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The determinants of the frequency of crowd funding activity in Africa

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Abstract
Crowd funding has become an efficient means for entrepreneurs to secure early-stage funding for their businesses and also offer other advantages to entrepreneurs such as playing the role of a marketing tool and fostering informed business decisions. However, crowd funding penetration in Africa is still very low and only few countries are taking full advantage of crowd funding. In this study we investigate the determinants of the frequency of crowd funding activity in Africa. We employed regularized regression for the analysis to overcome multicollinearity. In order to retrieve point estimates from the regularized coefficients to enable us to test the various hypothesis we adopted the induced smoothed lasso technique in the study. We find that economic variables such as GDP, and total investment have significant influence on the occurrence of crowd funding in Africa. Also, population size, wealth, institutional strength, technological advancement, labour force, and the education level have significant impact on the frequency of crowd funding. Largely, the findings show that the occurrence of crowdfund is not accidental but contingent of various significant factors.

Keywords: crowd funding, induced smoothed lasso, ridge regression, lasso regression, elastic net regression

Introduction

African economies are faced with a widening lending gap. So far, many entrepreneurs rely heavily on informal sources for financing (George *et al*., 2016) [20]. However, informal sources have not helped very much to bridging the early-stage credit gap in many African countries. Bruton *et al*., (2015) [8] suggest that new alternative sources of financing for entrepreneurial endeavors can be secured from many different sources such as microfinance, peer-to-peer lending and the crowd funding. Microfinance is very useful for entrepreneurs in Africa because with this system entrepreneurs are approved to secure small loans without any collateral (Galak *et al*., 2011) [19]. Duarte *et al*., (2012) [14] explain that peer-to-peer lending is another form of alternative source of financing. Peer-to-peer lending process has evolved from physical person to person lending to internet-based lending. The most popular form of peer-to-peer lending that is penetrating Africa is crowd funding that is providing the mean for entrepreneurs in Africa to access funding through internet-based web platforms. Crowd funding offer other advantages to entrepreneurs such as playing the role of a marketing tool and fostering informed business decisions. However, crowd funding penetration in Africa is still very low and only few countries are taking full advantage of crowd funding. World Bank (2013) suggest that crowd funding in Africa account for less than 1% of the global crowd funding market.

Figure 1 below shows the global crowd funding transactional volume by region for the year 2019 (Statista Digital Market Outlook, 2019) [40]. We can observe that Eastern Asia has the highest global crowd funding transactional volume. Crowd funding is estimated to record a global transaction volume of 10,490 billion by 2020, China remains a giant in the crowd funding terrain. According to World Bank (2013), crowd funding is crowd funding expected to explode to about $45 to $50 billion by 2025. We can also observe that crowd funding in the entire African region is just a speck in comparison to crowd funding in Eastern Asia as a region and China as a country.

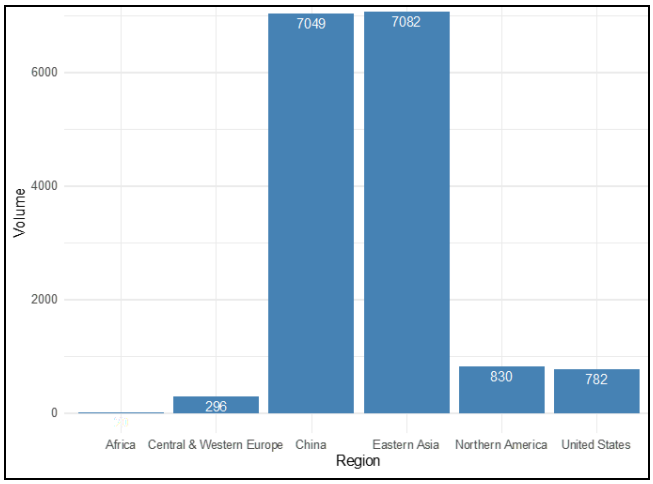

Fig 1: Global crowd funding volume (2019)

Literature review

Empirical research into crowd funding in Africa is gaining momentum even though crowd funding in Africa is arguably at the early stages of market development. Wolf (2017) [48], explains crowd funding in Africa in a sociological context and claim that the occurrence of crowd funding is similar to traditional collective reciprocity culture of most African societies. Similarly, (Berndt, 2016) [3] assets that crowd funding is a modern version of credit associations that existed in many African societies where individuals could invest in other people's businesses. As previously mentioned in earlier sections, traditional informal and formal credit associations are popular financing channels for many African businesses. Several researchers

have also attempted to draw a comparisons between crowd funding and microfinancing (Oruezabala & Peter, 2016; Wolf, 2017). Wolf (2017) [48] claim that crowd funding has helped to overcome the inadequacies of microfinancing in Africa. Authors writing on crowd funding in Africa also suggest that some microfinance institutions in Africa are gradually evolving their social mission to crowd funding options for businesses in Africa which is making crowd funding an important appealing alternative for small businesses (Munyanyi & Mapfumo, 2016) [32]. Wolf (2017) [48] also notes that crowd funding can create co-creation of innovation between entrepreneurs and funders or capital providers at the same time strengthen the entrepreneurship financing phenomenon in Africa. Hence, (Oruezabala & Peter, 2016) suggest that crowd funding is a new form of resource for African entrepreneurs that goes beyond securing funding.

