

Digital Divide and Bank Performance in the Economic and Monetary Community of Central Africa ZONE

Fracture numérique et performance des Banques de la Communauté Économique et Monétaire des États d'Afrique Centrale

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Date de soumission : 05/02/2023

Date d'acceptation : 11/05/2023

Pour citer cet article :

DJOUM. K. S. (2023) «Digital Divide and Bank Performance in the Central African Economic and Monetary Community ZONE», Revue Française d'Economie et de Gestion «Volume 4 Numéro 5 » p : 276 – 289.

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Abstract

Improving the performance of financial institutions has been an ongoing interest in the literature. The theoretical literature is positive about the role of digitization very little work postulates a role for the digital divide. Also, in developing countries such as those of the Economic and Monetary Community of Central Africa (CEMAC), access to digital services remains a key problem. In order to contribute to this literature gap, The objective of this paper is to analyse the effect of the digital divide on the financial performance of banks in the Economic and Monetary Community of Central Africa (CEMAC) over the period 1993 to 2022. To this end, we have estimated a panel data model with the Fixed Effect Ordinary Least Square regressor technique of Driscoll & Kraay (1998). The results show that digital divide has negative effect on the Banking financial performance in the CEMAC zone. This remains the same when the digital divide index is disaggregated into its various dimensions, including the mobile, broadband, internet and fixed telephone divides. The results are robust despite the use of an alternative indicator of the digital divide. This leads to recommendations for improving the access of economic agents to digital services.

Keywords: Digital divide; Fixed-effect model; Bank performance; Economic and Monetary Community of Central Africa; digitization.

Résumé

L'amélioration des performances des institutions financières fait l'objet d'un intérêt constant dans la littérature. La littérature théorique est positive quant au rôle de la numérisation, mais très peu de travaux postulent sur le rôle potentiel de la fracture numérique pour expliquer la performance financière. Aussi, dans les pays en développement tels que ceux de la Communauté économique et monétaire de l'Afrique centrale (CEMAC), l'accès aux services numériques reste un problème majeur. Cet article a pour objectif d'analyser l'effet de la fracture numérique sur la performance financière des banques en zone CEMAC entre 1993 et 2022. À cet effet, nous avons estimé un modèle de donnée de panel avec effet fixe à estimateur MCO censuré de l'estimateur de Driscoll & Kraay (1998). Les résultats montrent que quel que soit l'indice de fracture numérique utilisé, il a un effet négatif sur la performance financière des banques en zone CEMAC. Cet effet reste le même après décomposition de l'indice de fracture numérique dans ses différentes dimensions notamment de fracture de téléphone mobile, de bande passante, d'internet et de téléphone fixe. Ce résultat est robuste suivant l'usage d'un indicateur alternatif de fracture numérique. Ce résultat suggère des recommandations allant dans le sens de l'amélioration de l'accès des agents économiques aux services numériques.

Mots clés : Fracture numérique ; modèle à effet fixe ; Communauté Économique et Monétaire des États d'Afrique Centrale ; digitalisation ; performance bancaire.

