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Article

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GENERAL & APPLIED ECONOMICS | RESEARCH ARTICLE

Credit information sharing, nonperforming loans and economic growth: A cross-country analysis

Khanh Hoang^{1,2}, Son Tran^{1,2}, and Liem Nguyen^{1,2,*}

Abstract: Employing 3-Stage Least Squares (SLS) regression on the aggregate dataset of 120 countries from 2004 to 2017, this study is the first to investigate whether credit information sharing exerts impact on nonperforming loans of banking system and economic growth rate. First, our findings provide evidence of a negative association between bad debt levels and credit information sharing, suggesting that information sharing tends to enhance the financial sustainability of the banking sector. Furthermore, our study provides evidence in line with an indirect channel via which information sharing is conducive to economic growth: information sharing decreases the nonperforming loans, which hampers economic growth. This result remains unchanged due to the introduction of additional explanatory variables, as well as the use of an alternative dependent variable. Finally, policy implications are discussed based on the findings of the research.

Subjects: Economics; Finance; Business, Management and Accounting

Keywords: 3SLS; information sharing; nonperforming loans; economic growth

JEL Code: G15; O16

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PUBLIC INTEREST STATEMENT

Credit institutions require information to be able to assess the creditworthiness of borrowers. Credit information sharing through public and private bureaus has been serving this purpose, and it is in the interest of several stakeholders to examine the effectiveness of these entities. Also, bad debt can have negative effects on the economic growth, so we expect that thanks to its ability to mitigate informational issues, credit information sharing could reduce the negative effect of bad debts on the economy. In this paper, we use an aggregate dataset of 120 countries from 2004 to 2017 and several econometric techniques. It is found that credit information sharing helps reduce the bad debt ratio, thus improving the financial sustainability of the banking sector. Furthermore, thanks to the role of reducing nonperforming loans, credit information sharing indirectly improves the economic growth. Based on these findings, we provide policy implications to sustain the banking system and boost the economic growth.

1. Introduction

Theoretically, a financial system has a pivotal role in facilitating a country's economic growth. Traditionally, banks perform their financial mediation function of channeling funds from lenders to borrowers to support economic activities (Bouzgarrou et al., 2021; Derbali & Chebbi, 2018; Khalfaoui & Derbali, 2021). Nevertheless, the financial sector may operate inefficiently when there exists high levels of information asymmetry, inflicting damage to the whole economy. Information sharing bureaus are the tools that could be used to reduce information issues in the credit market, such as moral hazard and adverse selection (see, Triki & Gajigo, 2014).

The presence of information sharing mechanisms allows banks to alleviate borrowers' moral hazard and boost borrowers' motivations to pay back debt (Jappelli & Pagano, 2002). Information sharing conducted through the constitution of private bureaus and public registries is an enabler to banking system development (Barth et al., 2009). Previous studies show evidence in support of the argument that information sharing lowers moral hazard, adverse selections, and risk of over-indebtedness, thus curbing bad debts and enhancing banking soundness (Doblas-Madrid & Minetti, 2013; Guérineau & Léon, 2019; Houston et al., 2010; Padilla & Pagano, 2000; Pagano & Jappelli, 1993; Kusi et al., 2017; Jappelli & Pagano, 2002; Vercammen, 1995; Fosu, Danso, Agyei-Boapeah & Adegbite, 2020). Furthermore, Jappelli and Pagano (2002), Doblas-Madrid and Minetti (2013), and Fosu et al. (2020) argue that information sharing bureaus aid in reducing delinquency. Padilla and Pagano (2000) report that information sharing can decrease the default rates of borrowers by curtailing the hold-up issues, in addition to boosting borrower discipline. Guérineau and Léon (2019), Houston et al. (2010), and Kusi et al. (2017) provide similar findings.

Despite the fact that there have been numerous studies on the role of information sharing in reducing moral hazard and adverse selection issues, studies examining the association between information sharing and economic growth rates are scant (Loaba & Zahonogo, 2019). Theoretically, asymmetric information influences investment, and investment is, in turn, plays a significant role towards economic growth. Loaba and Zahonogo (2019) fail to find a significant linkage between credit information sharing and bank credit as well as economic growth rates, but this study only uses a sample of countries in West Africa.