Flanigan (2017) [16] examines how crowd funding could contribute towards heightening diaspora philanthropy. She explains that diaspora philanthropy comprises "money, goods, volunteer labor, knowledge and skills, and other assets donated for the social benefit of a community broader than ones' family members, in a country or region where there is a population with whom the donor(s) have ancestral ties". Flanigan (2017) [16] again notes that crowd funding technologies could increase the transfer of diaspora philanthropy. (Munyanyi & Mapfumo, 2016) [32] Also add that online philanthropy can be regarded as the giving of financial and social capital for promoting human welfare through online platform. Hence, through crowd funding, African migrants can support the entrepreneurial activities of by family members and friends in their countries of origin through the facilitation of crowd funding platforms. Flanigan (2017) [16] also explain that exploiting the shared characteristics and complementary strengths of crowd funding and diaspora philanthropy can help diaspora generated 'philanthropic crowd funding' flourish. Furthermore, people from the diaspora possess the relevant networks and information that could help offset crowd funding's vulnerabilities (Leblang, 2010) [28].

Studies by Berndt (2016) [3] and Flanigan (2017) [16] emphasize that regulatory factors are key to crowd funding development in Africa. Similarly, Munyanyi and Mapfumo (2016) [32] explain that a regulatory environment is necessary for the development of crowd funding in Africa. Ziegler *et al*., (2020) asserts that the more adequate national regulatory schemes ensure that crowd funding platforms operate in the same national market, the higher the overall market capitalization of crowd funding grows. Again, Ziegler *et al*., (2020) remark that most African countries lack alternative financing regulatory regimes. Given the nonexistence of crowd funding-specific regulation in many African countries, general financial services regulation is applied to firms seeking to provide services that boarders on activities that are specified in existing laws. However, some regulatory initiatives to help financial innovation, that include various steps taken towards establishing regulatory sandbox processes for financial technology companies have been implemented by various African government agencies (Ziegler *et al*., 2020)). Furthermore, the African Crowd funding Association was established in 2015 as an industry organization devoted to promoting in favour of crowd funding legislation creation and reforms, increasing public awareness of crowd funding, and ensuring industry practices that protect investors and democratize access to capital (African Crowd funding Association, 2020) [1].

Hypothesis

To develop testable hypothesis, we adopt the demand and supply of entreprenurship as theoretical basis. Thornton (1999) [43] classifies the eclectic theories on Entrepreneurship into two schools namely, the supply-side perspective and the demand-side perspective. According to Thornton (1999) [43], demand-side perspectives study the occurrence of entrepreneurship through diverse contexts such as the creations by organizational hierarchies Freeman (1986), the activity of the professions (Wholey *et al*., 1993) [47], the policy of nation-states (Dobbin & Dowd, 1997) [13], the development of markets (King & Levine, 1993; White, 1981) [24, 46], and the advent of technological change (Shane, 2016). On the other hand, supply-side perspective of entrepreneurship studies the phenomenon from the context of the individual characteristics of the entrepreneur.

Light & Rosenstein (1995) [29] explain that the demand-side perspective of entrepreneurship was first developed by scholars such as Marxist, economists, and geographers. Modern views based on demand-side perspective draws on theories from ecology and institutional theories in organizational sociology (Thornton, 1999) [43]. This perspective is also currently very popular among economic sociologists. Romanelli (1991) [36] characteristic of the ecological perspective, propose that the availability of resources encourages entrepreneurs to emerge. This proposition is also supported by Freeman (1986) [17] who conjecture that knowledge and resources provided by firms to their employees coupled with market niches spin off new entrepreneurial opportunities. However, according to Thornton (1999) [43] both ecological and institutional perspectives are weakened by their absence of an agency theory.

Arguably, the supply-side perspective dominates the theories on entrepreneurship. Diverse theories and concepts across many disciplines have been used to explain entrepreneurship from this perspective. For instance, the sociological point of view explain entrepreneurship as the occurrence of social hierarchy and values. Thus, factors such as an individuals' position, tradition, cultural values, mobility and social status determines entrepreneurial behaviour. Furthermore, from the psychological theories the occurrence of entrepreneurship in a society and their frequency has been explained by the individual centric arguments and also in psychological context. According to Thornton (1999) [43], one critical weakness of the supply perspective theories is their lack of thorough and appropriate research methods.

Schultz (1990) [38] and Bregger (1996) [6] both argue that the state of the economy impacts demand for entrepreneurship. However, according to them, the relationship between economic development and entrepreneurship is negative. This perspective is further echoed by Carree *et al*., (2002) [11] who explain that economic development enhances the quality of life and wages of workers which also increases the opportunity cost of entrepreneurship and thereby decreases the demand for entrepreneurship. Thus, from these arguments, it can be conjectured that less developed economies would have a high demand for entrepreneurships. Thus, a high per capita income implies low demand for entrepreneurship. Carree & Thurik (2010)

[10] also observe a positive effect of economic growth on entrepreneurship. Hence, we therefore hypothesize the following:

H1: Economic situation has a significant impact on the frequency of crowd funding campaigns.

