Climate change and bank performance

Abstract

We analyze the effect of climate change on bank performance measuring climate risk as both a physical risk of climate event hazard and a transition risk from moving toward a carbon neutral economy. We use the two-step System Generalized Method of Moment approach to model annual bank data across 180 countries around the world over the period 2005-2020. Our sample contains 12 548 banks. Results indicate that higher vulnerability to climate hazards in terms of sensitivity is associated to a better performance of banks. Moreover, better adaptative capacity of the country to climate change is associated with higher bank performance. Results indicate a stronger effect on return on equity.

Keywords: banks, financial intermediaries, performance, climate change,

JEL: G21, Q54

Introduction

Climate change is a major concern for international institutions and the financial system. Climate change is defined by the European Central Bank (EBC) through two main determinants: the physical risks of a changing climate (more frequent extreme weather events such as flooding, droughts and wildfires, hurricanes and high winds) and the transition risks from moving towards a carbon-neutral economy.

Previous research has extensively shown climate change has an impact on firm performance. The literature highlights a relationship with opposite directions. On the one hand, climate change can reduce business productivity and profitability of companies or lead to loss of real estate value (Lee et al., 2022) and, on the other hand, firms with environmental engagement increase their financial performance due to higher innovation that decrease product cost and improve the value (Caby et al., 2022).

Few are studied on bank performance on climate change. However, climate change affects banks since these climate change consequences on companies have also impact on bank's risk of credit, operational, liquidity or reputational because if banks don't support companies faced with climate change the market can associate the bank with adverse environmental impacts.

The relationship between climate change and banking is also suggested by international concerns and the current literature that shows climate change bank output measured by liquidity creation (Lee et al., 2022). ECB incites banks increasingly to include especially climate change in their strategy to support companies impacted by physical risks or entered into climate transition strategy and to maintain global financial stability through their lending. Besides, the Conference of the Parties (COP) to the United Nations puts pressure on banks to support and finance companies that contribute to reducing their greenhouse gas emissions and to decarbonising the economy. Consistent with Paris Agreements to achieve carbon neutrality in 2050, Net-Zero Banking Alliance based on 43 banks from 23 countries commits to include specially greenhouse gas emissions issues in their credit and investment activities even if the latest ECB supervisory stress test shows that banks do not yet sufficiently incorporate climate-related risks in their internal models and are "very timid" to implement climate change operationally (Caby et al., 2022).

International concerns and previous studies suggest Banking and climate change are linked. This study investigates if bank performance is affected by climate change.

The few current literature on climate change and bank performance is mainly focused on the impact of the one determinant of climate change, especially physical risk (Javadi & Masum, 2021; Zhang et al., 2022) or on the climate change management from banks (Caby et al., 2022). Other studies are focused on very specific contexts such as commercial banks (Li & Pan, 2022) or countries such as the United-States of America (Javadi & Masum, 2021) or China (Li & Pan, 2022).

We analyze the effect of climate change on bank performance using comprehensive proxies of climate change from the Notre Dame Global Adaptation Initiative following previous literature (e.g.Lee et al., 2022). These measures have information on climate risk sensitivity, exposure, and capacity. These measures account for both physical risk of climate event hazard and transition risk from moving toward a carbon neutral economy. We use the two-step System

Generalized Method of Moment approach to model annual bank data across 180 countries around the world over the period 2005-2020. Our sample contains 12 548 banks. Results indicate that higher vulnerability to climate hazards is associated to a better performance of banks. The exposure to climate change leads the stronger effect on bank performance. Moreover, better adaptative capacity of the country to climate change is associated with higher bank performance.

This paper contributes to enhance the empirical research by studying the impact of climate change on bank performance based on international context and by analyzing climate change as a whole by including its 2 main determinants.

The remainder of this paper is organized as follows. Section 2 reviews the relevant literature on the relationship between climate change and bank performance and presents research hypotheses. Section 3 describes data sources and the empirical model. Section 4 presents the empirical results and the discussions of the paper. Finally, Section 5 presents the conclusions and implications of the paper.

2. Literature review and hypothesis development.

The previous literature on the relationship between climate change and banking suggests that climate change mainly affects the performance of banks through its lending activities. The empirical studies show opposite results.

