. Following the application of these data filters, the final sample consists of 1,285 bank holding companies with a total of 65,558 BHC-quarter observations. I then adjust all variables for inflation and express them in 1986 dollars. To mitigate the influence of extreme outliers on the empirical results, all variables were winsorized at the 1st and 99th percentiles. To test the hypotheses, I estimate the following panel data model:

$$CILGA_{i,t} = \alpha_0 + \alpha_i + \beta_1 EPU_{i,t} + \beta_2 Deriv_{i,t} + \beta_3 * Deriv_{i,t} * EPU_{i,t} + \beta_4 Control_{i,t} + \varepsilon_{i,t} \quad (1)$$

Following the literature on the determinants of bank lending (Bernanke and Lown 1991, Sharpe and Acharya 1992; Brewer et al., 2000&2001, Zhao and Moser 2017), I use the quarterly change in Commercial and Industrial (C&I) loans relative to the previous' period's total assets (CILGA) as the dependent variable. I then select BHC-level control variables including capital-to-asset ratio (CARATIO) to control for capital-induced results, and C&I loan charge-offs (CILCOFA) to control for loan quality. Another relevant control variable is CILGALAG, which is the lag of the dependent variable. Furthermore, the inclusion of the state's employment growth rate (EMPGR) accounts for the economic conditions at the state level where the headquarters of the BHCs are located (Brewer et al., 2000&2001). The key explanatory variable of interest is EPU. Following the methodology of Gulen and Iron, 2016, I measure the proxy for EPU by taking the natural logarithm of the arithmetic average of the monthly EPU index and then converting the monthly data to quarterly data. Another primary variable in the specification is Derivative activity (DERIV), which is an indicator variable that equals one if the BHC is an interest-rate derivative user and zero otherwise. To gauge how the use of interest-rate derivatives affects the relationship between EPU and loan growth, an interaction term $EPU_{i,t} * Deriv_{i,t}$ (EDINTER) is introduced. If the coefficient of the interaction term is positive and statistically significant, it supports Hypothesis 1, indicating that interest-rate derivatives usage mitigates the adverse effect of EPU on lending. If the coefficient of the interaction term is negative and statistically significant, it supports Hypothesis 2, suggesting that interest-rate derivatives usage aggravates the negative impact of EPU on bank lending.

EMPIRICAL RESULTS

Table 2 presents key statistics for the main variables of the entire sample. The mean value of loan growth is 0.035, indicating that the sample banks have experienced a loan growth of 3.5% in their commercial industrial loan portfolios. The capital ratio averages around 9.1% for bank holding companies. When examining the explanatory variable EPU, it shows a mean value of 4.57 with a standard deviation of 0.28. This result is generally comparable to findings in current literature (e.g., Danisman et al, 2021, Ashraf and Shen, 2019). The average C&I loan charge-offs is approximately 0.01%, and the average state employment growth rate is roughly 0.3%.

TABLE 2
SUMMARY STATISTICS

Variable	P5	P25	Mean	Median	P75	P95	Std Dev	N
CILGA	-0.115	-0.015	0.035	0.027	0.075	0.203	0.190	58080
CARATIO	0.054	0.072	0.091	0.086	0.072	0.103	0.041	58926
CILCOFA	0.000	0.000	0.001	0.000	0.001	0.003	0.002	58458
CILGALAG	-0.115	-0.015	0.035	0.027	0.097	0.075	0.190	58079
EPU	4.246	4.395	4.629	4.574	4.807	5.205	0.284	65554
DERIV	0.000	0.000	0.294	0.000	0.005	0.010	0.456	65554
EMPGR	-0.006	0.000	0.003	-0.003	0.023	0.141	0.005	65152
EQINTER	0.000	0.000	1.372	0.000	4.319	5.063	2.132	65554

The final sample consists of 1,285 bank holding companies with a total of 65,558 BHC-quarter observations between 1986 and 2017. The table reports the summary statistics for the variables. The statistics include P5, P25, mean, median, P75, P95, and standard deviation.

In Table 3, I present separate sample statistics for interest-rate derivative users and non-users. The result indicate that the group of derivative users exhibits significantly higher mean value of loan growth, a greater capital-to-asset ratio, and lower loan charge-offs compared to their non-user counterparts. Following Brewer et al. (2014), a univariate analysis is conducted to test whether the mean difference in loan growth between the interest-rate derivative users and its non-user counterparts is significantly different from zero. The results indicate that BHCs that uses interest-rate derivatives instruments report significantly higher loan growth (p value=0.024). Additionally, the Wilcoxon rank sum procedure is performed to test whether median loan growth between the two groups differs significantly from zero. The results of this procedure conclude that the median difference is indeed significantly different from zero (p value =0.0047).