Financial development is correlated with demand for entrepreneurship as explained by Klapper *et al*., (2007) [26]. Klapper *et al*., (2007) [26] defines financial development by the ratio of domestic credit to private sector as a percentage of GDP and suggest that financial development is linked to new entry rates and business density. Conversely, financial crisis also affects the demand for crowd funding entrepreneurship since most financial institutions during periods of crisis are averse to lending out loans to businesses and especially new startups (Haddad and Hornuf, 2019). In order to make up for the refusals, entrepreneurs undertake crowd funding to fill the gaps for funding (Lopez-de-Silanes *et al*., 2015; Schindele & Szczesny, 2016). Thus, we hypothesize the following:

H2: Financial development has a significant impact on the frequency of crowd funding campaigns.

Wennekers & Thurik, (1999) [45] argue from the Schumpeterian perspective of creative destruction to explain that technological advancement leads to the creation of new level of entrepreneurship. Indeed, crowd funding is a typical example of a new industry which is gaining popularity due to the demand for financial technology or Fin Tech. Crowd funding ventures essentially depend on advanced new technologies to improve the sharing of information to reach the crowd. Hence, we hypothesize the following:

H3: Technological development has a significant impact on the frequency of crowd funding campaigns.

Reynolds (1999) [35] suggest education is a crucial element for stimulating entrepreneurship. Education provides people with needed skills to enter into entrepreneurship. Thus, countries with good education systems are likely to produce more entrepreneurs. Bates (1990) [2] argue that business ventures that are started by entrepreneurs with high level of education are likely to survive. Some studies also argue for a negative impact of education on entrepreneurship. Blanchflower & Oswald, 2007) [5] argue that the level of education has a negative effect on the willingness to engage in self-employment. This is because highly educated people are unwilling to accept the risks related with entrepreneurship. Hence, we hypothesize that:

H4: Education has a significant impact on the frequency of crowd funding campaigns.

Evans & Leighton (1989) [15] propose that wealth of individuals in a country increases the supply of entrepreneurship significantly. Thus, individuals with greater level of wealth and assets are likely to enter into entrepreneurship. Lindh & Ohlsson, (1998) [30] suggest that wealth in the form of inheritance or lottery winnings increases the likelihood of an individual to pursue entrepreneurship. Hence, we hypothesize that:

H6: Wealth has a significant impact on the frequency of crowd funding campaigns.

Bjørnskov & Foss (2008) [4] propose that institutional features of a country, such as tax environment, intellectual property rights, trust, corruption, crime, size of government etc., has a strong influence on the supply of entrepreneurship in a country. They argue that corruption and opaque administrative procedures impedes opportunities for potential and incumbent entrepreneurs. Klapper *et al*., (2004) observe that bureaucratic regulations inhibit new entries in European countries. Hence, we hypothesize that:

H7: Institutional features has a significant impact on the frequency of crowd funding campaigns.

The availability of adequate labour is a key determinant for the supply of entrepreneurship. Ernst and Young (2016) explain that supply of talent labour have a very strong effect on Fin Tech startups. Also, OECD (1998) suggest that a rigid labour market regulation hinders labour supply and constrains new entrepreneurial activity. Thus, labour force availability and a flexible labour market regulations regime are good influencers of the supply of entrepreneurship. So, we hypothesize that:

H8: labour force has a significant impact on the frequency of crowd funding campaigns.

The underlying notion of the "unemployment-push theory" is that unemployed workers seek self-employment as an escape out of unemployment. Thus, higher rates of unemployment lead to subsequent higher rates of entrepreneurship. Carree & Thurik, (1998) [9], find little evidence for the "unemployment-push theory", however, their findings signify that differences may appear when certain subsectors are examined. Hence, we hypothesize that:

H9: Unemployment has a significant impact on the frequency of crowd funding.

Materials

Country level data on the number of crowd funding campaigns are retrieved from Statista's primary research on crowd funding from 2017 to 2020. Overall, A total of 31,715 crowd funding activities are included in this study. For the independent variables, different databases are explored for country level data on Africa. To test Hypothesis 1, the study includes gross domestic product (GDP) in current prices of constant exchange rate of individual countries from Statista's Country Outlook. Also, the study incorporates consumer price index (CPI), which represent a change in the level of prices for goods and services from households in order to capture the effects of inflation on the number of crowd funding campaigns. Data on Consumer price index is taken from the African Information Highway of the African Development Bank. Ocampo *et al*., (2009) [33] and Stiglitz & Greenwald (2014) [41] suggest that exchange rate plays a significance role in an economy by facilitating economic diversification. Hence, we include exchange rate (XRT) in one unit of local currency in United States dollars. Data on exchange rate is taken from Statista's Country Outlook. Exogenous growth proponents also advocate the importance of investment in every economy. Hence, we capture the impact of investment on the total number of crowd funding campaigns by incorporating total investment (TTINV) or gross capital formation which represents the total value of the gross fixed capital formation and changes in inventories and acquisitions minus the disposals of valuables for every sector. Data on total investment is obtained from Statista's Country Outlook. Furthermore, in recent years, human development index (HDI) has become a popular indicator of the economy since GDP does not take into consideration other aspects such as the well-being of the people in a Country. The HDI provides a single measure which utilizes four key metrics namely: life expectancy, expected years of schooling, average years of schooling, and gross national

