

Factors Influencing the Deployment of Local Platform Crowdfunding in Sub-Saharan Africa: Evidence from West and Central Africa Countries

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Abstract

Purpose: The purpose of this study is to show why African countries, in West and Central Africa (WCA) particularly, are not able to exploit the potential of crowdfunding and maintain the activities of local platforms. **Research Design and Methods:** To achieve our purpose, we used the hypothetico-deductive methodology. Faced with panel data, this study uses logistic regression models (Fixed Effect, Random Effect, and Mixed Effect), covering the period 2010-2019 for twenty WCA countries (West and Central Africa). **Originality and Contribution:** To our knowledge, this study is among the first to explore the factors upstream of the deployment of local crowdfunding platforms, based on basic infrastructure, technological and communication innovation, education, and the legal framework and financial system. This research contributes to the current debate on the development of crowdfunding in sub-Saharan Africa as well as to the future models to be adopted so that this activity is sustainable at the local level. **Findings and Results:** The study points out that the infrastructure of information and communication technologies, based on the penetration of the Internet and mobile telephony, significantly influences the deployment of the national platform. Nevertheless, the basic infrastructure such as electricity and urbanization variables, a legal framework based on the business creation score, education, and the weakness of the financial development system constitute an obstacle to claiming development in long-term and sustainable local crowdfunding activities. Following these striking results, the study highlights a series of levers on which legislators in WCA countries can act to meet the crowdfunding challenges of tomorrow. **Implications:** By proposing three research levers, this study should promote and support the development of crowdfunding from a pedagogical

point of view by emphasizing entrepreneurship and emerging technologies in education at the level of professional or university training, from the infrastructure, access to physical and digital infrastructure by emphasizing the importance of regional partnerships, creating partnerships with traditional African banks, and to prevent risks, build trust and ensure the security of investments, decision makers must establish the law on alternative finance activities (Crowdfunding, cryptocurrency).

Keywords

Crowdfunding, Key Success Socio-Economic Factors, Panel Data, Logistic Regression, West and Central Africa (WCA)

1. Introduction

Crowdfunding (literally financing by the crowd) appeared in the early 2000s, but the original concept is not unknown. Having project finance (funding) by many subscribers (crowd) is not an innovation. It is the modern form of a rather old phenomenon.

Short et al. (2017) based on publications of crowdfunding in 1885, on how Joseph Pulitzer funded the completion of the Statue of Liberty pedestal by soliciting investment readers of his New York World newspaper. When the American Committee for the Statue of Liberty was unable to fund the project’s completion, a group of average Americans contributed about \$1 each, raising over \$100,000 to fund the project’s completion pedestal.

Moysidou and Hausberg (2020) based on the studies of *Short et al. (2017)* underlines that crowdfunding as a new form of fundraising, emerged in the wake of the 2008 financial crisis and revolutionized the fundraising process, especially for startups and small and medium enterprises (SMEs).

The history of crowdfunding demonstrates that, following the 2008 financial crisis, crowdfunding emerged as a viable alternative for small and medium enterprises (SMEs) seeking financing. This shift was driven by the implementation of various prudential measures outlined in Basle III. These measures mandate changes in traditional financing practices, including the introduction of liquidity ratios, the reinforcement of equity, and enhancements to the solvency ratio for banks and other financial institutions.

Heitz (2019) indicated that Basle III particularly affects SMEs, noting that large companies are rated companies, and they raise new money by issuing additional shares, which is not the case for SMEs.

SMEs need to think about other ways to obtain liquidity, in addition to traditional bank loans; for this reason, many alternative forms of financing have been developed, such as crowdfunding and SME bonds with rights profit-sharing and microloans for individuals, medium-sized businesses and many options available

to them.

Ziegler et al. (2021) pointed out that in terms of SME financing via alternative finance volume, over \$50 billion was recorded in 2020 globally with over \$32 billion in the USA, followed by the UK \$6.4 billion in 2020, EU \$5.2 billion and Asia-Pacific (excluding China) raised \$4.21 billion in 2020.

The total volume of online alternative finance in SSA reached \$1.2 billion in 2020, which remains insignificant compared to another continent and the World Bank's prediction of a potential of over \$96 billion by 2025 using crowdfunding for developing countries, and the market opportunity for SSA is between USD 2.09 billion and USD 2.46 billion (World Bank, 2013).

Hiller (2017) notes that around 84% of SME in Africa do not have access to sufficient funding, with an aggregated funding gap between \$70 and \$170 billion.

Adjakou (2021) has drawn up a disastrous record of the crowdfunding platforms created in SSA from 2012 to 2020; out of a total of 64 in 2012, 58% of the platforms created are inactive in 2020 and 42% of the 64 registered remain active in 2020.

The African countries in general, and particularly the WCA countries are far behind, on the one hand, in terms of bank financing, for example, the bank financing of the private sector is still insufficient, and on the other hand, these countries are not able to exploit the potential of crowdfunding, the market opportunity for Africa was estimated, at more than \$ 2.5 billion, unable to maintain the activities of domestic platforms crowdfunding and question the factors that could enable the development of local platforms crowdfunding.

To our knowledge, the existing literature on crowdfunding in Africa has not been detailed on the subject, Adjakou (2021) studied the factors hindering crowdfunding in Benin, Munyanyi & Mapfumo (2016) analyzed the launch of crowdfunding platforms in Zimbabwe after a hyperinflationary period, and Yermack (2018) focused on the best way to accelerate the diffusion of fintech applications and realize their full potential to drive economic growth and financial inclusion.