2.1 The positive impact of climate change on bank performance

Paris agreements expect decarbonising the economy to achieve carbon neutrality in 2050 or sooner. Consistent with this commitment, Li & Pan (2022) assume banks are likely to decrease loan scale to limit high energy consumption and high pollution industries and suggest banks are likely to make more loans to companies in decarbonising activity. Their results are consistent with their assumption. Li & Pan (2022) also assume the relationship between climate change and bank profitability is specially based on how banks include and manage climate change risks. For example, by fully predicting and incorporating climate change into their decisions-process, banks can increase their performance by charging the climate risk premium for the risk. However, their results didn't show a significant relationship.

Caby et al. (2022) studied climate change management from banks and their profitability. They argue current literature regarding the impact of environmental performance on corporate financial performance provides a relevant framework to assume the relationship between climate change and bank profitability. Some studies show firms with environmental engagement increase their financial performance due to higher innovation that decrease product cost and improve the value. Moreover, green firms have less business risk and are more competitive. As intermediate, banks can be affected by the relationship between environmental performance and corporate financial performance. The increase of innovation and the solvency from firms with environmental engagement has an impact on the increase of bank loans which in turn on bank profitability. By supporting the green economy, banks are consistent with environmental regulation to maintain financial stability and they reduce reputational risk.

Lee et al. (2022) investigated the impact of climate risk on bank liquidity creation. They assume bank liquidity creation is related to bank profitability since bank deposits, fees and commissions and net interest margin determine bank profitability and increase its liquidity.

Thus, an increase in bank liquidity underlies an increase in bank profitability. They mainly focused on 3 variables related to climate risk and the country's vulnerability to climate change: sensitivity, exposure and adaptive capacity. They show different relationships between determinants of climate change and bank liquidity that imply either a negative or positive effect on bank profitability. Regarding climate adaptation, their results reveal a positive relationship with bank liquidity creation. Lee et al. (2022) results show climate adaptation has more effects on liquidity creation specially for larger banks with lower capital, banks located in Asia or in lower-GDP and developing countries. Regarding the sensitivity and exposure variables, the authors show a negative relationship between climate change and liquidity creation, which will be developed below. Based on the above argument, we propose the hypothesis as follow:

Hypothesis 1a. Climate change increases bank performance.

2.2 The negative impact of climate change on bank performance

Bank profitability based on credit to firms is affected negatively by climate change because credits become bad debts (Li & Pan, 2022). Climate event or climate transition to neutral carbon leads to a decline in the production and productivity and an increase in costs which in turn have an impact on operating results, net result and solvency of companies. Regarding companies with high carbon emission, they have to increase their investment to manage their energy consumption. Li & Pan (2022) show the impact of climate change and China commercial banks profitability. Their results highlight a significant negative relationship especially due to the decrease of bank loans scale. Companies subject to physical climate risks constitute a risk for banks. In the transition climate perspective, banks are likely to reduce loan scale to companies with a high energy consumption in order to support Paris agreements. More specifically, banks are likely to reduce the loan approval rate or the loan limit to these companies (Li & Pan, 2022). The decrease of loan scale has a negative impact on income banks.

Javadi & Masum (2021) investigate the relationship between climate change and the cost of bank loans. They assume the bank includes climate change as a relevant risk factor when lending to firms affected by climate risk. When a bank assesses the ability of the firm to repay loans, it is likely to incorporate climate change on load contracts. Their results show a significant positive relationship between climate change and loan spreads. It suggests firms more exposed to climate change have higher loan spreads and pay significantly higher interest. Moreover, Javadi & Masum (2021) assumes climate change is a long-term risk and their results show loan spreads are higher for long-term loans and specially for poorly rated firms more susceptible to be exposed to climate risk. Banks are likely to grant less loans and automatically reduce their profitability.

Regarding the relationship between corporate environmental engagement and financial performance, Caby et al. (2022) point out that previous research has not always shown a significant positive relationship. They cited Horváthová's analysis of literature (2010) that concluded previous studies on the relationship between environmental performance and corporate financial performance are "inclusive". Empirical studies show a firm with environmental engagement decreases its value and solvency and leads to decreased bank loans.