In this study, we analyze whether information sharing reduces the adverse impact of bad debts on economic growth rate. Using dataset from the World Bank over 14-year period (2004–2017) covering 120 countries, we address two fundamental questions: First, is information sharing significantly associated with the level of nonperforming loans? Second, does information sharing weaken the adverse influence of bad debts on economic growth rate?

The present paper seeks to extend the literature in several ways. To start with, there is scarce evidence on the association between information sharing, nonperforming loans, and economic growth (Loaba & Zahonogo, 2019; Manz, 2019). Our findings respond to this call. Previous studies have suggested that financial intermediaries spur economic growth by channeling funds effectively (Diamond, 1984; Greenwood & Jovanovic, 1990). These studies, however, do not particularly investigate the role of financial intermediaries as information-sharing organizations as they impose effects on economic growth. Houston et al. (2010) claim that information sharing is positively associated with industrial growth, but why this positive effect exists has not been elaborated. On the other hand, Loaba and Zahonogo (2019) document that information sharing fails to be always positively associated with economic growth for a sample of West African countries. Second, while extant studies show some empirical evidence on the influence of information sharing on banking soundness, they do not explore the indirect impacts of information sharing on economic growth via banking channel.

Very few exemptions (see, for example, Loaba & Zahonogo, 2019) provide evidence on the impact of credit information sharing on bank fund levels rather than bank stability or banking soundness and economic growth. In this study, we offer proof that credit information sharing

tends to undermine the adverse impact of bad debts on economic growth. This conclusion is reached by estimating a system of two equations using 3SLS regression. Furthermore, the study of Loaba and Zahonogo (2019) only examines a sample of West African Economic and Monetary Union over the period from 2005 to 2015. We contribute by using the most updated dataset over 14-year period (2004–2017) for a sample of 120 economies, and investigating banking soundness in terms of nonperforming loans and loan loss provisions, which should be more relevant to the role of credit information sharing.

The remainder of our study continues as follows. After this introduction, Section 2 discusses theories and relevant studies regarding the link between information sharing, nonperforming loans, and growth. Section 3 outlines the research methodology, including estimation methods, models, hypotheses, and variable definition. Sections 4 and 5 present the estimation results to test the hypotheses as well as robustness tests. Section 6 concludes the paper with the policy implications and proposals for future research directions.

2. Theories and relevant empirical studies

The literature suggests that financial intermediaries have an important role in financial markets by alleviating information problems between savers and borrowers. The role of financial intermediation is stressed in theories dealing with asymmetric information or information sharing (Freimer & Gordon, 1965; Stiglitz & Weiss, 1981). Adverse selection and moral hazard resulting from information asymmetry negatively affect banking sector by reducing the efficiency in the provision of credit and causing nonperforming loans (Freixas & Rochet, 1997; Jappelli & Pagano, 2002; Stiglitz & Weiss, 1981). Therefore, information sharing bureaus can be the essential tools to reduce information-related issues in the credit markets (Triki & Gajigo, 2014). Consistently, credit information sharing agencies have been shown to play a vital role in the development of banking systems (Barth et al., 2009).

Previous studies suggest that information sharing might positively affect banking soundness via three channels that deal with moral hazard, adverse selection, and risk of over-indebtedness (Doblas-Madrid & Minetti, 2013; Guérineau & Léon, 2019). Regarding the first channel, information sharing institutions can lessen borrowers' moral hazard and boost borrowers' incentives to repay the loans because information sharing motivates debtors to behave (Jappelli & Pagano, 2002). According to Pagano and Jappelli (1993), the second channel is that information sharing among banks assists in reducing the risks and the lending rate, as well as adverse selection. Finally, information sharing can lower the risk of over-indebtedness, which is the third channel.