Thus, this article stands out by providing clear literature on the factors upstream of the success of local crowdfunding platforms in West and Central Africa based on basic infrastructure, communication and technology infrastructure, the legal framework, and socio-economic factors.

The research hypothesis explored the factors influencing the deployment of crowdfunding platforms and highlighted a series of levers on which legislators in WCA countries can act to address the challenges of crowdfunding. To achieve this objective, the hypothetico-deductive methodology is put in place to identify the success factors of crowdfunding platforms.

The following section of this paper reviews previous work related to the key success factors of crowdfunding, section 3 presents the methodology and the empirical results based on logistic regression in the final section, we will conclude with a discussion of series of levers to be applied by the countries in WCA.

2. Literature Review

Previous work related to key factors is rare for Africa, especially in WCA. The importance of this study is to provide the drivers that can allow the deployment or development the domestic crowdfunding platforms in WCA countries.

Crowdfunding has its origins in concepts like micro-finance, which fall under the category of alternative financing, having as its main mission the collection of funds, through dedicated platforms on the Internet (Mollick, 2014).

The literature provides different definitions of crowdfunding. It can be defined as an online alternative financing tool that does not use traditional channels, such as bank financing, but instead calls on financial resources from Internet users to finance a project, which can be (cultural, artistic, entrepreneurial, etc.) (Dushnitsky et al., 2016).

According to Schwienbacher and Larralde (2010), it is also seen as “*the process of one party requesting and receiving money and other resources from many individuals for financing a project, in exchange for a monetary or non-monetary return on investment*”.

According to the World Bank (2013), the crowdfunding is an internet enabled way for businesses or other organizations to raise money in the form of either donations or investments from multiple individuals.

We can also find in the literature “*an open call, primarily via the internet, for the provision of financial resources either in the form of a donation or in exchange for some form of reward or voting rights to support initiatives for specific purposes*” (Golubić, 2019).

The crowdfunding is an efficient tool for certain transactions that already existed to finance the small structures and a facilitator for transactions that were not possible before for micromanagement or direct support of entrepreneurs in developing countries (Adjakou, 2021).

From these definitions derive four types of internet crowdfunding business model, namely donation-based crowdfunding, reward-based crowdfunding, peer-to-peer lending (possibly subdivided into consumer and business lending), and equity-based crowdfunding.

In the donation model, no compensation is granted to crowdfunders, who are in effect donors. In the other three models, crowdfunders receive some forms of compensation. In the reward model, participants commit to offering crowdfunders reward, ranging from immaterial acknowledgements to the delivery of an early version of the product/service that is produced using the money raised through the crowdfunding campaign. In the lending model, the compensation normally takes the form of interest payments; while in the Equity model, the compensation consists of equity, dividends, and/or voting rights in the funded venture (Dushnitsky et al., 2016).

According to World Bank (2013), the key factors have facilitated crowdfunding in developed countries must include:

- A regulatory framework that leverages the transparency, speed, and scale that

advances in technology and the Internet can deliver to early-stage funding marketplaces.

- Strong social media market penetration and internet usage, which is necessary to harness demographic and technology trends to drive collaboration and cultural shifts.
- A regulated online marketplace that facilitates capital formation while providing prudent investor protections through education and training.
- Collaboration with other entrepreneurial events and hubs including business plan competitions, incubators, accelerators, universities, and co-working spaces to create a channel for opportunity and oversight.

Rau (2020) identifies three factors that significantly affect the volume of crowdfunding within the country. The first factor is the underlying legal system in the country, the rule of law, control of corruption, and the quality of regulation in the country. The second factor linked to the rents collected by the existing financial intermediaries, which probably constitute the products of entry barriers to doing business, and he concluded that the crowdfunding business is higher in countries where it is easier to start business.

Hence the need to build an ecosystem favorable to the development of crowdfunding by setting up a specific regulatory framework, by using the new technology and communication to secure, support, promote the development of different crowdfunding models, minimize risks and provide a favorable framework for the overall development of the financial sector, particularly the alternative financing sector.

As Kukurba et al. (2021) point out that technological innovation is at the heart of crowdfunding, plays a unique role in the creation of value and the development of companies, demonstrate a close link between technology innovation and economic growth.

To secure investors and platforms, protect project holders, some countries have put in place a specific legal framework to support the crowdfunding ecosystem, which was done in the United States in 2012 with the Jobs Act, followed by Great Britain, France in 2014, and followed by some countries like Morocco, Tunisia, Nigeria, and South Africa.

The works of Yermack (2018), using a panel of 35 Sub-Sahara countries over the period 2014, provide some evidence that the common law countries typically provide more investor protection, achieve lower costs of capital and greater liquidity for investors.

Other considerable studies such as the works of (Adjakou, 2021) and (Munyanyi & Mapfumo, 2016) provide evidence from Benin and Zimbabwe argued that the law and regulation factor is not key determinant for a successful crowdfunding implementation.

Yermack (2018) underlines that the fintech platforms or the crowdfunding can only succeed where an infrastructure of electric power, telecommunications and internet providers are available to support them.

Hiller (2017) suggests that the current lack of management know-how and education, African entrepreneurs can improve their productivity and increase the success rate of their business, despite environmental barriers such as access to infrastructure, human resources, regulatory constraints and corruption and also adding in spite of increased access to information and communication technologies, countries in SSA still suffer from poor infrastructure, unreliable electricity supply, roads and railways in poor condition.

Owusu-Agyei et al. (2020) argued that the availability of the internet and its usage will reduce information asymmetry and its costs, increase accessibility of financial services, and will then provide an enabling environment to harness the opportunities that abound for internet penetration in SSA towards increased financial development.