TABLE 3
SUMMARY STATISTICS FOR DERIVATIVE USERS AND NON-USERS

	Derivative Users				Derivative non-users			
Variable	Mean	Median	Std Dev	N	Mean	Median	Std Dev	N
GILGA	0.037	0.028	0.188	19281	0.033	0.025	0.191	46273
CARATIO	0.098	0.093	0.004	19281	0.088	0.083	0.039	42693
CILCOFA	0.001	0.001	0.001	19281	0.001	0.002	0.002	42693
CILGALAG	0.038	0.026	0.187	19281	0.033	0.029	0.192	42673
EPU	4.663	4.605	0.328	19281	4.614	4.573	0.262	42673
EMPGR	0.002	0.003	0.005	19281	0.003	-0.045	0.005	42673

The final sample consists of 1,285 bank holding companies with a total of 65,558 BHC-quarter observations between 1986 and 2017. The table reports the summary statistics of variables for derivative users as compared to non-users.

Table 4 presents the correlations among the C&I loan growth and other variables. First, the correlation coefficients between C&I loan growth and EPU is -0.06 indicating a negative association between EPU and loan growth. Second, it shows that interest-rate derivative users experience positive loan growth, which is in line with the prediction of previous studies (e.g., Brewer et al., 2000). Third, the correlation between EPU and DERIV is 0.08, signifying a positive relationship between EPU and interest-rate derivative usage, which is consistent with the findings of prior studies (e.g., Tran et al., 2021). Lastly, a notable result is the relatively low correlation coefficients among variables, indicating a low possibility of multicollinearity (Danisman et al. 2021).

TABLE 4
CORRELATIONS

Variable		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CILGA	(1)	1.00							
CARATIO	(2)	0.05	1.00						
CILCOFA	(3)	-0.08	-0.13	1.00					
CILGALAG	(4)	0.01	0.02	-0.09	1.00				
EPU	(5)	-0.06	0.04	0.09	-0.05	1.00			
DERIV	(6)	0.01	0.12	-0.06	0.01	0.08	1.00		
EMPGR	(7)	0.06	0.00	-0.04	0.04	-0.24	-0.05	1.00	

The table reports the correlations between Loan growth and EPU, and other key variables that potentially affect loan growth. (1) to (8) represents the variables: loan growth, capital ratio, loan charge-offs, EPU, derivative usage, and state employment growth rate. Variable definitions are provided in table 1. The sample period is from 1986 to 2017.

To address the central question of this research study: "Does the usage of interest-rate derivatives impact the relationship between EPU and bank lending?" I estimate a regression model as specified in equation 1. In this regression, the dependent variable is C&I loan growth, while the independent variables include EPU, an indicator variable for interest-rate derivatives, the interaction between EPU and the interest-rate derivative indicator variable, and a set of control variables derived from relevant literature.

Table 5 reports the regression results for the sample period. The baseline model is presented in column (1), while the interaction-term augmented model is presented in column (2). As to BHC-level controls, I find that the overall empirical results align with previous studies in the literature. Specifically, loan growth is positively associated with capital ratio and negatively related to loan quality (proxied by loan charge-offs). This suggests that BHCs with strong capital positions and lower loan charge-offs experience higher loan growth. The state employment growth rate enters the specification with a significant positive coefficient estimate, consistent with the notion that BHCs enjoy a faster loan growth when the state economy is strong. The measure of BHCs' participation in interest-rate derivatives (DERIV) has a statically significant positive coefficient estimate, suggesting that BHCs using interest-rate derivatives are associated with higher loan growth. The result is in line with the findings of Brewer et al., (2000); Purnanandam (2007); Zhao and Moser (2017). The coefficient estimation on the key explanatory variable EPU is negative and significant at the 1% level. This suggests that economic policy uncertainty has a negative effect on BHC's loan growth. This result is consistent with the prior studies (Bordo et al., 2016, Hu and Gong 2018 etc.). Economically, a 1-standard-deviation increase in EPU (0.284) corresponds to a decrease in loan growth of 91 basis point (-0.032*0.284*100). This aligns with empirical evidence presented by Bordo et al. (2016), supporting their notion that EPU, as a macroeconomic factor, significantly impacts credit activities through the bank lending channel by affecting credit growth.