The study of Lee et al. (2022) regarding the impact of climate risk on bank liquidity creation suggests climate change affects bank performance negatively. They suggest climate change decreases bank liquidity that is inherent in previous decrease of bank profitability. Their analysis of climate change is based on 3 variables: sensitivity, exposure and adaptive capacity.

Their results show a negative relationship with sensitivity and exposure variables. Sensitivity measures the dependance of the country in the sectors affected by climate change and which in turn affects people. It's related to socio economic context. Exposure assesses a system is exposed to future changing climate conditions from physical factors external. Their results show bank liquidity creation is negatively impacted by climate sensitivity and climate exposure as well. Based on the above argument, we propose the following hypothesis:

Hypothesis 1b. Climate change reduces bank performance.

3. Methodology

3.1. Measurement of study variables

3.1.1. Bank performance measures

In line with the relevant literature (e.g. Meslier et al., 2014; Ahamed, 2017), we employs two accounting ratios as measures of bank performance: return-on-asset (ROA), estimated as the ratio of profit before tax to total assets, and return-on-equity (ROE), measured as the ratio of profit before tax to equity. We use the profit before tax instead of the net income to calculi the ROA and ROA to avoid accounting differences driven by deferring tax regulations across the countries in our sample.

3.1.2. Climate change measure

We obtain the climate change measurements from the Notre Dame Global Adaptation Initiative (ND-GAIN) of University of Notre Dame. The ND-GAIN data allows us to analyze a country's vulnerability to climate change. Vulnerability stands for the propensity or predisposition of human societies to be negatively impacted by climate hazards. The ND-GAIN data allows to decompose a country's vulnerability to climate change in three dimensions: exposure, sensitivity, and adaptative capacity. The sensitivity index accounts for the extent to which people and the economics sectors they rely upon are affected by current climate-related perturbations. The exposure index examines the degree to which future changes in climate conditions will stress human society and economy. The adaptative capacity refers to a country's ability to make necessary adjustments in order to reduce potential damage and the negative impacts of climate change. Therefore, the smaller capacity index and the higher the sensitivity and exposure indices, the more sensitive a country is to climate change.

3.1.3. Control variables

We employ a number of bank-level and country-level controls. For bank-level controls, we use bank size (SIZE), the natural logarithm of total assets to control for size-induces bank difference; larger banks may have better opportunities of investments related to climate change than smaller one. We also include capital ratio (CAR) computed as tier 1 capital to total assets, operating cost (OPC) computed as operating costs to income, and liquidity (LIQ) computed as liquid assets to total assets. For macro-level controls, we use GDP per capita (GDP), inflation rate (INF), and unemployment (UNEM).

3.2. Data

We employ a sample of commercial banks in 180 countries around the world. Our sample contains 12 548 banks for the period of fifteen years (2005-2020). The bank-level data were obtained from the Moody's Analytics Bureau van Dijk Bankfocus database while the macro-economic data used in this study is sourced from the World Bank country indicators database.

3.3. Empirical strategy

This study examines the impact of climate change on commercial bank peformance by adopting empirical models used in similar studies (e.g. Addai et al., 2022 ; Mostak Ahamed, 2017). The baseline model for the impacts of diversification and foreign ownership on performance is expressed as follows:

$$Performance_{it} = \beta_0 + \beta_1 Climate + \beta_\Phi X_{it} + \beta_Y Z_t + V_{ijt} \tag{1}$$

Where i denotes bank i in country j in year t; *Performance* indicates bank performance measured by ROA or ROE; Climate is one of the four measures of climate change; X if a vector of bank-level controls and Z is a vector of country controls. $V_{ijt} = \mu_j + \lambda_t + \varepsilon_{ijt}$ where μ_j, λ_t and ε_{ijt} are the year effect, country effect , and the stochastic error term, respectively.