Specifically, credit information sharing decreases credit risk (Jappelli & Pagano, 2002; Kusi et al., 2017), default rates (Fosu et al., 2020; Houston et al., 2010; Padilla & Pagano, 2000; Vercammen, 1995), and banking system fragility (Guérineau & Léon, 2019). Kusi et al. (2017) render evidence that private and public credit bureaus decrease credit risk of banks in African countries. Houston et al. (2010) suggest that markets with information sharing among creditors can help improve bank profitability and lower default rates. The findings of Fosu et al. (2020) show that information sharing bureaus lessen default rate in developing countries. Padilla and Pagano (2000) and Vercammen (1995) report that information sharing can curtail the borrower hold-up issues and boosting borrower discipline, therefore decreasing the default rate of borrowers. In addition, Guérineau and Léon (2019) provide evidence that credit information sharing bureaus help undermine financial instability for both developed and developing countries.

Despite a considerable number of empirical works on the role of financial intermediation, the empirical studies dissecting the connection between credit information sharing and economic growth are scarce (Loaba & Zahonogo, 2019). Previous studies suggest that financial intermediaries spur economic growth by channeling funds effectively. Diamond (1984), Williamson (1986), and Greenwood and Jovanovic (1990) indicate that financial intermediaries can promote economic growth by reducing monitoring costs and channeling resources to the most efficient uses. Bencivenga and Smith (1991) show that a reduction of the unproductive liquid assets in the

form of savings is helpful to capital accumulation and economic growth. However, these studies do not focus on the role of information sharing on economic growth.

In addition, there have not been studies that investigate the channel through which information sharing can exert its impact on economic growth. We expect to find that information sharing can influence economic growth of a country indirectly, particularly through the effect on nonperforming loans of banks. Information sharing decreases information asymmetries between borrowers and lenders (Houston et al., 2010; Jappelli & Pagano, 2002); as a result, information sharing may increase banking soundness. Hence, we expect that information sharing should weaken the adverse effect of nonperforming loans on economic growth: information-sharing bureaus should provide much needed information about the true financial status, thus mitigating the association asymmetric information between borrowers and creditors. Due to lower level of asymmetric information between lenders and borrowers, the nonperforming loans in the presence of information sharing mechanisms are less likely to reflect the issue of moral hazards or adverse selection, but rather bad luck or systematic failure due to economic distress. Therefore, our testable hypotheses are as follows:

H1: information sharing is negatively linked to nonperforming loans.

H2: information sharing weakens the adverse effect of nonperforming loans on economic growth rate.

3. Research methodology

3.1. The collection of data

The current study covers 120 countries between 2004 and 2017 using aggregate data extracted from the World Bank dataset and the Financial Development and Structure Dataset (FDSD). Our choice of period under investigation is driven by data availability. Specifically, the World Bank only releases data on credit information sharing—proxied by the level of existence of public credit registries (PCR) and private credit bureaus (PCB)—from the year 2004.

3.2. Methodology

This research seeks to verify whether information sharing institutions decrease the adverse influence of nonperforming loans on economic growth rates. We strive to measure the direct effect of credit information sharing on nonperforming loans, and to uncover an indirect impact of information sharing (through the channel of nonperforming loans) on economic development. This, however, is problematic since nonperforming loans should be a decisive factor for economic growth, but the latter can be one of the explanatory variables explaining nonperforming loans. In an attempt to address the potential simultaneity issue, we rely on the techniques that allow the estimation of simultaneous equations of NPL and GDP. For the estimation of the models, 3SLS is expected to be more efficient than 2SLS since the former can address the interrelations of the errors from the two equations (Belsley, 1988). According to Nosier and El-Karamani (2018), the technique of 3SLS is highly relevant and effectively supports the verification of an indirect effect of a variable, if any, on economic development. As a consequence, the 3SLS estimator is employed in the present study to investigate the simultaneous equations discussed above.