Nan (2017) notes that mobile money also called mobile financial services, refers to the use of information and communication technologies (ICT) and non-bank retail channels to extend the delivery of basic financial services to users who would not be reached profitably with traditional branch based financial services. Adaba et al. (2019) notes that mobile money is an important complement to the functions of the mobile phone, allowing individuals to receive funds from the urban population to the rural population and other personal networks, to save money independently within the scope of a savings and crowdfunding group in response to emergencies. Beck (2020) shows that mobile money allowed risk sharing across geographic distances in the case of the 2008 earthquake in Rwanda, as mobile money users sent a considerable amount of mobile money to affected friends and families, and show that the adoption of M-Pesa by small entrepreneurs in Kenya to pay their suppliers was associated with increases in trade credit, with positive repercussions for firm and aggregate growth.

The growing role of the Internet, mobile phones, and new forms of digital services are helping to reduce transaction costs, increase the speed and transparency of transactions, and reduce the importance of borders between different jurisdictions.

The application of ICT has also revolutionized the business model of finance and improved customers’ access to various forms of financial services (through the Internet, personal computers, and mobile phones) and the ability to create new products and institutions capable of offering financial services (crowdfunding platforms, financial IT companies, and mobile telephone operators).

This situation is paradoxical in SSA, where there are many disparities between the countries of East Africa, the West, and the Center, the main obstacle to faster growth of crowdfunding in WCA would be:

- the absence of the basic infrastructure, the information, and Communication Technology Infrastructure,
- the absence of the suitability of public policies in education and employment,
- the weak regulatory environment (doing business),
- and the weak financial development system.

3. Methodology

As [Jabareen \(2009\)](#) puts it, a conceptual framework provides not a causal/analytical setting but, rather, an interpretative approach to social reality ([Jabareen, 2009](#)), according to importance of this paper, the hypothetico-deductive (HD) methodology was adopted to provide a conceptual framework, based on the study of [Servant-Miklos \(Servant-Miklos, 2019\)](#). The HD methodology was applied to confirm the upstream factors, enabling the deployment of local crowdfunding platforms in West and Central Africa.

Based on previous knowledge of crowdfunding, especially based on key success factors as a keyword in this paper, we selected the following works of [Adaba et al. \(2019\)](#), [Beck \(2020\)](#), [Hiller \(2017\)](#), [Kukurba et al. \(2021\)](#); [Owusu-Agyei et al. \(2020\)](#), [Rau \(2020\)](#), [Nan \(2017\)](#), [Yermack \(2018\)](#), which allowed us to collect the data, to constitute our explanatory variables.

This technique allowed us to establish the list of variables and their meaning, as indicated in [Table 1](#) shown in appendix, which covered a panel of 20 countries of the WCA countries, (Angola, Burundi, Chad, Central African Rep, Congo Rep, Democratic Congo, Rwanda, Sao-Tôme, Gabon, Equatorial Guinea, Cameroon, Senegal, Benin, Burkina Faso, Ivory Coast, Mali, Togo, Guinea, Guinea Bissau, Ghana), over 10 years from 2010 to 2019.

The Real GDP (gdp+) used as the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products, according to [Kukurba et al. \(2021\)](#) studies. The Employment (Emp-) ratio is defined that the proportion of a country's population that is employed, The Education (Educat+) is defined as a percentage of total general government expenditure on all sectors (including health, education, social services, etc.), all variables considered as proxy variables of suitable public policy.

The internet (inet+) is defined that the proportion of individuals using the Internet in line with existing of studies of [Yermack \(2018\)](#), [Owusu-Agyei et al. \(2020\)](#), [Rau \(2020\)](#), and the mobile (mobi+) referred to the number of subscriptions to a public mobile-telephone service that provide access to the PSTN using cellular technology, based on studies of [Nan \(2017\)](#), [Adaba et al. \(2019\)](#), [Beck \(2020\)](#), as proxy variables of the information and communication technology infrastructure

The electricity (elec+) is defined that the percentage of population with access to electricity, has been used by [Hiller \(2017\)](#) and [Yermack \(2018\)](#), and the Urban population (urba+) referred to people living in urban areas as defined by national statistical offices, has been used by [Adaba et al. \(2019\)](#), as proxy variables of the basic infrastructure.

As well as the score on the starting business (ssbu+) business measured the gap between an economy's performance, and the regulatory best practice on the starting a business indicator components in line of study of [Rau \(2020\)](#), as proxy

Table 1. Definitions and data source.

Variables			Data source	Definition
INDEPENDANTS VARIABLES	RealGDP growth (annual %)	gdp+	International Monetary Fund (IMF)	GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.
	Employment to population ratio, 15+, total (%) (national estimate)	Emp–	World Bank	Employment to population ratio is the proportion of a country’s population that is employed. Employment is defined as persons of working age who, during a short reference period, were engaged in any activity to produce goods or provide services for pay or profit, whether at work during the reference period (i.e., who worked in a job for at least one hour) or not at work due to temporary absence from a job, or to working-time arrangements.
	Access to electricity (% of population)	elec+	World Bank	Access to electricity is the percentage of population with access to electricity. Electrification data are collected from industry, national surveys, and international sources.
	Internet users (%)	inet+	International Telecommunication Union (ITU)	This indicator can include the proportion of individuals using the Internet.
	Mobile-cellular subscriptions per 100 inhabitants (‰)	mobi+	International Telecommunication Union (ITU)	Mobile-cellular telephone subscriptions included to the number of subscriptions to a public mobile-telephone service that provide access to the PSTN using cellular technology. The indicator includes (and is split into) the number of postpaid subscriptions; and the number of active prepaid accounts (i.e., that have been used during the last three months).
	Urban population (% of total population)	urba+	United Nations Population Division	Urban population refers to people living in urban areas as defined by national statistical offices.
	Score-Starting a business (%)	ssbu+	World Bank	Score-Starting a business measures the gap between an economy’s performance and the regulatory best practice on the Starting a business indicator components.
	Government expenditure on education, total (% of government expenditure)	Educat+	World Bank	General government expenditure on education (current, capital, and transfers) is expressed as a percentage of total general government expenditure on all sectors (including health, education, social services, etc.)
Financial system deposits to GDP (%)	Findvpt+	World Bank	Demand, time and saving deposits in deposit money banks and other financial institutions as a share of GDP.	
DEPENDENT VARIABLES	CFwc	1	The Cambridge Centre for alternative Finance	Ready for crowdfunding if they have a local platform = 1
	CFwc	0	The Cambridge Centre for alternative Finance	Not ready for crowdfunding if they don’t have a local platform = 0