income (GNI). Data on HDI is taken from the African Information Highway database of the African Development Bank. In order to test Hypothesis 2, we incorporate credit card penetration (CCP) and online banking penetration (OBP) as indicators for financial development. Credit card penetration measures the number of credit card accounts or the percentage of the total population that own at least one credit card in an economy. Online banking penetration also measures the percentage of individuals that uses the internet to access banking services. Data on credit card penetration and Online banking penetration are obtained from Statista's Country Outlook database. We examine Hypothesis 3 by including digital revenue (DR), Internet usage penetration (IU), Broadband subscription (BBS), and Smartphone penetration (SPHNP) as indicators of technological advancement of a country. Digital revenue encompasses the revenue from e-commerce and digital platforms. Internet usage penetration measures the number of Internet subscriptions. Broadband subscriptions indicate the fixed subscriptions to high-speed public internet through broad bands. Smartphones production showcases the number of people using smartphones. Data on Digital revenue, Internet usage penetration, Broadband subscription, and Smartphone penetration are taken from Statista's Country Outlook.

We test Hypothesis 4 by including School age population for Secondary School Education (SAPOP) as an indicator for the impact of education on the total number of crowd funding campaigns. The difficulties to school attendance at the secondary level are prevalent in many African countries due to high cost to access secondary schools and affordability. Consequently, secondary school education has been preserved for only the privileged class of many African societies and thereby rendering a good fraction of their labour force without secondary education. The school age population for secondary school variable provides information on the number of people that are within the secondary school age in a country. Data on School age population for secondary school education is taken from the African information highway database.

We examine Hypothesis 5 by incorporating the total population of a country (TPOP) as well as the population of different age groups. We account for the impact of different categories of age groups on the number of crowd funding campaigns. We incorporate the population of age categories; 0 year to 14 years (POP0-14), 15 years to 24 years (POP15-24), 25 years to 34 years (POP1-14), 35 years to 44 years (POP1-14), 45 years to 54 years (POP1-14), 55 years and above (POP55+). Furthermore, we study the impact of the number of households (NHH) on the total number of crowd funding campaigns. Households represent residential communities of people living and keeping house together. Thus, business facilities as well as institutional households such as dormitories or retirement homes are not classified as households. Data on the total number of households is taken from Statista's economic outlook.

We test Hypothesis 6 by including consumer spending which describes voluntary spending by the population. Consumers often spend on different goods and services, consequently, the study includes consumer spending per capita of private households in constant exchange rate (CPPHH), consumer spending per capita for food and non-alcoholic beverages (CPFNAB), consumer spending per capita for alcoholic beverages, tobacco, and narcotics (CPTNA), consumer spending per capita for clothing and footwear (CPCF), consumer spending per capita for housing, water, gas, and fuel (CPHWEG), consumer spending per capita for furnishings, households equipment, and routine maintenance (CPFHEH), consumer spending per capita for health (CPH), consumer spending per capita for transport (CPT), consumer spending per capita for communication (CPC), consumer spending per capita for recreation and culture (CPRC), consumer spending on education (CPE), consumer spending on restaurants and hotels (CPRH), and consumer spending on miscellaneous goods and services (CPM). Data on consumer spending is collected from Statista's Country Outlook.

We test Hypothesis 7 by incorporating the ease of doing business index (EDB). Ease of doing business score, according to the World Bank, helps to assess the absolute level of regulatory performance over a period of time. It captures the gap between a particular economy's performance and the best performance at any point in time. Ease of doing business is score from 0 to 100 where 0 implies the lowest score and 100 implies the best score. Also, the study includes the institutional strength of a country using the strength of legal rights (SLR). The strength of legal rights index measures the extent to which collateral and bankruptcy laws ensures that the rights of borrowers and lenders are protected. The index ranks from a scale of 0 to 12, with highest scores showing that laws are well calculated to expand access to credit.

Hypothesis 8 is examined by using three different indicators for namely: employment in industry (EMPI), employment in services (EMPS), and employment in agriculture (EMPA). Data on the three indicators is take from the African information highway of the African Development Bank (AfDB). We test Hypothesis 9 by extracting country-level data on unemployment (UNEMPL) from the African information highway of the African Development Bank (AfDB). Finally, we test Hypothesis 9 by including data on unemployment in the countries involved in the study.