The simultaneous equations are as follows:

$$NPL_{i,t} = \alpha_0 + \alpha_1 \cdot IS_{i,t} + \alpha_2 \cdot GDP_{i,t} + \alpha_3 \cdot HHC_{i,t} + \alpha_4 \cdot EFF_{i,t} + \alpha_5 \cdot PROF_{i,t} + \alpha_6 \cdot CAP_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$GDP_{i,t} = \gamma_0 + \gamma_1 \cdot IS_{i,t} + \gamma_2 \cdot NPL_{i,t} + \gamma_3 \cdot POP_{i,t} + \gamma_4 \cdot GOV_{i,t} + \gamma_5 \cdot FIXED_{i,t} + u_{i,t} \quad (2)$$

Where: $GDP_{i,t}$ and $NPL_{i,t}$ are the two endogenous factors. Following extant studies, including Park (2012), Tran et al. (2020), the ratio of nonperforming loans to total loans is built to measure banks' nonperforming loans.

3.2.1. Main independent variables

Credit information sharing (IS): Following Barth et al. (2009) and Triki and Gajigo (2014) and others, in this paper, we resort to public and private credit bureaus (PCR and PCB, respectively) as proxies of credit information sharing. We also sum PCB and PCR to derive the total coverage for information sharing institutions. Therefore, in total we have three proxies for IS in this paper.

3.2.2. Aggregate banking systems characteristics

EFF (Efficiency): Studies on the influence of bank efficiency on bad debt tend to offer mixed evidence at best. The skimping hypothesis argues that banks are prone to see an increase in bad debt if banks dedicate fewer resources to supervise loans (Berger & DeYoung, 1997). On the other hand, "bad management" hypothesis argues that cost inefficiency is likely to lead to higher levels of bad debt. The ratio of bank overhead costs to total assets is employed to control for factor of bank efficiency.

CAP, bank capital to total assets (CAP), is included in order to account for the impact of bank capitalization, in line with Park (2012). The moral hazard hypothesis suggests that bank capitalization has a negative influence on nonperforming loans (Keeton & Morris, 1987).

PROF (Profitability): The bad management hypothesis argues that banks with high profitability have lower incentives to involve in risky activities, therefore decreasing bad debts (Berger & DeYoung, 1997). PROF, measured by the ratio of net income to total assets, is included to deal with the effect of bank profitability.

3.2.3. Macroeconomic factors

GDP, the annual real GDP growth rate, is included to control for the influence of economic cycles. In an expanding economy, the level of nonperforming loans tends to reduce since the repayment capacity of firms and individuals receives a boost (Louzis et al., 2012).

HHC, measured by the ratio of household final consumption expenditures to GDP, is created to control for household spending. Household spending is meant to represent personal credit and is believed to be one factor that influences bad debt (Park, 2012). We assume a positive association between HHC and nonperforming debt ratio.

Following Levine and Renelt (1992), we propose a simple production function in which total investment of a country (FIXED), population growth rate (POP), and government expenditures (GOV) are the determinants of the GDP equation. FIXED, measured by the ratio of gross fixed capital formation to GDP, is utilized to take into account the total investment of a country. POP is used to control for the population growth rates. GOV, the ratio of government expenditures to GDP, is included to further consider government expenditures. For other variables, we rely on the same definitions as in equation [1].

4. Results and discussions

4.1. Data description

Table 1 presents descriptive figures of the variables. For the dependent variable, the mean of NPL is about 5.66%. For the whole sample, GDP growth rate is about 3% per annum on average. Our variables of interest, PCB and PCR, have means of roughly 45% and 16%, respectively.

Table 1. Descriptive statistics of variables

Variable	Obs	Mean	Std. Dev.	Min	Max
NPL	748	5.663	6.717	0.146	54.541
PCB	748	45.487	36.808	0.000	100.000
PCR	748	15.641	23.701	0.000	100.000
GDP	748	2.984	3.643	-14.814	25.163
HHC	748	59.736	13.386	12.775	94.232
EFF	748	3.052	2.434	0.109	28.011
PROF	748	1.280	2.068	-24.117	15.054
CAP	748	9.254	3.340	0.000	23.011
GDP	748	2.984	3.643	-14.814	25.163
POP	748	0.991	1.094	-2.258	6.028
FIXED	748	23.914	6.190	10.217	50.807
GOV	748	16.209	4.743	5.116	30.004

Source: Calculation from dataset.