variables of legal framework.

Financial system deposits to GDP (%) (Findvpt+) is defined as Demand, time and saving deposits in deposit money banks and other financial institutions as a share of GDP, as proxy variable of financial system.

Logistic regression was provided an observation model the likelihood odds ratio to explain the factors influencing to develop crowdfunding in West and Central Africa Countries.

The natural logarithm logit of an odds ratio was the main mathematical concept that underlies logistic regression. The logistic regression was used for testing hypothesis about a relationship between categorical outcome variable and one more categorical or continuous predictor variables (Peng et al., 2002).

A researcher could overcome this problem from logistic regression applying logit transformation to the dependent variable. In the essence, the logistic model was predicted the logit, the natural algorithm of response variable (dependent) over continuous variable (independent). The simple form of logistic regression was adopted from (Peng et al., 2002):

$$\text{Logit}(\text{CFwc}) = \text{naturallog}(\text{odds}) = \ln\left(\frac{\pi}{1-\pi}\right) = \alpha + \beta X_i.$$

where β is the regression coefficient; Π = Probability (Y = outcome of interest = X and α is the Y intercept and this can be extended to the multiple predictors the equation is:

$$\text{Logit}(\text{CFwc}) = \text{naturallog}(\text{odds}) = \ln\left(\frac{\pi}{1-\pi}\right) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n.$$

where β^n are regression coefficients, X^n are set of predictors. The α and β are typically estimated by the Maximum Likelihood (ML) method which is preferred over the weighed least squares method.

Firstly, we observed the impact of the information and communication technology infrastructure (internet and mobile phone), education, and financial system factors on the deployment of local or national crowdfunding platforms.

$$\begin{aligned} \text{Logit}(\text{CFwc}) &= \text{naturallog}(\text{odds}) = \ln\left(\frac{\pi}{1-\pi}\right) \\ &= \alpha + \beta_2 \text{mobi} + \beta_3 \text{educat} + \beta_4 \text{findvp} \end{aligned}$$

And finally, we examined the impact of the integration of control variables: The basic infrastructure (the urbanization and the electricity); the suitable public policy (the employment and the real GDP); and the score starting business proxy variable legal framework.

$$\begin{aligned} \text{Logit}(\text{CFwc}) &= \text{naturallog}(\text{odds}) = \ln\left(\frac{\pi}{1-\pi}\right) \\ &= \alpha + \beta_1 \text{inet} + \beta_2 \text{mobi} + \beta_3 \text{educat} + \beta_4 \text{findvpt} + \beta_5 \text{gdp} \\ &\quad + \beta_6 \text{employ} + \beta_7 \text{ssbu} + \beta_8 \text{urba} + \beta_9 \text{elec} \end{aligned}$$

To confirm or refute the hypothesis: the main obstacle to faster growth of

crowdfunding in WCA would be:

- the absence of the basic infrastructure, and the information and Communication Technology Infrastructure,
- the absence of the suitability of public policies in education and employment,
- the weak regulatory environment (doing business), and financial development.

We tested the points below:

- No relationship between dependent variable and the independents variables separately:

If $\beta_n \leq 0$ and no significant: The deployment of local or national crowdfunding platforms is not possible due to the absence of the basic infrastructure, and the information and communication technology infrastructure, the absence of the suitability of public policies in education and employment, the weak regulatory environment (doing business), and the weak financial development system.

- Relationship between dependent variable and the independents variables separately:

If $\beta_n \geq 0$ and significant: The deployment of local or national crowdfunding platforms is possible to the presence of the basic infrastructure, and the information and communication technology infrastructure, the suitability of public policies in education and employment, the strong regulatory environment (doing business), and the strong financial development system.

The Logistic Regression was applied to analyze and estimate the parameter of our data, therefore, faced with a panel data, three models were used for analyzing longitudinal data, namely fixed effects (FE), random model (RE), mixed model (MI). The statistical analysis was conducted with the STATA software.

4. Findings and Discussion

This section represents the results, firstly, a brief general description of the summary statistics on the dependent and independent variables, as shown in **Tables 2-4**, following by the estimation of the panel regression model.

As shown in **Table 2**, 49.00% of WCA countries are not ready for local platform crowdfunding and 51.00% are ready for local platform crowdfunding,

Table 2. Summary statistics of independents variables.

Crowdfunding	Overall		Between		Within Percent
	Freq.	Percent	Freq.	Percent	
CFwc = 0	98	49	18	90.00	54
CFwc = 1	102	51	17	85.00	60

Notes: This table presents three different types of statistics. Overall statistics are ordinary statistics that are based on 200 observations, “Between” statistics were calculated, based on summary statistics of 20 countries (entities) regardless of time or period, and while “within” statistics by summary statistics of 10 time periods.