The past performance of banks may determine present performance and the explanatory variables in Eq. (1) may not be strictly exogenous. Thus, we employ a dynamic model, the System Generalized Method of Moment (SYS-GMM) estimator proposed by Arellano & Bover (1995) and Blundell & Bond (1998). By employing the SYS-GMM estimation method, we overcome two critical econometric issues: (i) since the prior values of performance can determine the present values to exploit the dynamic nature of the data. (ii) the explanatory variables may not be strictly exogenous, and the use of SYS-GMM can eliminate endogeneity issue while using lagged levels and lagged differences of the regressors as instruments (Addai et al., 2022). The dynamic form of the basic model is specified as follows:

$$Performance_{it} = \beta_0 + \beta_1 Performance_{it-1} + \beta_2 Climate + \beta_\Phi X_{it} + \beta_Y Z_t + V_{ijt} \tag{2}$$

4. Results and discussion

In table 1, we statistically describe our four sets of variables dealing with banks' performance and structure, adaptability to climate change and the macroeconomic environment. A strong heterogeneity among banks can be noticed in terms of operational costs (*Cost*), liquidities (*Liquidity*) and size (*Ln (TA)*) that report the largest gaps between the minimum and the maximum values. Additionally, the countries from our sample tend to be subject to a high degree of vulnerability to climate change consequences as suggested by the average of 0.36 for *Vulnerability*. However, some of the countries seem to lack social resources to implement sustainable adaptation solutions to global warming damage according to the standard deviation of *Capacity* that is the highest among our ecological variables.

{Table 1}

Static panel estimates based on a panel time-fixed effects approach with errors clustered at country level are presented in table 2 where we used our 3 time-variant environmental proxies, such as *Vulnerability* and its components (*Capacity* and *Sensitivity*). In this frame, we control for banking features through the 1-year lagged values of *Cost*, *Capital*, *Liquidity* and *Ln (TA)* and the macroeconomic environment through the 1-year lagged values of *GDPc*, *GDPg* and *Inflation*. In columns (1)-(5), we have considered *ROA* as dependent variable while in columns (6)-(10) the ratio between net income and equity (*ROE*). Significant and robust associations are revealed for all climate change variables, except for *Sensitivity*. The financial performance of banks seems to be higher in countries subject to a higher degree of ecological vulnerability (*Vulnerability*) where sustainable adaptation solutions were employed to address the effects of climate change (*Capacity*). More interestingly, the effect sizes of those variables are larger for *ROE*. Banks' financial performance may be expected to improve by 0.19 percentage points following a 0.01-point increase in the index of *Capacity*. Those preliminary estimates suggest that banks can effectively integrate the climate change risk affecting their operations and their debtors to generate higher margins of benefits. Additionally, the performance of banks as captured by *ROA* benefits from environments subject to economic expansion (*GDPg*). In terms of control variables, the banking performance benefits from a high level of liquidity that can help banks better seize investment opportunities and manage the payment of interest expenses (Chen et al., 2021).

{Table 2}

Furthermore, table 3 presents the dynamic panel estimates for our two measures of banking performance, namely *ROA* and *ROE*. Coefficients were estimated using a GMM (Generalized Method of Moments) system method with time effects, robust standard errors corrected for finite sample bias and collapsed instruments. The country's adaptability to the harmful effects of global warming as captured by *Capacity* significantly relates to our both dependent variables. Those estimates provide a solid support to our first hypothesis. In this regard, a degradation of 0.01-point rise in the climate change vulnerability index leads to an increase in the return on assets (return on equity) of the following year amounting to 0.02 (0.09) percentage points. Additionally, banks perform better in countries that benefit from important social resources that can facilitate the economic sectors adaptation to climate change (*Capacity*). As argued by Li and Pan (2022), the banking financial performance can be improved if the climate transition risk is incorporated in the overall risk management system and into banks' operations as an environmental risk premium. Our findings suggest that banks seem to be financially aware about the consequences of global warming. By anticipating such consequences, banks can optimize their decision-making process and investment strategies leading to higher ratios of *ROA* and *ROE*.

As expected, the values of *ROA* and *ROE* significantly diminish following an increase in the operating costs (*Cost*). Table 3 also points out a positive and robust association between the inflation rate (*Inflation*) and the banking performance. This confirms the previous findings of Athanasoglou et al. (2008) arguing that the profitability can be increased if banks' management can satisfactorily anticipate future inflation leading to an appropriate adjustment of interest rates. In this econometric framework, the autoregressive component (ROA_{t-1} and ROE_{t-1}) has a positive and significant coefficient similarly to other studies that applied the system-GMM to address the variance of banks' performance such as Pathan and Faff (2013) or Köster and Pelster (2017).