Table 2. Correlation matrix between variables

	GDP	NPL	PCB	PCR	PROF	HHC	CAP	EFF	GOV	FIXED	POP
GDP	1.000										
NPL	-0.069	1.000									
PCB	-0.163	-0.144	1.000								
PCR	-0.082	-0.069	-0.081	1.000							
PROF	0.255	-0.246	-0.153	-0.088	1.000						
HHC	-0.020	0.256	-0.109	-0.063	0.112	1.000					
CAP	0.181	0.123	-0.098	-0.034	0.281	0.258	1.000				
EFF	0.071	0.144	-0.109	-0.054	0.188	0.308	0.232	1.000			
GOV	-0.309	-0.111	0.249	0.010	-0.164	-0.327	-0.264	-0.187	1.000		
FIXED	0.260	-0.209	-0.183	0.034	0.112	-0.308	0.087	-0.090	-0.058	1.000	
POP	0.171	-0.054	-0.275	-0.134	0.183	-0.122	0.060	0.001	-0.233	0.034	1.000

Source: Author's calculation.

Table 2 gives the pair-wise correlation matrix of the variables. PCB and PCR have a negative association with NPL, and NPL is negatively linked to GDP growth. However, there is a negative association between PCB and PCR and GDP growth. Also, the low coefficients between pairs of variables suggest that the problem of multicollinearity is not considerable in this article. Nevertheless, these tentative explanations do not establish a valid basis for the conclusion of the impact of PCB and PCR on growth and bad debt ratio; as a consequence, we continue by estimating models to empirically examine the hypotheses.

4.2. Empirical results

4.2.1. The effect of information sharing on nonperforming loans

This section displays the results from the model estimation. We sum PCB and PCR to derive the total coverage for information sharing institutions (TIS). **Table 3** provides empirical results on the impact of total information-sharing coverage and nonperforming debt rate on economic growth. In column (1), the results suggest that the total coverage of information sharing institutions has

Table 3. Total coverage of information sharing, nonperforming loan rate and economic growth

	Dependent variable			
	NPL		GDP	
	Coefficients	Standard errors	Coefficients	Standard errors
NPL			−0.166***	(0.062)
TIS	−0.029***	(0.006)	0.001	(0.004)
GDP	−0.589***	(0.156)	-	
HHC	0.054***	(0.016)	-	
EFF	0.086	(0.087)	-	
PROF	−1.018***	(0.135)		
CAP	0.304***	(0.069)	-	
POP	-		0.498***	(0.137)
FIXED	-		0.119***	(0.023)
GOV	-		−0.238***	(0.025)
CONS	4.180*	(1.104)	4.484	(1.249)
R ²	0.129		0.210	
No of obs	748		748	

Notes: *, **, and *** show 10%, 5%, and 1% level of significance. Standard errors are those in parentheses.

a significant and negative impact on the nonperforming loans. The results also imply that the growth of information sharing institutions consolidates banking systems. This is consistent with the findings of Houston et al. (2010), Guérineau and Léon (2019), Fosu et al. (2020), which conclude that information sharing reduces credit risk, default rates, and banking system fragility. The research results provide support for our first hypothesis as well.

For control variables, efficiency (EFF) has an insignificant influence on nonperforming debt. Bank profitability is negatively correlated with bad debt. This is in support of the bad management hypothesis documented in Berger and DeYoung (1997). This result is also in accordance with Louzis et al. (2012). Bank capital (CAP) is positively associated with nonperforming loans, which is in line with moral hazard hypothesis established in Keeton and Morris (1987). GDP is negatively associated with nonperforming loans, and in an expanding economy, nonperforming loans of banking sector tend to decrease. In contrast, higher levels of household credit (HHC) lead to increases in nonperforming loans.