Table 3. Summary statistics of independents variables by region.

Crowdfunding	Region		Total
	CENTER	WEST	
Cfwc = 0	69	29	98
Cfwc = 1	41	61	102
	110	90	200

Table 4. Summary statistics of dependents variables.

Variable		Mean	Std.dev	Min	Max	Obs	
RealGDP	overall	3.4549	5.2047	-36.4000	17.4100	N	200
	between		2.4178	-3.5050	6.3400	n	20
	within		4.6376	-32.8580	16.0479	T	10
Electricity	overall	3.4727	0.7454	1.6677	4.5109	N	200
	between		0.7382	2.0606	4.4804	n	20
	within		0.1877	2.3735	4.0652	T	10
Internet	overall	2.2279	1.0126	-0.3285	4.1109	N	200
	between		0.7462	0.8280	3.5511	n	20
	within		0.7027	0.4084	3.9950	T	10
Mobile phone	overall	4.1797	0.4873	2.9074	5.0478	N	200
	between		0.4414	3.2778	4.9270	n	20
	within		0.2269	3.4694	4.6492	T	10
Score starting	overall	4.2748	0.9401	0.0000	5.1930	N	200
	between		0.6547	2.7414	5.0628	n	20
	within		0.6889	1.5334	5.7539	T	10
Urban population	overall	3.7304	0.4825	2.3609	4.4998	N	200
	between		0.4923	2.4758	4.4758	n	20
	within		0.3802	3.5778	3.8299	T	10
Employment	overall	3.6457	0.3850	2.4849	4.2195	N	200
	between		0.3921	2.4849	4.1679	n	20
	within		0.3685	3.4921	3.7648	T	10
Financial development	overall	2.9115	0.4408	1.6152	3.8252	N	199
	between		0.4360	1.9918	3.6888	n	20
	within		0.1307	2.5349	3.2894	T	9.95
Education	overall	2.7009	0.3646	1.6094	3.6376	N	178
	between		0.3123	1.9953	3.1572	n	20
	within		0.1845	2.0745	3.3476	T	8.9

Notes: This table presents Summary statistics of dependents variables, these variables are further described, with sources of data indicated, in **Table 1**.

between indicates that 90% of WCA countries have at least no crowdfunding and at least 85% have crowdfunding and indicates that 60% of WCA countries that have had crowdfunding platforms, still have these platforms.

As shown in **Table 3**, 69.00% in Central Africa countries are not ready for local platform crowdfunding and 41.00% are ready for local platform crowdfunding, and 29.00 % in West Africa countries are not ready for local platform crowdfunding and 61.00% are ready for local platform crowdfunding.

As shown in **Table 4**, Internet Penetration, Business Performance Score, and Employment, the between and within standard deviations are almost the same. The variation of these two variables between countries is nearly equal to that observed within a country over time. If you randomly choose two countries among the data, the difference between these two variables should be almost equal to the difference for the same country in two randomly chosen years.

Apart from these three variables, the others show a lot of intra-subject variabilities, the fixed-effects model works much better when there are a lot of within-subject variabilities, but we will look at all three models to analyze our data: the fixed-effects model, the random model, and the mixed model.

The existence of multicollinearity and the bias of the standard errors of the coefficients were investigated and used the correlation spearman matrix and the variance inflation function, as shown in **Table 5**.

This analysis discusses rank using Spearman's rank correlation coefficient, which is less sensitive to extreme values than Pearson's correlation coefficient.

The results of the correlation matrix between the explanatory variables are presented in **Table 5**, show that the correlation coefficients between the pairs of explanatory variables were low, suggesting that there was no multicollinearity problem between these explanatory variables.

We observed that there exists a positive linear correlation between electricity, internet, mobile phone, urban population, score starting business, education, financial system development and the correlation between these variables is statistically significant at 1% level, and negative relationship between the employment with electricity, internet, mobile phone, urbanization, education, financial system development, and the correlation between these variables is statistically significant at 1% level.

We also observed that there exists a positive linear correlation, not statistically significant with the real GDP with mobile phone, and employment, a negative linear correlation, not statistically significant with score starting business and employment. The mean VIF for each variable was also low, indicating that the explanatory variables included in the model were not correlated with each other and the mean VIF equal 3.03 is less than 10, signifying that the study does not suffer from multicollinearity issues among the variables.

Table 6 has reported logistic regression results, with three approaches FE, RE

Table 5. Correlation matrix.

	Realgdp	Electricity	Internet	Mobile phone	Score starting	Urban population	Employment	Financial ssystem	Education	VIF
RealGDP	1.0000									1.13
Electricity	-0.1407 (0.0474)	1.0000								7.32
Internet	-0.2952 (0.0000)	0.7469 (0.000)	1.0000							3.47
Mobile phone	0.0228 (0.7491)	0.6334 (0.0000)	0.6062 (0.0000)	1.0000						3.42
Score starting Business	-0.1508 (0.0335)	0.2061 (0.0035)	0.5485 (0.0000)	0.4488 (0.0000)	1.0000					2.23
Urban population	-0.2404 (0.0006)	0.8036 (0.0000)	0.5889 (0.0000)	0.4023 (0.000)	-0.0371 (0.6032)	1.0000				4.31
Employment	0.1372 (0.0534)	-0.7160 (0.0000)	-0.4606 (0.0000)	-0.4062 (0.000)	0.0100 (0.8890)	-0.7600 (0.000)	1.0000			2.02
Finanncial system	-0.1067 (0.1576)	0.3925 (0.0000)	0.4170 (0.0000)	0.3154 (0.0000)	0.3200 (0.000)	0.2503 (0.0008)	-0.4249 (0.0000)	1.0000		1.57
Education	0.0114 (0.8803)	0.2880 (0.0000)	0.1401 (0.0000)	0.3803 (0.0000)	0.3951 (0.0000)	-0.0153 (0.8399)	-0.2923 (0.0000)	0.3205 (0.0000)	1.0000	1.13
VIF										3.03

Notes: This table presents the correlation coefficients between the pairs of explanatory variables, using the correlation spearman matrix and the variance inflation function (VIF).s. The significant parameters are representing the confidence levels of 99%. These variables are further described, with sources of data indicated, in [Table 1](#).

and MI, that were measured the deployment of crowdfunding in West and Central Africa.