Next, I investigate whether the utilization of interest-rate derivative instruments by BHCs, in the context of EPU, can mitigate or exacerbate both total risk and systematic risk (specifically, interest-rate risk uncertainty) associated with bank lending activities. The interaction term between EPU and BHCs' derivative activities (EPU*DERIV) is examined. In Table 5 column (2). I expect that the interaction term will capture a joint effect of interest-rate derivatives usage and EPU on loan growth. The coefficient of the interaction term is negative and significant at the 5% level, signifying that the negative association between EPU and loan growth is more pronounced for BHCs that utilize interest-rate derivatives. This result suggests that when BHCs employ interest-rate derivatives as risk management tools, the adverse effects of EPU on lending are magnified. Derivatives can be sensitive to market conditions, liquidity constraints, and counterparty risks (e.g., Bodnar et al. 1996; Campa and Kedia, 2002; Angbazo, 1997). During periods of heightened uncertainty, these risks may become more intensified, thereby negatively impacting banks' lending capacity. It is also plausible that the utilization of interest-rate derivatives does not provide sufficient risk mitigation against the influence of EPU on bank lending. While derivatives can offer some protection against interest rate fluctuations, they might not effectively address the broader effects of EPU, such as its effects on economic fluctuations and volatility in the financial market (e.g., Kelley et al., 2016), regulatory policies (e.g., Gissler and Ruffino, 2016), or borrower creditworthiness and financial constraints (e.g., Bordo et al. 2016; Ashraf and Shen 2019). Taken together, this finding suggests that interest-rate derivative is an effective risk management tool for hedging against interest-rate uncertainty, but it has limitations in fully assessing and safeguarding against the challenges posed by EPU in bank lending.

TABLE 5
LOAN GROWTH, ECONOMIC POLICY UNCERTAINTY, AND DERIVATIVE ACTIVITIES

	Model 1		Model 2	
	Coefficient	T-statistics	Coefficient	T-statistics
Intercept	0.166	12.60***	0.139	6.93***
CARATIO	0.171	8.65***	0.173	8.74***
CILCOFA	-7.8	-16.31***	-7.85	-12.43***
CILGALAG	-0.001	-0.28	-0.001	-0.27
EPU	-0.032	-11.29***	-0.026	-5.27**
DERIV	0.0043	2.56**	0.0045	2.41**
EMPG	1.55	10.14***	1.54	10.49***
EPU*DERIV			-0.01	-2.71**
Fixed Effects	Yes		Yes	
Observations	56,507		56,507	
Adj. R^2	0.0132		0.0134	

The table reports the results of panel regression of the commercial industrial loan growth. The dependent variable is the quarterly change in Commercial and Industrial (C&I) loans relative to the previous' period's total assets (in percentage). The independent variables include capital ratio, loan charge-offs, EPU, derivative usage, state employment growth rate, interaction term between EPU and derivative usage. In the dataset, all variables have been winsorized at the 1st and 99th percentiles, adjusted for inflation, and are expressed in 1986 dollars. Variable names and definitions are detailed in Table 1. The sample period is from 1986 to 2017. All specifications include bank fixed effects. Robust standard errors are clustered at the bank level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Since the decision to use derivatives and lending choices may be interrelated and made simultaneously (e.g., Brewer et al., 2000; Zhao and Moser, 2017), this could potentially lead to endogeneity issues in the empirical results. To address this concern, an instrumental-variable approach is employed. Specifically, in the first-stage specification, I estimate the probability of a bank using derivatives using a probit model, following the methodology outlined by Kim and Koppenhaver (1993). Subsequently, the estimated probability of derivative usage serves as an instrument for derivative activity in the second-stage equation. A Hausman test confirms the validity of the instrumental variable. The key results, as reported in Table 5, remain robust.

CONCLUSION

Bank lending is crucial for real sector growth. On the other hand, EPU can have a detrimental impact on the broader economy. This paper aims to assess the influence of EPU on bank lending and to investigate how the utilization of interest-rate derivatives affects the relationship between EPU and loan growth. A large body of literature has examined the linkage between EPU and some real-economic-activities. However, in contrast to interest-rate uncertainty, many manifestations of EPU examined in these studies lack straightforward hedging mechanisms (Bretscher et al., 2018). In contrast, Interest-rate derivatives serve as primary tools employed by banks to hedge interest rate risk (e.g., Akhigbe et al., 2018; Tran et al., 2021) What remains unexplored in the existing literature is the extent to which the use of interest-rate derivatives influences the impact of EPU on loan growth. This study seeks to bridge the research gap. The empirical results confirm the negative effect of EPU on BHCs' commercial and industrial loan growth and indicate that BHCs would experience a decrease in loan growth rate by 91 basis points in response to a 1-standard-deviation increase in EPU. Furthermore, the negative effect of uncertainty on loan growth was intensified by the usage of interest-rate derivatives. The findings in this research complement the emerging studies on the effect of EPU on the banking system through the bank-lending-channel and highlight that the joint effect EPU and interest-rate derivative activity is negative and significant. Therefore, the broader impacts of EPU on bank lending, such as changes in economic conditions or borrower creditworthiness, may not be fully captured, or alleviated by interest-rate derivative usage. Policymakers ought to consider this complex interrelationship. It is essential for banks and financial institutions to carefully evaluate the potential risks and benefits of interest-rate derivative usage in the context of EPU. While derivatives can provide some degree of risk management, they should be employed alongside other risk mitigation strategies.

ENDNOTES

1. http://www.policyuncertainty.com
2. Examples See the BIS's OTC derivatives statistics at end-December 2017.
3. Since one BHC may own one or more other BHCs, therefore there could be double counting of the data if all tier BHCs are included (Brewer et al., 2014).

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