Introduction

Improving the performance of financial institutions has been an ongoing interest in the literature. Indeed, a financial institution with good financial performance is likely to be more successful in terms of financing economic activities (Levine, 1997; Aghion et al., 2005; Pagano & Pica, 2012). Statistics from FinStats¹ (2018) reveal that African countries have a considerably less developed financial system compared to other regions of the world. Indeed, an examination of two banking performance indicators such as the ratio of "deposits with banks/GDP" and the ratio of "credit to the private sector/GDP" in Africa shows that these are 27% and 18% respectively in Africa compared to 42% and 34% on average in other Developing Countries (DCs). Also, the gap between deposits and credits shows that African banks are less efficient in intermediating savings, with private sector credits representing less than 50% of bank deposits in these countries compared to more than 80% in other developing countries. This underperformance of financial institutions has prompted some theoretical and empirical contributions in the literature. This literature generally classifies the explanatory variables of bank performance into internal determinants, which include bank-specific factors related to their management such as capital, liquidity, asset quality, diversification, operational costs and size; and external determinants, which are related to a set of macroeconomic factors that affect bank performance (Dermiguc Kunt & Huizinga, 1999 ; Thalassinos & Thalassinos, 2018 ; Abreu & Mendes, 2002 ; Goddard et al., 2004 ; Ben Naceur & Goaeid, 2008 ; Kosmidou et al., 2005; Athanasoglou et al, 2008; Anbar & Alper, 2011; Rekik & Kalai, 2018; Hughes et al, 2019; Rupeika-Apoga et al, 2018) . As such, Ferreira & Filipe (2018) analysed the impact of board quality on the performance of Portuguese banks, as measured by return on assets and return on equity and conclude that the level of education positively influences ROA and ROE ratios. Also, KuKaj et al. (2020) analyse the impact of profitability on return on assets and conclude that ROE and profit margins are important variables to explain bank performance. Despite the fruitfulness of these works, little attention is given to the role of digital divide as a determinant of bank performance. Thus, our question is *what is the effect of digital divide on the bank's performance in the CEMAC² zone?* The objective of this paper is to analyse the effect of digital divide on the bank's performance in the CEMAC zone.

While the theoretical framework underlying such a link can be traced back to Schumpeter's (1934) work, particularly with regard to the analysis of the effects of technology on economic

¹ Global Financial Development statistics (2018),

² Cameroon, Gabon, Chad, the Republic of Congo and the Central African Republic.

and financial variables, it is worth referring to Rallet & Rochelandet's (2004) work for a definition of digital divide. Thus, the digital divide refers to inequalities in access to digital information and use of ICT content and services that exist amongst persons (Rallet & Rochelandet, 2004). This formulation yields two aspects of the digital divide. The first, referred known as the first-level gap, refers to disparities in ICT access (Le Guel, 2004; Rallet & Rochelandet, 2004). The second form of the digital divide focuses on differences in ICT use rather than access (Hargittai, 2002). It characterizes Internet users' capacity to use the Internet "effectively and efficiently." These access and use disparities, as well as other economic and social differences, can be exacerbated if adequate policies are not in place to ensure that every individual, community, or people has the opportunity to create, obtain, use, and share information and knowledge in order to realize their full potential for development and well-being, thereby limiting bank performance (Bakehe et al., 2017).

At least two transmission channels support the notion of a digital divide effect on bank performance. The first is that of information production and transaction cost reduction. Indeed, the high level of digital financial service penetration minimizes the level of financial instability inherent in the many types of human behavior in banking markets. Indeed, according to authors such as Goel & Hsieh (2002), Asongu & Nwachukwu (2016), Gonzalez & Paramo (2017), Owusu - Agyei et al. (2020), and Mignamissi & Didjo (2021), the increased use of digital technology forces banking companies to improve financial services by lowering the cost of capital. This lowers unfavourable selection biases that lead to inefficient financial contracts. Another important channel is financial literacy. In fact, one's level of financial education has a considerable impact on one's knowledge and use of digital tools. These, in theory, should make it easier for customers to find banking and financial services, hence improving banks' financial performance ratios (Hasan et al., 2020).