Method

We collapsed the dataset into a panel data set for 36 African countries for the 3-year study period. Due to high dimensional panel data settings, we estimate a regularization of multivariate regression which allows us to overcome multicollinearity. Regression with regularization penalty has been popular in econometrics since Lamarche (2010), Harding and Lamarche (2019), and Su *et al.*, (2016). The regression models incorporated in the study are ridge regression, lasso regression, and elastic net regression.

Ridge regression model belongs to the class of L2 norm regularization. Ridge regression is built on least squares regression but introduces the L2 penalty term to reduce the RSS (Hoerl & Kennard, 1970). The L2 term is equal to square magnitude of the coefficients. Thus, the Ridge regression coefficients are given by;

$$\hat{\beta}_{ridge} = \sum_{i=1}^{n}(y_i - \hat{y})^2 + \lambda \sum_{j=0}^{p} \hat{\beta}_j^2 \quad 1$$

Ridge regression minimizes the estimated coefficients of variables that have less contribution to the model towards Zero (Hastie *et al*., 2015). The minimization requires a λ or a tuning parameter to determine the amount of shrinkage. The regularization parameter $\lambda \geq 0$ controls the penalty term. In this case, when $\lambda = 0$ the model produces least

squares estimates and as λ increases to infinity, the minimizing penalty also increases and yields coefficients closer to zero. This can be observed in Figure 3.2 where the elliptical contours represent the cost function of the linear regression whiles the shaded circle represent the ridge constraint. If the ridge conditions are relaxed on the coefficients, then the constrained region can expand and eventually touch the center of the ellipse which would result in the similar output of the ridge and the linear model.

Lasso uses the L1 penalty term to minimize the RSS which is equal to the absolute value of the coefficients (Tibshirani, 1996) [44]. Given a suitable λ Lasso can render some coefficients to zero and thereby perform variable selection while minimizing prediction errors by constraints on the parameters that render some coefficients to reduce to zero. The Lasso coefficients are given by:

$$\hat{\beta}_{lasso} = \sum_{i=1}^{n}(y_i - \hat{y})^2 + \lambda \sum_{j=0}^{p}|\hat{\beta}_j| \quad 2$$

In the cartesian plane the shaded diamond is the constraint region for lasso coefficients. The elliptical contours represent functions of linear regression. The lasso regression conditions on the coefficients constrain the regression coefficients to the diamond.

Elastic Net regression is the hybrid of Ridge and Lasso, in that, it combines the L2 penalty of Ridge and L1 penalty of Lasso (Zou & Hastie, 2005). The coefficients of the Elastic Net are given by:

$$\hat{\beta}_{enet} = \frac{\sum_{i=1}^{n}(y_i - \hat{y})^2}{2n} + \lambda\left(\frac{1-\alpha}{2}\sum_{j=1}^{m}\hat{\beta}^2 + \alpha\sum_{j=1}^{m}|\hat{\beta}_j|\right) \quad 3$$

With respect to Elastic Net, aside choosing a suitable, the optimal α parameter which is a mixing parameter for Ridge and Lasso also has to be tuned for effective prediction. From Figure 4.5 it can be seen that ridge restricts the regression coefficient to the circle whiles lasso restricts the coefficient to the diamond.

The elastic net regression keeps the coefficient between the convex of the ridge penalty and the lasso penalty. Further, the convexity of the elastic net regression depends on the α value.

The disadvantage regarding ridge regression, lasso regression, and elastic net regression is that they do not provide point estimates and *p-values* for hypothesis testing, however, they provide an efficient variable selection functions. Cilluffo *et al*., (2019) [12] propose the induced smoothing based on Brown & Wang (2005) [7] that leads to estimators with sampling distribution closer to a normal one and corresponding reliable covariance matrix to carry out inference. Details of the methodology can be found in the research paper Cilluffo *et al*., (2019) [12]. The induced smoothed lasso can be implemented by the *islasso* package for *R* statistical software. The advantage of the *islasso* package is that there is a provision for a lambda and alpha values estimated by *K*-fold cross validation that specifies the tuning parameters in the penalized objective (Friedman *et al*., 2009) [18]. Hence, the tuning parameter would allow us to specify the point estimate for the ridge regression, lasso regression, and elastic net regression using the elastic net mixing parameter$0 \leq \alpha \leq 1$. Alpha=0 produces estimates for the ridge model whereas Alpha=1model yields estimates for the lasso regression model.