Regarding information sharing bureaus (PCB and PCR), from column (1) in Table 4, we find that PCB and PCR have a negative relationship with the nonperforming debt, suggesting that information sharing bureaus promote banking soundness by alleviating the potential asymmetric information between lenders and borrowers. This is consistent with the findings of Jappelli and Pagano (2002), Doblas-Madrid and Minetti (2013), and Guérineau and Léon (2019). The more negative coefficients of PCR relative to that of PCB suggest that PCR may play a more significant role compared to PCB for banking soundness. There are also no significant changes in the coefficients of the control variables. These findings support Hypothesis 1, which states that information sharing reduces nonperforming loans of banks or promotes banking soundness.

4.2.2. Indirect impact of credit information sharing on the economic development

In column 2 of Tables 3 and 4, NPL is negatively linked to economic growth. However, the negative coefficients of total coverage of information sharing institutions (TIS) and PCR and PCB suggest that there is proof supporting the existence of the indirect channel in which information sharing promotes growth: information sharing decreases nonperforming debt, and this in turn increases

Table 4. Information sharing in terms of PCB and PCR, nonperforming loans and economic growth

	Dependent variable			
	NPL		GDP	
	Coefficients	Standard errors	Coefficients	Standard errors
NPL			−0.165***	(0.062)
PCB	−0.027 ***	(0.007)	0.001	(0.004)
PCR	−0.036***	(0.010)	−0.001	(0.181)
GDP	−0.576***	(0.155)	-	
HHC	0.055***	(0.016)	-	
EFF	0.084	(0.087)	-	
PROF	−1.024***	(0.134)		
CAP	0.306***	(0.070)	-	
POP	-		0.478***	(0.139)
FIXED	-		0.121***	(0.023)
GOV	-		−0.242***	(0.025)
CONS	4.086***	(1.104)	4.540	(1.249)
R ²	0.132		0.215	
No of obs	748		748	

Notes: *, **, and *** show 10%, 5%, and 1% level of significance. Standard errors are those in parentheses.

economic growth. Such results show evidence in support of Hypothesis 2, i.e., information sharing weakens the adverse effect of nonperforming loans on economic growth.

Information sharing mitigates information asymmetries between borrowers and creditors, contributing to the soundness of the banking system. Information sharing institutions should provide much needed information about the true financial status and debt obligations that borrowing firms hold, significantly increasing the information flow between borrowers and lenders. Consequently, it is expected that information sharing should weaken the adverse effect of nonperforming loans on economic growth. Other control variables in the GDP equation such as total investment of a country (FIXED), growth rate of the population (POP), government expenditures (GOV) also have significant expected signs.

5. Robustness checks

In order to ensure the robustness of research findings, we perform a comparative investigation of the impact of information sharing and nonperforming loan on economic development by using an alternative dependent variable, and introducing additional explanatory variables.

5.1. Alternative dependent variable

LLP, loan loss provisions to bank total loans, is used to control for the bank asset quality indicator (Le et al., 2021; Williams, 2004). Supposing that loan loss provisions for nonperforming loans are equivalent to the volume of nonperforming loans, an economy with a higher volume of bad debt is expected to accrue more LLP. Since the data on this ratio, however, is not directly available from the Financial Development and Structure Database, we obtain this measure through the multiplication of loan loss provisions/nonperforming loans by nonperforming loans/total loans. The results are highly consistent with those reported earlier, as shown in Table 5. To be specific, the variable of total coverage of information sharing (TIS) is still negatively and significantly related to LLP. The negative association

Table 5. Robustness test (1): alternative dependent variable

	LLP		GDP	
	Coefficients	Standard errors	Coefficients	Standard errors
LLP			−0.325**	(0.125)
TIS	−0.013***	(0.003)	−0.001	(0.004)
GDP	−0.135	(0.082)	−	
HHC	0.042***	(0.090)	−	
EFF	0.128**	(0.051)	−	
PROF	−0.629***	(0.082)		
CAP	0.161***	(0.039)	−	
POP	−		0.415***	(0.140)
FIXED	−		0.115***	(0.024)
GOV	−		−0.292***	(0.030)
CONSTANT	1.161*	(0.628)	5.726	(1.436)
R ²	0.146		0.210	
No of obs	718		718	

Notes: *, **, and *** show 10%, 5%, and 1% level of significance. Standard errors are those in parentheses.

between LLP and GDP provides evidence in support of Hypothesis 2. Meanwhile, all control variables show significant expected signs in all models.