As shown in [Table 6](#) simple model, in the first two columns of FE, the relation existing between the internet, the mobile penetration, and the CFwc were positive and proved that the information and communication technology infrastructure to be statistically significant at any level.

The coefficient for the internet is 0.3905 which shows that for a one unit increasing the internet, the CFwc deployment of local platform is expected to increase by 0.3905 units holding other variables constant. Assuming that other factors are constant, one unit increase in mobile phone will lead to an increase of CFwc deployment of local platform by 0.3533 units. The coefficient for electricity penetration is 0.2314 which suggests that as electricity penetration increases by one unit, deployment of CFwc reduces by 0.2314 units holding other variables constant.

Table 6. The results of the simple model.

Variables	FE	RE	MI
	Crowdfunding in West and Central Africa		
Internet	0.3905*** (0.000)	0.3399*** (0.000)	0.3560*** (0.000)
Mobile phone	0.3533* (0.019)	0.2425 (0.059)	0.2733* (0.037)
Education	-0.07633 (0.533)	0.04195 (0.709)	-0.3158 (0.956)
Financial system	-0.6293** (0.004)	-0.2343 (0.096)	-0.3158* (0.040)
Constant	0.2429 (0.747)	-0.6602 (0.230)	-0.4905 (0.403)
rho	0.7037	0.4508	rho
LR test			68.57 (0.000)
F test	41.51 (0.000)		
Wald		140.34 (0.000)	158.65 (0.000)
N	177	177	177

Notes: This table reports the logistic regression results for the deployment of crowdfunding using a simple model. The dependent variable is CFwc. The explanatory variables are: log Internet; log Mobile phone; log Employment, log education and log financial system development > |z|-statistics in parentheses * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

The relation existing between the education, and the CFwc was negative, and proved to be not statistically significant at any level, however, the relation existing between the financial system development, and the CFwc was negative, and proved to be statistically significant at ** $p < 0.01$.

The correlations value between error terms and regressors $\text{corr}(u_i, Xb) = -0.5764$ has shown that errors U_i were correlated with the regressors in the fixed effects model. The value of rho.7037 revealed that 70.37% of the variance was explained due to the differences across panels in the sample undertaken. The F-test was a test to see whether all the coefficients in the model was different than zero and it explained the goodness fit of the model, the F-value 41.51 was statically significant at 1% level which indicated that an overall this model was goodness fit with the dependent and independent variables in this study.

To compensate for the loss of significance of the fixed effect, a random effects model was applied in the second column, in the one hand, the relation existing between the financial development system, and the CFwc was negative, and proved to be not statistically significant at any level, in another hand, the internet, the mobile phone and the education, and the CFwc were positive.

The magnitude of the coefficients Internet penetration (0.3399) was positive, statistically significance level at 0.1% level, the mobile phone (0.2425) was positive and not statistically significance at any level, and the education (0.04195) remained highly insignificant.

The result of the Wald test (140.343) is indicative of the significant contribution of the explanatory variables together to the dependent variable CFwc. It concluded that internet is statistically significant predictors of local crowdfunding platform deployment in all countries at 1%. While the education and the financial development system are not good predictors of CFwc deployment in the random-effect model.

Then, we used the mixed effects models to capture the random and fixed variations of the model. The result of the Wald test revealed the significant contribution of all the explanatory variables to the dependent variable CFwc. We found that at the upper section of table (Fixed effects), the internet and mobile phone penetration were statistically significant predictors of CFwc in all countries at 1% and 5% levels, while the education and financial development system were not drivers CFwc predictors.

The lower session of the table (Random effects) shown an estimated standard deviation of the random intercepts (0.3557), along with a standard error (0.0677) and a 95% confidence interval for this standard deviation, was found to be significant, we concluded that interceptions vary from country to country as shown in **Figure 1**. A likelihood ratio test (68.57) reported on the final line of the output confirms that this random intercept pattern offered an improvement over the regression model with fixed effects, is better model.

As can be seen in the full model in **Table 7**, we incorporated three variables into our model: the real GDP, the electricity, the employment, the score starting business, and urbanization, and we focused on mixed model.

The result of the Wald test (173.38) is indicative of the significant contribution of the explanatory variables together to the dependent variable CFwc. It concluded that internet and mobile penetration are statistically significant predictors of local crowdfunding platform deployment in all countries at 5% and 10% levels.

The financial system, real GDP, business start-up score, legal framework proxy variable, and urbanization are the barriers to deploying CFwc in the mixed effects model. They were negative and not statistically significant at any level.