We transform the variables into a common data set by taking the natural logarithm of all the variables in the study sample. In our baseline specification, we estimate the following model:

$$LNCRWD_{i,t} = F(LGDP_{i,t} + LCPI_{i,t} + LHDI_{i,t} + LTTINV_{i,t} + LXRT_{i,t} + LEDB_{i,t} + LSLR_{i,t} + LTPOP_{i,t} + LPOP1-14_{i,t} + LPOP15-24_{i,t} + LPOP25-34_{i,t} + LPOP35-44_{i,t} + LPOP45-54_{i,t} + LPOP55+_{i,t} + LNHH_{i,t} + LCCP_{i,t} + LOBP_{i,t} + LDR_{i,t} + LIU_{i,t} + LSPHNP_{i,t} + LBBS_{i,t} + LCPPHH_{i,t} + LCPFNAB_{i,t} + LCPTNA_{i,t} + LCPCF_{i,t} + LCPHWEG_{i,t} + LCPFHHE_{i,t} + LCPH_{i,t} + LCPT_{i,t} + LCPC_{i,t} + LCPRC_{i,t} + LCPE_{i,t} + LCPRH_{i,t} + LCPM_{i,t} + LEMPA_{i,t} + LEMPI_{i,t} + LEMPS_{i,t} + LUNEMPL_{i,t} + SLAPOP_{i,t}) \quad 4$$

Results

Summary Statistics

Table 1: Descriptive statistics

Variable		Obs	Mean	SD	Min	Max	Skew
Dependent Variable							
Number of crowd funding	*NCRWD*	108	302.1	308.7	20	1470.	2.05
Independent Variables							
Ease of Doing Business	*EDB*	108	56.76	38.76	37.86	81.47	0.41
Strength of Legal Rights	*SLR*	108	5.56	2.53	1	11	0.47
Total Population	*TPOP*	108	29.1	37.6	13	201	2.77
Population: Ages 0-14	*POP0-14*	108	11.7	157	2	878	3.15
Population: Ages 15-24	*POP15-24*	108	5.58	7.27	2	38.7	2.80
Population: Ages 25-34	*POP25-34*	108	4.33	5.46	2	27.5	2.44
Population: Ages 35-44	*POP35-44*	108	3.10	3.99	2	20.2	2.44
Population: Ages 45-54	*POP45-54*	108	2.05	265	1	13.0	2.32
Population: Ages 55+	*POP55+*	108	2.35	3.11	1	13.7	2.11
Number of Households	*NHH*	108	5.98	7.88	3	40.3	2.51
Average Consumer Spending Per capita of Private Households	*CPPHH*	108	1620	167	218	878	2.06
Consumer spending per capita for food and non-alcoholic beverages	*CPFNAB*	108	618	600	124	3096	2.16

Consumer spending per capita for alcoholic beverages, tobacco and narcotics	*CPTNA*	108	37.81	66.11	2	401	4.05
Consumer spending per capita for clothing and footwear	*CPCF*	108	90.06	85.95	7.00	449	1.88
Consumer spending per capita for housing, water, electricity, gas and other fuels	*CPHWEG*	108	273	292	15	1204	1.42
Consumer spending per capita for furnishings, household equipment and routine maintenance of the house	*CPFHHE*	108	95	123	9	678	2.79
Consumer spending per capita for health	*CPH*	108	55.84	64.46	2	228	1.41
Consumer spending per capita for transport	*CPT*	108	146.21	209.94	9.00	1106	2.69
Consumer spending per capita for communication	*CPC*	108	52.49	68.26	1	366	2.42
Consumer spending per capita for recreation and culture	*CPRC*	108	46.81	75.16	2.00	452.00	3.74
Consumer spending per capita for education.	*CPE*	108	43.68	51.29	1.00	237.00	1.64
Consumer spending per capita for restaurants and hotels	*CPRH*	108	59.43	78.36	0.00	475.00	3.27
Consumer spending per capita for miscellaneous goods and services	*CPM*	108	106.5	147.21	10.0	660.0	2.11
Digital revenue	*DR*	108	428	393	100	409	10.10
Broadband Subscription	*BBS*	108	1.629	3.89	0.010	22.300	3.74
Smartphone penetration	*SPHNP*	108	24.91	14.31	4.60	64.80	0.62
Internet Users	*IU*	108	962	146	300	839	2.78
Gross Domestic Product	*GDP*	108	2656	2793.17	315.0	11558	1.48
Consumer Price Index	*CPI*	108	107.6	19.53	100.0	289.6	7.60
Exchange rate	*XRT*	108	0.05	0.11	0.00	0.79	3.91
Total Investment	*TTINV*	108	13.806	20.52	0.180	91.3	2.07
Human Development Index	*HDI*	108	3.9815	14.28	0.10	65.20	3.83
Unemployment	*UNEMPL*	108	7.739	6.82	0.471	28.181	1.28
Employment in Industry	*EMPI*	108	14.339	18.478	5.4	76.71	2.02
Employment in Services	*EMPS*	108	3.856	5.51	1.69	30.543	3.05
Employment in Agriculture	*EMPA*	108	5.26	6.812	4.0	34.381	2.45
Credit card penetration	*CCP*	102	2.981	3.71	0.10	21.7	3.08
Online Banking penetration	*OBP*	93	6.592	6.86	0.01	29.80	1.55
School age population (Secondary School)	*SAPOP*	108	4.21	5.21	1.25	26.9	2.54