5.2. Alternative determinants

We provide two new variables: financial sector credit (measured as domestic credit granted via financial sector, calculated in terms of % of GDP) in NPL models and TRADE (total of export and import over GDP) in GDP models as the additional explanatory variables. Next, we dropped HHC since it can be replaced by financial sector credit.

From Table 6, the coefficient of NPL is negatively associated with GDP. The total coverage of credit information sharing (TIS) is still negatively and significantly related to NPL. These findings once again provide evidence in support of Hypothesis 2. Meanwhile, all control variables show significant expected signs in all models.

6. Conclusion

Using the aggregate dataset of 120 countries from 2004 to 2017, this study is the first to investigate whether information sharing exerts impact on nonperforming loans and economic growth. We document some significant findings. First, there exists a negative link between credit information sharing and nonperforming debt, implying that information sharing increases the banking stability. Second, we argue that there is an indirect channel through which information sharing promotes economic growth: information sharing decreases bad debts, and this in turn facilitates the growth of an economy. This finding is robust to alternative dependent variables as well as alternative explanatory variables.

Even though the previous works on information sharing and the role of financial intermediation are abundant, the examination of the indirect impact of credit information sharing on economic development via banking channels is scant. Particularly, the assessments of the links between credit information sharing institutions, nonperforming loans, and economic growth are relatively scarce. Our results are consistent with the studies of Fosu et al. (2020); Houston et al. (2010), and Guérineau and Léon (2019), which conclude that information sharing structures reduce credit risk, default rates, and banking system fragility. The findings in this study are also in line with the view that financial

Table 6. Robustness check (2): alternative determinants

	Dependent variable					
	NPL		GDP			
	(1)	(2)	(1)	(2)	(1)	(2)
NPL					−0.189** (0.063)	−0.131** (0.062)
TIS	−0.029*** (0.006)		−0.028*** (0.006)		−0.002 (0.004)	0.000 (0.004)
GDP	−0.626*** (0.156)		−0.641*** (0.164)		-	-
HHC	0.051*** (0.016)		-		-	-
FINANCIAL SECTOR CREDIT			−0.000 (0.005)			
EFF	0.083 (0.086)		0.154* (0.089)		-	-
PROF	−0.981*** (0.135)		−0.966*** (0.130)			
CAP	0.292*** (0.069)		0.352*** (0.070)		-	-
POP	-				0.471*** (0.139)	0.527*** (0.133)
FIXED	-				0.114*** (0.023)	0.129*** (0.022)
GOV	-				−0.233*** (0.025)	−0.219*** (0.024)
TRADE					0.001 (0.001)	0.002 (0.002)
CONS	4.584*** (1.097)		6.779*** (1.110)		4.668*** (1.315)	3.527*** (1.215)
R ²	0.120		0.104		0.191	0.223
No of obs	748		734		748	734

Notes: *, **, and *** show 10%, 5%, and 1% level of significance. Standard errors are those in parentheses.

intermediation can promote economic growth, i.e., information sharing weakens the negative repercussions of nonperforming debt on economic growth. This paper also contributes by extending the study of Loaba and Zahonogo (2019) by using the most updated dataset over 14-year period (2004–2017) for a sample of 120 economies, and investigating another aspect of the banking system which is banking soundness, rather than only bank credit.

Based on our findings, the main policy implication is that, as information sharing institutions increase banking soundness and economic growth, better coverage of information sharing systems can help economic development. We find that PCR might play a more important role compared to PCB for banking soundness. As a consequence, countries could either promote PCB to make these agencies more useful, or if limited in terms of resources, strengthening the quality PCR should be the priority.

Information technology such as the use of information and communication technologies can affect financial sector (Asongu et al., 2019). To extend this research, other studies may verify the impact of technology-driven credit information sharing structures on the financial sectors and economic growth.

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correction

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