The coefficient for urbanization (-0.5992) is which suggests that as the urbanization increases by one unit, deployment of CFwc reduces by 0.5992 units

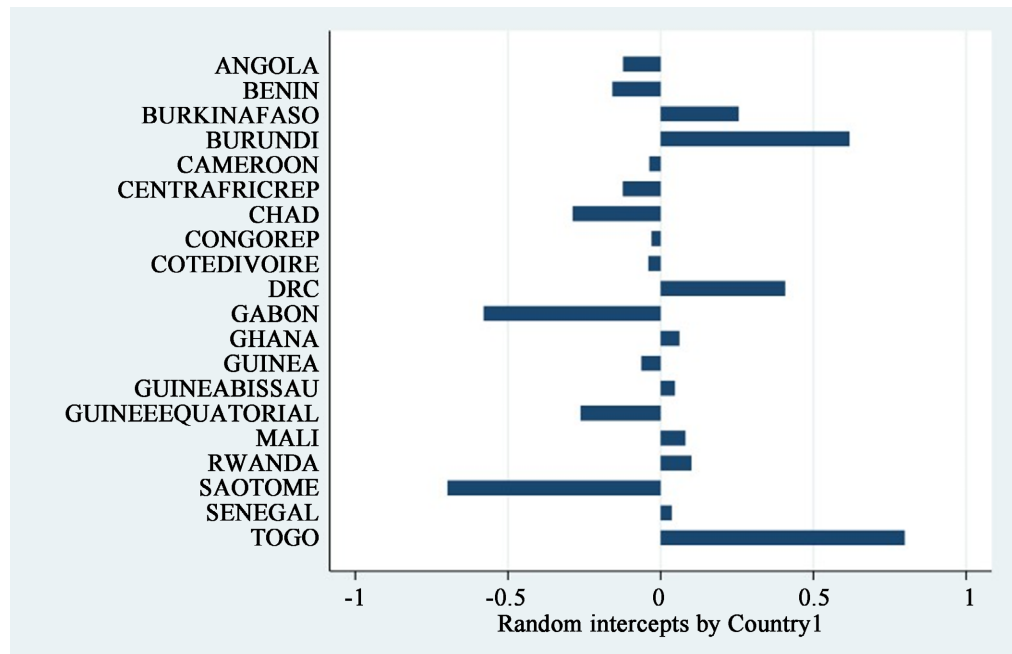


Figure 1. Random intercept with the simple model.

Table 7. The results of the full model.

Variables	FE	RE	MI
	Crowdfunding in West and Central Africa		
Internet	0.3513*** (0.000)	0.3713*** (0.000)	0.3890*** (0.000)
Mobile phone	0.1383 (0.428)	0.2968* (0.027)	0.2957* (0.028)
Education	-0.0328 (0.794)	0.0313 (0.787)	0.0189 (0.868)
Finanncial system	-0.5923** (0.008)	-0.2145 (0.121)	-0.2871 (0.054)
Real Gdp	-0.0020 (0.699)	-0.0031 (0.553)	-0.0030 (0.545)
Electricity	0.3053 (0.052)	0.1302 (0.301)	0.1649 (0.199)
Employment	0.0505 (0.949)	0.0098 (0.962)	0.0327 (0.893)
Starting doing business	-0.0781 (0.075)	-0.0632 (0.147)	-0.06724 (0.107)
Urbanization	2.022 (0.091)	-0.5796** (0.004)	-0.5992** (0.008)

Continued

Constant	-7.3826 (0.167)	0.9632 (0.230)	1.0642 (0.512)
rho	0.9586	0.3912	rho
LR test			56.07 (0.000)
F test	20.24 (0.000)		
Wald		153.49 (0.000)	173.38 (0.000)
N	177	177	177

Notes: This table reports the logistic regression results for the deployment of crowdfunding using a full model. The dependent variable is CFwc. The explanatory variables are: Real GDP; logElectricity; log Internet; log Mobile phone; log Score Starting business; log Urbanization; log Employment, log education and log financial system development. These variables are further described, with sources of data indicated, in **Table 1**. $p > |z|$ -statistics in parentheses * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

holding other variables constant, and assuming that other factors are constant, one unit increase in urbanization will lead to decrease the deployment of local platform by 0.55542 units.

The lower session of the table (Random effects) shown an estimated standard deviation of the random intercepts (0.3026), along with a standard error (0.059) and a 95% confidence interval for this standard deviation was found to be significant, we concluded that interceptions vary from country to country as shown in **Figure 2**.

A likelihood ratio test (56.07) reported on the final line of the output confirms that this random intercept was better model.

From the simple model to the full model, as shown in **Figure 1** and **Figure 2** in appendix, we have the simple model, as shown in **Figure 1**, by using random intercept, revealed that at a given level of the information and communication technology infrastructure (internet and mobile phone), education, and financial system, the percentage of deployment factors were on average approximately 7 points lower in Sao Tome, average approximately 4 points lower in Gabon, Guinea Equatorial and average approximately 2 points lower in Angola, Benin, Central African Rep, Congo Rep, Cameroon, Chad, Côte d’Ivoire, and Guinea.

And average higher by around 7 points in Togo, by 5 points in Burundi, Democratic Congo and average higher by around 2 points in Ghana, Rwanda, Burundi, Guinea Bisau, Mali.