Table 1 presents the descriptive statistics of the dependent variable and the independent variables for the total sample. It can be seen that the lowest number of crowd funding campaigns within the study period is 20 whereas the highest number of crowd funding campaigns is 1470. Also, the mean number of crowd funding campaigns is approximately 308.76. The skewness value for crowd funding campaigns suggests that the distribution of values for the number of crowd funding campaigns in the total sample is positively skewed which indicates that many countries in the sample have lower values. The mean value for the ease of doing business index is 56.76 which suggest that averagely the many countries involved in the study have an above average score for the ease of doing business index. Also, the minimum score for the ease of doing business index reported in the summary statistics is 37.86 whereas the maximum is 81.47. The ease of doing business index skew score also suggest that the distribution is symmetrical about the mean value. Similarly, the strength of legal rights index summary results paints a fairly flamboyant picture of the protection of lenders and borrowers with a mean score of approximately 5.56 and a maximum score of 11. The score for skewness also suggests that the distribution is symmetrical about the mean value. The average of total population in the countries involved in the study is approximately 29 million whereas the minimum and maximum are approximately 13 million and 200 million respectively. We can notice that averagely the countries have 11.7 million of the population between the ages of 0 to 14 years. Also, the countries have averagely 5.5 million of the population between the ages of 15 to 24 years. Furthermore, we notice that the countries have averagely 4.3 million of the population between the ages of 25 to 34 years. Again, we find that the countries involved in the study have averagely 3.1 million of the population between the ages of 35 to 44years. Besides we can observe that the countries have averagely 2 million of the population between the ages of 45 to 54 years. Moreover, we can notice that the countries have averagely 2 million of the population between over 55 years old. Thus, the trend reveals a younger population in the African countries involved in the study. The summary statistics also pinpoints wealth gap among the countries included in the study sample. We can infer from the skewness values for all the variables representing wealth that fewer countries have high numbers of wealthy individual. Likewise, by observing the standard deviation, mean, maximum, and minimum for digital revenue, broadband subscription, smartphone penetration, and internet users' population, we can notice a positive skew for technological advancement in Africa.

With respect to the economy, the descriptive analysis reveals that the average GDP in constant exchange rate is 2656.3 whereas the minimum and maximum values are 315 and 11558 respectively indicating a skewed distribution to the right which suggests disparities in the level of economic development among the countries involved in the study sample. The summary statistics for consumer price index show that averagely the countries involved in the study yielded a single digit inflation within the study period. The average exchange rate in one unit of local currency to the unitedstates dollars is 0.05083, thus, averagely most local currencies would equal this amount in the countries involved in the study. We can also notice a positively skewed distribution for total investment and human development index given their summary statistics. It can be seen that the mean for unemployment rate is 7.739 and the

minimum and maximum are 0.471 and 28.181 respectively. The average employment in industry is 1433.9 million. Similarly, 3856 million people are employed in services, and 5215 million are employed in agriculture. Thus, the majority of the countries involved in this study have high proportion of their labour force employed in the Agric sector. It can be seen that the mean for secondary school age population is 4.21 million and the minimum and maximum are 1.25 million and 26.9 million respectively.

Table 2: Induced smoothed lasso estimates

	Ridge	Lasso	Elastic Net
Intercept	***24.385*****	***24.296*****	***24.343***
EDB	-4.485***	-4.474***	-4.479
SLR	0.451**	0.447**	0.449
TPOP	3.883	3.920	3.900
POP0-14	-1.913	-1.959	-1.936
POP15-24	-1.304	-1.245	-1.274
POP25-34	-9.823***	-9.907***	-9.866***
POP35-44	12.248***	12.391***	12.320***
POP45-54	-0.832	-0.864	-0.849
POP55+	-3.634**	-3.686**	-3.658**
NHH	-0.464	-0.460	-0.462
CPPHH	-1.603	-1.614	-1.609
CPFNAB	3.298***	3.315***	3.307***
CPTNA	0.164	0.167	0.165
CPCF	-1.373***	-1.371***	-1.371**
CPHWEG	0.870**	0.856**	0.862
CPFHE	-2.195***	-2.205***	-2.200***
CPH	0.535***	0.532***	0.533
CPT	2.952***	2.971***	2.961***
CPC	-1.984***	-1.988***	-1.985***
CPRC	-0.421	-0.408	-0.414
CPE	0.429**	0.425**	0.427
CPRH	-0.589***	-0.584***	-0.586
CPM	1.498***	1.508***	1.502**
DR	0.002	0.002	0.002
BBS	0.464***	0.462***	0.463
SPHNP	-0.068	-0.065	-0.066**
IU	0.438	0.436	0.436
GDP	-1.994***	-2.020***	-2.007
CPI	0.145	0.155	0.150
XRT	0.049	0.048	0.048**
TTINV	1.134***	1.138***	1.136
HDI	-0.376	-0.372	-0.374
UNEMPL	0.016	0.028	0.022***
EMPI	1.942***	1.953***	1.947***
EMPS	-4.107***	-4.131***	-4.118
EMPA	0.040	0.043	0.042
CCP	0.275	0.275	0.274
OBP	-0.217	-0.222	-0.219
SAPOP	2.36***	2.317***	2.326***
AIC	111.54	111.61	111.57
Null deviance	62.8506	62.8506	62.8506
Null deviance Df	83.00	83.00	83.00
Residual deviance	6.9979	6.9974	6.9975
Residual deviance Df	44.04	44	44.02
Model complexity	39.95733	39.99744	39.97627