{Table 3}

5. Conclusion

Results show that the vulnerability of a society to climate change also measured as its sensitivity to climate-related events is associated to higher bank performance. These results are consistent with the view that the overall risk management system incorporates climate risk and into banks' operations as an environmental risk premium (Li and Pan, 2022). Moreover, the capacity of society to cope with climate change is associated to higher performance of banks.

The contribution of this research is to analyze the relationship between climate risk – measured comprehensively as both physical and transition risk – on bank performance. To the best of our knowledge, previous research focuses on either physical risk (e.g. Do et al., 2022) or transition risk (e.g. Caby et al., 2022). As financial performance of banks matters for financial and macroeconomic stability it is worth understanding better the effect of climate change on banks. Moreover, the relationship between climate change and bank performance would imply that policymakers should exercise caution when implementing climate-related strategies, as these can influence bank performance that matters for financial stability.

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Table 1. Descriptive statistics

Variable	Mean	Std.Dev.	Min	Max	Variable description
Banking variables					
ROA	0.010	0.009	0.001	0.030	Net Income / Total Assets
ROE	0.075	0.056	0.013	0.183	Net Income / Equity
Cost	0.648	0.150	0.397	0.867	Operating Costs / Operating Income
Capital	0.098	0.038	0.051	0.175	Tier 1 Capital / Total Assets
Liquidity	0.253	0.164	0.049	0.560	Liquid Assets / Total Assets
Ln (TA)	13.492	2.058	10.212	16.690	Natural logarithm of total assets
Environmental variables					
Vulnerability	0.363	0.077	0.249	0.688	Index that measures a country's exposure, sensitivity and capacity to adapt to the global warming consequences
Capacity	0.367	0.150	0.181	0.927	Index that captures the ability of a country to use available social resources to adapt to climate change
Sensitivity	0.306	0.063	0.159	0.634	Index that measures the climate risks impact on society and economic sectors
Macroeconomic Variables					
GDPc	27151.12	23076.94	278.203	182000	GDP per capita
GDPg	0.026	0.023	-0.012	0.068	Growth rate of national GDP
Inflation	0.032	0.028	0.003	0.096	Inflation measured by CPI

Table 2. Climate change and banking performance. A static panel approach

	Dependent variable = ROA					Dependent variable = ROE				
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**
Vulnerability $_{t-1}$		0.074***					0.462***			
		(0.017)					(0.149)			
Capacity $_{t-1}$			0.031***		0.030***			0.194***		0.190***
			(0.008)		(0.008)			(0.066)		(0.066)
Sensitivity $_{t-1}$				0.018	0.011				0.105	0.061
				(0.016)	(0.015)				(0.116)	(0.107)
Cost $_{t-1}$	-0.007***	-0.008***	-0.008***	-0.007***	-0.008***	-0.051***	-0.051***	-0.052***	-0.051***	-0.052***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Capital $_{t-1}$	0.005	0.005	0.005	0.005	0.005	-0.235***	-0.235***	-0.236***	-0.235***	-0.236***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
Liquidity $_{t-1}$	0.002**	0.002**	0.002**	0.002**	0.002**	0.015**	0.014**	0.014**	0.015**	0.014**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Ln (TA $_{t-1}$)	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001	0.000	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Ln (GDPc $_{t-1}$)	-0.001	-0.000	0.000	-0.001	0.000	-0.026	-0.019	-0.016	-0.026	-0.017
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.017)	(0.015)	(0.014)	(0.017)	(0.014)
GDPg $_{t-1}$	0.016***	0.017***	0.016***	0.016***	0.016***	0.147***	0.151***	0.148***	0.148***	0.149***
	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.034)	(0.034)	(0.035)	(0.034)	(0.034)
Inflation $_{t-1}$	0.009*	0.007	0.007	0.008	0.006	0.062*	0.049	0.049	0.060	0.047
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.037)	(0.038)	(0.037)	(0.037)	(0.038)
Constant	0.040***	0.003	0.014	0.035**	0.011	0.404**	0.168	0.235	0.372*	0.220
	(0.013)	(0.016)	(0.014)	(0.015)	(0.014)	(0.172)	(0.174)	(0.150)	(0.189)	(0.162)
Observations	32732	32730	32710	32726	32710	32729	32727	32707	32723	32707
Banks	6347	6346	6341	6345	6341	6346	6345	6340	6344	6340
Overall-R^2	0.327	0.300	0.363	0.298	0.345	0.367	0.319	0.363	0.337	0.351
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Banks' effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Coefficients are estimated using a panel time-fixed effects approach with errors clustered at country level. The dependent variable is *ROA* in columns (1)-(5) and *ROE* in columns (6)-(10).