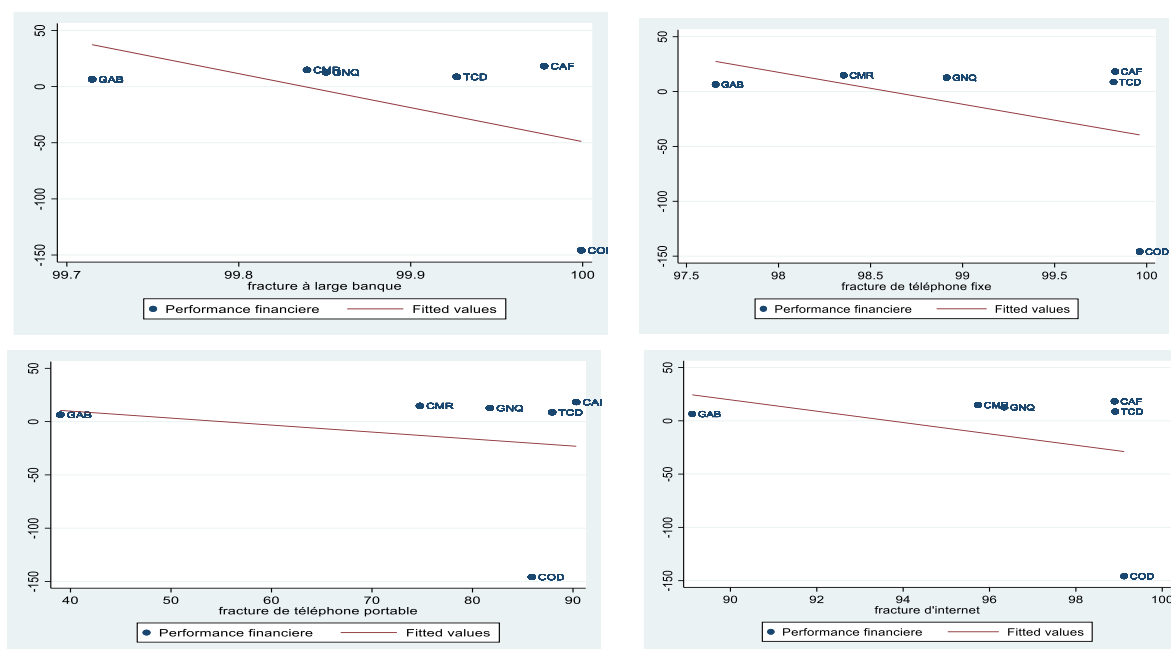
This paper, positioned in the extension of the existing literature on the determinants of the performance of banks, has a double interest. The first is that, to the best of our knowledge, this study is the first to analyse the effects of the digital divide on the performance of banks in Africa and especially in the CEMAC zone. The second interest of this study is that it proposes to make a comparative analysis of each type of digital divide on banking performance in CEMAC. To achieve our objective, we have estimated a panel data model with the Fixed Effect Ordinary Least Square regressor technique of Driscoll & Kraay (1998) in the Economic and Monetary Community of Central Africa (CEMAC) over the period 1993 to 2022. The rest of the paper is structured as

follows. Section 1 presents the stylised facts; Section 2 describes the methodological framework; Section 3 presents the results and Section 4 concludes.

1. Stylized facts

Bank performance is referred to the main driver of profitability generated from their activities (Quoc Trung, 2021). Generally, the popular ratios are used to measure bank performance as return on assets (ROA) and return on equity (ROE). According to digital divide, it refers to “*the gap between those who have access to IT and those who do not*” (Rice & Katz, 2003). The graphs below highlight the link between each of the dimensions of digital divide and the financial performance of banks in the CEMAC zone.

Figure 1: Link between digital divide and financial performance



Source: Author

Note: Cameroon (CMR), Gabon (GAB), Chad (TCD), the Republic of Congo (COG) and the Central African Republic (CAR)

Figure 1 shows an a priori negative relationship for each of the different numerical divide indicators with the financial performance of banks in the CEMAC. However, the effect varies according to the indicator considered. Indeed, the effect is more pronounced for broadband and fixed-line telephones and relatively less pronounced for internet and mobile phone use. This difference can be justified by the fact that mobile phones and the internet are more widely used by the population as a whole in the countries considered, whereas the other two indicators are less used in the area. Moreover, the descriptive statistics (table 3) reveal that the digital divide rate is 99.84 for the broadband divide; 99.07 for the fixed telephone divide; 76.47 for the mobile telephone divide, and 96.33 for the internet. This a priori link is confirmed by the correlation

matrix below. The correlation matrix below shows a negative a priori link between the digital divide and financial performance, whatever the digital divide indicator is taken into account. Indeed, this link is -0.010, -0.069, -0.017, and -0.042 respectively for the bandwidth divide, the fixed telephone divide, the mobile telephone divide and the internet divide.