As shown in **Figure 2**, the figure revealed that at a given level of the information and communication technology infrastructure (internet and mobile phone), education, financial system, the real GDP, the electricity, the employment, the

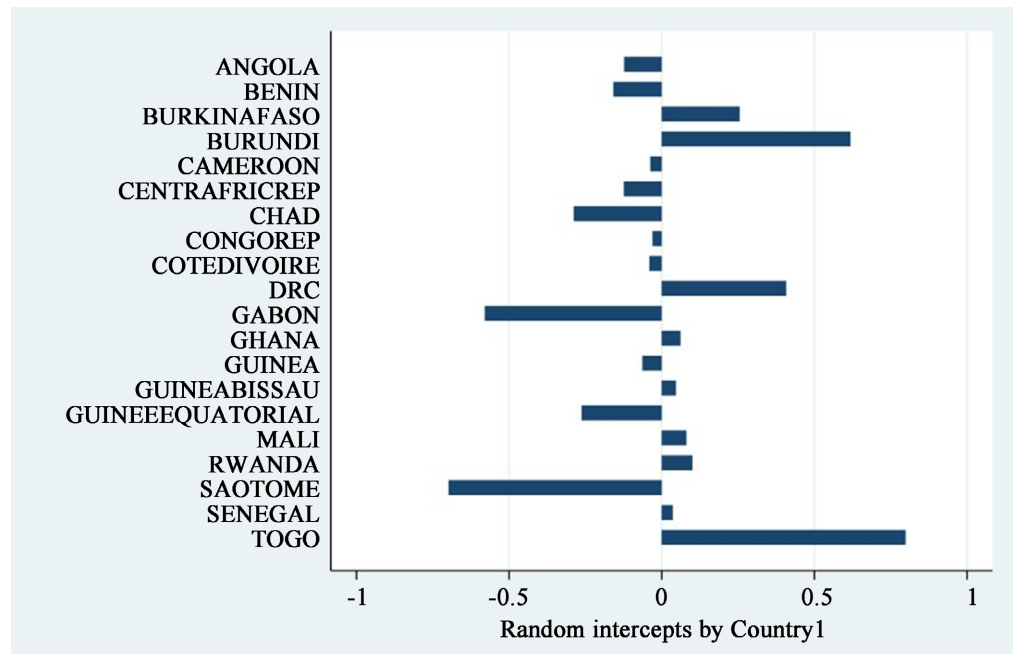


Figure 2. Random intercept with the full model.

score starting business, and urbanization, the percentage of deployment factors were on average approximately 0.5 points lower in Sao Tome, Rwanda, Guinea Equatorial, Guinea, Gabon, Côte d’Ivoire, Chad, Central Africa Rep, Benin.

And average higher by around 0.5 points in Togo, Mali, Guinea Bissau, Ghana, Democratic Congo, Congo Rep, Cameroon, Burundi, Burkina Faso, and Angola.

We have observed that the lack of basic infrastructure, the legal framework and the sustainable public policy between employment and education, and the low level of GDP are the blocking factors for developing the local platform in WCA.

5. Conclusion

Based on striking results, the study highlights a series of levers on which legislators or public policies in Central and West African countries can act to meet the challenges of crowdfunding, we summarize them into three main levers, namely:

The first lever concerns factors relating to basic infrastructure, namely the level of urbanization, education, and electricity penetration are the obstacles to the deployment of the local platform in West and Central Africa. The weakness of basic infrastructure is a fundamental obstacle to the development of crowdfunding in Africa, particularly the deployment of local platforms.

The results affirm that without proper policies addressing essential infrastructure, African countries face challenges in attracting increased risk capital and investments. Building confidence and security for potential investors requires addressing these issues as a priority. To achieve this, African nations must prioritize improving access to both physical and digital infrastructure.

Central Africa needs to build multi-stakeholder partnerships with the West as well as the East, harnessing inclusive and sustainable digitalization to help build more equitable societies.

To address the educational challenge in Africa effectively, we need to:

1. Adopt a pedagogical model that combines entrepreneurship and emerging technologies in education.
2. Revamp both vocational and university education models.
3. Overhaul the African education system, making entrepreneurship a focal point in university and college programs.
4. Establish partnerships between public and private institutions and universities to create an educational model centered around digital development and entrepreneurship.
5. Use this model to transition many unemployed young people from the informal economy to the formal economy.

The second lever concerns the infrastructure of information and communication technologies, based on the penetration of the Internet and mobile telephony, constituting a vector of positive influence for the deployment of the local crowdfunding platform.

The countries of Central and West Africa must exploit the advantages they provide from the Internet and mobile, to create or develop a unique model of Crowdfunding in Africa, preserving the characteristics of each country and betting on an internet platform model with the mobile phone as highlighted in Yang’s study (Yang & Zhang, 2016).

To enhance infrastructure and improve the efficiency of Central and West African financial systems, we can leverage existing achievements like the Internet and mobile phones. This involves partnering with established African banks that offer secure and interoperable digital infrastructures with data confidentiality measures.

To attract investors, digital institutions must be created to encourage innovation, and ensure data security and protection, while ensuring the protection of both investors and project leaders.

To mitigate risks, build investor confidence, and ensure investment security, decision-makers must enact and enforce laws. This third lever, implementing these laws, will facilitate investment in digital infrastructure, leading to employment growth and economic prosperity.

The results of our research reinforce the importance of setting up a national or regional support policy between public authorities, universities, financial and banking institutions, telecommunications companies, small and medium-sized enterprises, and entrepreneurs. Our results also demonstrate the relevance of implementing the strategies to support the development of the digital and entrepreneurial ecosystem, through a comprehensive digital and entrepreneurial innovation policy. The digital and entrepreneurial innovation policy should be implemented, and strengthened to significantly promote youth employment, a

path that opens to these African countries, to put in place investments and innovative structures, support entrepreneurship, provide access to financial education, and guide small fundraising projects within African schools and universities.

The weakness of this study is to consider the factors listed below at the macro level as the only ones allowing the deployment of domestic platforms, which constitute upstream the main indicators of the establishment of an efficient, and sustainable business model.

Future studies should integrate organizational and cultural factors at the meso level and implement a crowdfunding awareness survey to assess crowdfunding awareness, knowledge, and the feelings and perceptions of potential funders in Sub-Saharan Africa.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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