Table 3. Climate change and banking performance. A dynamic panel approach

Variables	Dependent variable = ROA					Dependent variable = ROE				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable $_{t-1}$	0.392***	0.392***	0.395***	0.391***	0.395***	0.359***	0.356***	0.362***	0.359***	0.364***
	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
Vulnerability $_{t-1}$		0.016***					0.090***			
		(0.002)					(0.014)			
Capacity $_{t-1}$			0.013***		0.013***			0.107***		0.114***
			(0.001)		(0.001)			(0.010)		(0.010)
Sensitivity $_{t-1}$				0.002	-0.000				-0.023**	-0.043***
				(0.001)	(0.001)				(0.010)	(0.010)
Cost $_{t-1}$	0.002	0.002	0.002	0.002	0.002	-0.016	-0.018	-0.017	-0.017	-0.017
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Capital $_{t-1}$	0.053***	0.053***	0.055***	0.053***	0.055***	-0.179**	-0.191**	-0.169**	-0.179**	-0.167**
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.077)	(0.077)	(0.076)	(0.076)	(0.076)
Liquidity $_{t-1}$	-0.002	-0.002	-0.002	-0.002	-0.002	0.007	0.006	0.005	0.007	0.004
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Ln (TA $_{t-1}$)	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.007***	-0.008***	-0.007***	-0.007***	-0.007***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Ln (GDPc $_{t-1}$)	-0.001***	-0.000	0.000*	-0.001***	0.000	-0.010***	-0.005***	0.003*	-0.011***	0.002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
GDPg $_{t-1}$	0.028***	0.025***	0.016***	0.028***	0.016***	0.347***	0.332***	0.250***	0.342***	0.237***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.034)	(0.033)	(0.031)	(0.034)	(0.032)
Inflation $_{t-1}$	0.028***	0.030***	0.025***	0.029***	0.025***	0.182***	0.195***	0.159***	0.172***	0.139***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.028)	(0.028)	(0.028)	(0.027)	(0.027)
Constant	0.020***	0.006	-0.000	0.018***	-0.000	0.254***	0.179***	0.097***	0.268***	0.108***
	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.032)	(0.031)	(0.029)	(0.033)	(0.030)
Observations	32732	32730	32710	32726	32710	32729	32727	32707	32723	32707
Banks	6347	6346	6341	6345	6341	6346	6345	6340	6344	6340
Number of instruments	23	24	24	24	25	23	24	24	24	25
AR(1) (*p*-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) (*p*-value)	0.336	0.309	0.264	0.338	0.263	0.249	0.238	0.152	0.241	0.139
Hansen test (*p*-value)	0.234	0.176	0.167	0.227	0.169	0.039	0.045	0.030	0.046	0.034
DIH test of instrument subset for levels										
Hansen test excluding group	-	-	-	-	-	-	-	-	-	-
Difference (null H = exogenous)	0.234	0.176	0.167	0.227	0.169	0.039	0.045	0.030	0.046	0.034

Notes: Estimates are based on a GMM (Generalized Method of Moments) system method with time effects, robust standard errors corrected for finite sample bias and collapsed instruments. The table reports the two-step estimation. The dependent variable is *ROA* in columns (1)-(5) and *ROE* in columns (6)-(10). The first differences equation uses the first lagged values of the lagged dependent variable and of the financial banking variables. The level equation uses the time dummies, the environmental and macroeconomic variables and the first difference of the lagged dependent variable. Robust standard errors are reported in brackets. * implies significance at 10% level, ** at 5% level and *** at 1% level.