Table 1 : Correlation matrix

Variables	1	2	3	4	5	6	7	8	9	10
(1) financial performance	1.000									
(2) liquidity ratio	0.020	1.000								
(3) Capitalisation	-0.83	0.103	1.000							
(4) Inflation	-0.977	-0.189	0.049	1.000						
(5) GDP per capita	0.078	-0.302	-0.235	-0.072	1.000					
(6) Total natural res	-0.030	-0.354	-0.168	0.005	0.381	1.000				
(7) broadband divide	-0.010	-0.393	0.306	0.192	0.176	0.068	1.000			
(8) fixed line telephone divide	-0.069	-0.272	0.612	0.077	0.005	-0.119	0.258	1.000		
(9) mobile phone divide	-0.017	-0.531	0.481	0.102	0.124	-0.109	0.598	0.335	1.000	
(10) internet divide	-0.042	-0.483	0.419	0.049	0.076	-0.037	0.713	0.279	0.892	1.000

Source : Author

2. Methodological framework

2.1. The model and estimation technique

In our study, we use the model of Kim et al. (2021). The equation to be estimated is as specified below:

$$ROA_{it} = \alpha_i + \beta_0 DD_{it} + \beta_1 X_{it} + \mu_t + \varepsilon_{it} \quad (1)$$

Where ROA_{it} represents the level of financial profitability of country i at date t . DD_{it} represents the digital divide. μ_t represents the time-specific effect that measures the effects on temporal variation. According to Song et al. (2020) and Mignamissi & Didjo (2021), three categories of indicators can be used to understand the DD. They are linked to the following: (i) access (computer penetration, mobile phone penetration, internet service providers per capita, internet access price), (ii) use (internet users per capita, broadband subscribers per capita, time-on-line, internet bandwidth per capita), and (iii) outcome (E-commerce economy, online shopping benefits, online learning outcome, E-Government). Due to the lack of data in some African countries, four main measures of the DD are retained, namely: broadband divide (BBD), fixed telephone divide (FTD), mobile telephone divide (MTD), and internet divide (ID). For each indicator selected, the divide is calculated as the difference between 100% (the full penetration rate) and the level of the indicator in percentage (Rice & Katz, 2003). X_{it} is the matrix of control variables described in the section below (see table 2). The estimation of equation (1) is done

with the Pooled Ordinary Least Square (POLS) regressor technique of Driscoll & Kraay (1998). The advantage of this technique is to take into account the heterogeneities between groups and specially to correct the potential heteroscedasticities and autocorrelations that may exist between variables while taking into account the cross-sectional dependencies within the groups. Also, this estimator is able to handle missing values and does not impose any restriction on the limiting behavior of the number of individuals with respect to the temporal dimension of the panel. In addition, the Driscoll-Kraay fixed-effects estimator has the advantage of proposing a non-parametric variance-covariance matrix that generates not only consistent standard errors under the assumptions of homoscedasticity and autocorrelation, but also standard errors that are robust to cross-sectional dependence. The Driscoll-Kraay standard deviation estimation thus ensures that the covariance matrix estimator is consistent regardless of the cross-sectional dimension and eliminates the deficiencies of other large-scale consistent covariance matrix estimation methods (Hoechle, 2007).

2.2. Description of variables and some descriptive statistics

Table 2: Definition, sources and measures of variables

Variables	Descriptions	Source
Financial performance	It measures the success of banks in the CEMAC zone in terms of financial performance. It is calculated as the ratio of net income to equity.	Author's calculation based on data from the CEMAC Financial Analysis
Liquidity ratio	Indicates the company's ability to meet its short-term obligations.	Financial analysis of the CEMAC
Capitalisation	Indicates the value of all shares in the market.	Financial analysis of the CEMAC
Gross Domestic Product	A measure of economic growth in a country, given as a percentage.	World Database Indicator (WDI)
Natural resources	Measures the rent from the extraction of minerals, forest timber, natural gas, oil and coal	World Database Indicator (WDI)
Inflation	Indicates the loss of purchasing power of money that results in a sustained increase in prices given as a percentage of GDP.	World Database Indicator (WDI)
Internet divide	Indicates the imbalance in internet usage per 100 inhabitants.	Author's calculation from WDI data
Broadband divide	Indicates the imbalance in broadband usage per 100 inhabitants.	Author's calculation from WDI data
Mobile phone divide	Indicates the imbalance in mobile phone use per 100 inhabitants.	Author's calculation from WDI data
Fixed line divide	Indicates the imbalance in fixed telephone use per 100 inhabitants.	Author's calculation from WDI data

Source: Author

In our study, we used a panel sample composed of the cinq countries of the CEMAC zone, namely: Cameroon, Gabon, Chad, the Republic of Congo and the Central African Republic. The study was conducted over a period ranging from 1993 to 2022. Our data sources are essentially drawn from two databases, namely BEAC³ and the World Bank Indicator (WDI) database. Data such as digital penetration rates (internet, mobile phone, fixed phone), data on GDP, inflation are taken from the World Database Indicator (WDI). Data on the liquidity ratio, capitalisation and financial performance of banks in the CEMAC zone come from the BEAC databases. An examination of the statistical table below shows that, in general, the countries of the CEMAC zone have a low level of financial performance. Indeed, the average value of this indicator in the sample is -14.137 with a standard deviation of 256.80. The high value of the standard deviation reflects the idea of a strong difference in financial performance between the countries in our sample. Moreover, we can see that the effect of the digital divide is large. Indeed, the indicator in the sample is 99.847 for the broadband divide, 99.074 for the fixed telephony divide, 76.474 for the mobile telephony divide and 96.339 for the internet. The large standard deviation in the mobile phone divide reflects the technological disparity that exists within the countries of the region.

Table 3: Descriptive statistics

	Obs	Mean	Standard deviation	Min	max
Financial performance	144	-14.137	256.806	-3002.4	164.153
Liquidity ratio	137	13.9	5.373	3.055	26.166
Capitalization	43	12.554	4.565	6.409	23.677
Inflation	144	234.471	2242.399	-31.566	26765.858
GDP per capita	144	2.917	15.366	-36.557	140.367
Total natural resources	138	21.575	13.58	5.094	62.04
Broadband divide	55	99.847	.251	98.475	100
fixed telephone divide	141	99.074	1.133	94.902	100
mobile phone divide	142	76.474	34.746	-55.682	100
Internet divide	139	96.339	7.956	51.948	100

Source: Author

3. Results

3.1. The Main result

We proceed in a two-step analysis for our results. We present and interpret the effect of the variable of interest in the first stage and the control variables in the second.

We have distinguished the digital divide in its four (04) dimensions beyond the digital divide index. Considering the digital divide index, the table 4 below shows that the effect of digital

³ Banque des Etats d'Afrique Centrale

divide on financial performance is negative and significant at the 1% level. This reflects the idea that any upward variation in the digital divide of 1% leads to a decrease in the financial performance of banks in the CEMAC zone of -0.0783. This result is explained by the idea that the low level of technological penetration of the populations limits their capacity to use new financial services offered by banks and thus reduces banking activity and the potential gains linked to such financial innovation. The digital divide limits the performance of banks in CEMAC by slowing down the pace of financial transactions. Also, poor access to digital technology creates a barrier between customers and their bank, which reinforces mistrust, complicates the payment of any debt due to the transaction costs induced by the distance from the bank (Pradhan et al., 2017; Mignamissi & Didjo, 2021; Tchich, 2023). This result is similar to Mignamissi & Didjo (2021) which shows that the digital divide negatively affects financial development and therefore limits the performance of banks in Africa in terms of access, usage and stability of the financial system.

This effect of the digital divide index nevertheless conceals some specificities. Indeed, while it is true that whatever sub-indicators of the digital divide (mobile telephony, fixed telephony, broadband and internet) are taken into account, the effect remains negative. The magnitude of this effect is not the same for each of them. But a priori, the bandwidth divide seems to have a more pronounced effect at the rate of -0.957 points, unlike the mobile telephony divide, which is -0.0256, the fixed telephony divide, which is -0.0578, and the internet divide, which is -0.0578 on financial performance. More specifically, poor access to digital technology creates a barrier between customers and their bank, which reinforces mistrust, complicates the payment of any debt because of the transaction costs induced by distance from the bank, and increases the difficulty of financing commercial operations which do not necessarily require physical contact (Mignamissi and Didjo, 2021; Tchich, 2023). Regarding the control variables, most of them exhibit the signs almost predicted by the financial performance literature.

3.2. Robustness

In order to analyse the robustness of our results, we use these alternative indicators of the digital divide known as the relative digital divide. This indicator is obtained by simply calculating the difference between the digital penetration indicators of the reference country in sub-Saharan Africa and the different indicators obtained in our sample. The table 5 below summarises the results obtained. In general, the results remain similar to those obtained previously.

Table 4: Effect of the digital divide on the financial performance of CEMAC banks

VARIABLES	Fixed effects					MCO				
	financial performance					financial performance				
Internet	-0.0578*** (0.0139)					-0.0350 (0.0344)				
Mobile phone divide	-0.0256*** (0.00267)					-0.0181 (0.0114)				
Landline telephones divide	-0.802*** (0.225)					-0.0309 (0.317)				
Bandwidth divide	-0.957** (0.321)					-1.072* (0.540)				
DDI	-0.0783*** (0.00808)					-0.0518 (0.0371)				
liquidity ratio	0.0361 (0.0320)	-0.0287 (0.0315)	0.0853** (0.0371)	0.174** (0.0674)	-0.0229 (0.0296)	-0.0984** (0.0410)	-0.165** (0.0658)	-0.0506 (0.0412)	-0.0815* (0.0381)	-0.152** (0.0618)
Capitalisation	-0.201*** (0.0562)	-0.212*** (0.0487)	-0.201** (0.0693)	-0.190** (0.0655)	-0.207*** (0.0484)	-0.399*** (0.0444)	-0.366*** (0.0547)	-0.441*** (0.0686)	-0.410*** (0.0334)	-0.372*** (0.0541)
Inflation	-0.0211 (0.0148)	-0.0112 (0.0111)	-0.0125 (0.0135)	-0.00695 (0.0173)	-0.0142 (0.0126)	0.00403 (0.0232)	0.00814 (0.0204)	-0.00975 (0.0239)	-0.00611 (0.0251)	0.00694 (0.0197)
GDP	-0.00124 (0.0177)	-0.00550 (0.0126)	0.0132 (0.0136)	0.00634 (0.0174)	-0.00247 (0.0139)	-0.0211 (0.0155)	-0.0300 (0.0189)	-0.0204 (0.0167)	-0.0155 (0.0357)	-0.0253 (0.0174)
Natural resources	0.0445* (0.0235)	0.0112 (0.0163)	0.0257 (0.0167)	0.0279 (0.0168)	0.0236 (0.0159)	-0.0512** (0.0230)	-0.0724** (0.0318)	-0.0430 (0.0256)	-0.0457* (0.0246)	-0.0661** (0.0287)
Constant	13.91*** (1.071)	11.79*** (0.882)	-70.66*** (22.72)	102.2*** (31.50)	16.73*** (0.961)	18.85*** (3.328)	17.68*** (1.615)	12.22 (30.93)	122.6** (53.72)	20.89*** (3.927)
Number of groups	5	5	5	5	5	5	5	5	5	5
R2						0.762	0.776	0.746	0.730	0.772
r2_w	0.606	0.739	0.611	0.546	0.717					

Standard deviations are in brackets. *** p<0.01; ** p<0.05; * p<0.1 represent the significance level of 1%, 5% and 10% respectively.

Source: Author

Table 5: Robustness

VARIABLES	Fixed effects					MCO				
	financial performance					financial performance				
Landline										
telephones divide	-0.170** (0.0729)					-0.300** (0.138)				
Bandwidth divide		-0.247 (0.156)					-0.733** (0.330)			
Mobile phone divide			-0.0391*** (0.00589)					-0.0137* (0.00744)		
Internet divide				-0.00895 (0.0159)					-0.0465** (0.0194)	
DDI					-0.111*** (0.0234)					-0.0405* (0.0216)
Liquidity ratio	0.185** (0.0642)	0.168** (0.0651)	0.174*** (0.0335)	0.164** (0.0681)	0.224*** (0.0503)	-0.0743 (0.0432)	-0.0421 (0.0435)	0.0213 (0.0625)	-0.00448 (0.0421)	0.00607 (0.0507)
Capitalisation	-0.248*** (0.0670)	-0.195** (0.0666)	-0.213*** (0.0396)	-0.239*** (0.0622)	-0.210*** (0.0424)	-0.371*** (0.0434)	-0.431*** (0.0368)	-0.487*** (0.0414)	-0.481*** (0.0329)	-0.496*** (0.0439)
Inflation	-0.0180 (0.0186)	-0.00125 (0.0145)	-0.0276* (0.0148)	-0.0213 (0.0200)	-0.0228 (0.0142)	-0.0105 (0.0270)	0.00795 (0.0180)	-0.0130 (0.0227)	-0.00878 (0.0237)	-0.0152 (0.0229)
GDP	0.0180 (0.0167)	0.00368 (0.0139)	0.00865 (0.0143)	0.0150 (0.0198)	-0.00577 (0.0136)	-0.0105 (0.0177)	-0.0375 (0.0263)	-0.0101 (0.0191)	-0.0146 (0.0163)	-0.00590 (0.0211)
Natural resources	0.0201 (0.0190)	0.0163 (0.0149)	0.0125 (0.00982)	0.0137 (0.0243)	0.0169 (0.0140)	-0.0272 (0.0221)	-0.0329 (0.0208)	-0.00919 (0.0260)	-0.00696 (0.0198)	-0.00845 (0.0238)
Constant	6.028** (2.064)	6.693*** (1.853)	9.544*** (0.914)	7.808*** (1.560)	8.820*** (0.781)	16.58*** (1.459)	13.50*** (1.695)	12.97*** (1.755)	12.96*** (1.437)	13.19*** (1.525)
Number of groups	5	5	5	5	5	5	5	5	5	5
R2						0.773	0.783	0.778	0.804	0.780
r2_w	0.525	0.517	0.705	0.498	0.667					

Standard deviations are in brackets. *** p<0.01; ** p<0.05; * p<0.1 represent the significance level of 1%, 5% and 10% respectively.

Source: Author

Conclusion

Improving the performance of financial institutions has been an ongoing interest in the literature. The theoretical literature is positive about the role of digitization very little work postulates a role for the digital divide. Also, in developing countries such as those of the Economic and Monetary Community of Central Africa (CEMAC), access to digital services remains a key problem. In order to contribute to this literature gap, this paper analyses the effect of the digital divide on the performance of banks in the CEMAC zone between 1993 and 2022. In contrast to previous works, the paper does not only use the overall digital divide index, but also decomposes the digital divide into its different components, namely the mobile phone, bandwidth, internet and fixed telephone divides. By estimating panel data model with Fixed Effect Ordinary Least Square regressor technique of Driscoll & Kraay (1998), we obtain a major result. Indeed, the results show that whatever digital divide index we use, it has a negative effect on the financial performance of banks in the CEMAC zone. Our results are robust and lead to a major policy implication. The paper shows that in CEMAC countries there are strong inequalities in terms of technological access and financing. While it is recognised that digital technology plays an important role in aspects of financial development, particular attention should be paid to the acquisition of new and sophisticated technologies. In other words, one of the priorities of policy decisions must be to promote digital technology in order to benefit CEMAC banks and thus remove certain barriers that reduce their performance.

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