Note: ** p<0.1; ** p<0.05; *** p<0.01*

Model Selection

From Table 5.3 we observe the *islasso* coefficient estimates for the independent variables using the regularization parameters of the ridge regression model, lasso regression model, and the elastic net model as tuning parameters. The null deviance reported in the table shows how well the dependent variable is predicted using only the intercept. The residual deviance shows the reduction of the deviance when some independent variables are included. In the relative measure of model parsimony. We use the Akaike Information Criteria (AIC) to select the model for the Hypothesis testing. We can observe that the ridge regression model yielded the lowest AIC value; hence, we conduct interpretation of the hypothesis testing results using the ridge regression estimates.

Country level determinants of the frequency of Crowd funding

The ridge regression model provides evidence for us to accept Hypothesis 1 that the economy has a significant impact on the frequency of crowd funding campaigns. We can notice that the coefficient of GDP is negative and statistically significant at 1% significance level. Also, the model predicts that a 1% increase in GDP would result in 1.994% decrease in the number of crowd funding campaigns ceteris paribus. Also, we observe that the coefficient of total investment is statistically significant at 1% significance level and positive. The model estimates that a 1% increase in total investment contributes to a 1.134% increase in the number of crowd funding campaigns ceteris paribus. The model provides no evidence to for us to accept Hypothesis 2 that financial development has a significant impact on the frequency of crowd funding campaigns. We can observe that the coefficients of both credit card penetration and online banking penetration are not statistically significant at 10% significance level. Hence, we reject Hypothesis 2. With respect to Hypothesis 3, we can observe that the coefficient of broadband subscription is statistically significant at 1% significance level and positive. The model estimates that a 1% increase in broadband subscription contributes to a 0.464% increase in the number of crowd funding campaigns ceteris paribus. Hence, we accept Hypothesis 3. The results also supply evidence for us to accept Hypothesis 4 that education has a significant impact on the frequency of crowd funding campaigns. We can notice that the coefficient of school age population for secondary education is positive and statistically significant at 1% significance level. The model predicts that a 1% increase in school age population for secondary education leads to 2.36% increase in the number of crowd funding campaigns ceteris paribus. Hence, we accept Hypothesis 4. We accept Hypothesis 5 that crowd funding campaigns occur more frequently in countries that have high population. We can observe that the coefficient the population of age group between 25 years to 34 years is statistically significant at 1% significance level. The model estimates that a 1% increase in the population of age group between 25 years to 34 years leads to a 9.823% decrease in the number of crowd funding campaigns ceteris paribus. We also find that the population of age group between 35 years to 44 years is statistically significant at 1% significance level. The model predicts that a 1% increase in the population of age group between 35 years to 44 years contributes to a 12.248% increase in the number of crowd funding ceteris paribus. Similarly, we can observe that the population of age group 55 years and above is statistically significant at 5% significance level. The model estimates that a 1% increase in the population of age group 55 years and above leads to a 3.634% decrease in the number of crowd funding. Again, we accept Hypothesis 6 that wealth has a significant impact on the frequency of

crowd funding campaigns. We can observe that the coefficient of consumer spending per capita for food and non-alcoholic beverages is statistically significant at 1% significance level. The model estimates that a 1% increase in consumer spending per capita for food and non-alcoholic beverages contributes to 3.298% increase in the number of crowd funding ceteris paribus. We can also notice that the coefficient of consumer spending per capita for clothing and footwear is significant at 1% significance level and contributes negatively to the number of crowd funding campaigns. The model suggests that a 1% increase in consumer spending per capita for clothing and footwear contributes to a 1.373% decrease in the number of crowd funding ceteris paribus. The coefficient of consumer spending per capita for housing, water, electricity, gas and other fuels is statistically significant at 5% significance level. It can be seen that a 1% increase in consumer spending per capita for housing, water, electricity, gas and other fuels contributes to a 0.870% increase in the number of crowd funding ceteris paribus. Also, the coefficient of consumer spending per capita for furnishings, household equipment and routine maintenance of the house is statistically significant at 1% significance level. It can be noticed that a 1% increase in consumer spending per capita for furnishings, household equipment and routine maintenance of the house leads to a 2.195% decrease in the number of crowd funding ceteris paribus. The model also estimates the coefficient of consumer spending per capita for health to be statistically significant at 1% significant level. The model predicts that a 1% increase in consumer spending per capita for health results in 0.535% increase in the number of crowd funding ceteris paribus. We can also find that consumer spending per capita for transportation is statistically significant at 1% significant level. The model predicts that, a 1% increase in consumer spending per capita for transportation causes a 2.952% increase in the number of crowd funding ceteris paribus. The coefficient of consumer spending per capita for communication is statistically significant at 1% significance level. We can also identify a negative relationship between consumer spending per capita for communication and the number of crowd funding. The ridge model estimates that a 1% increase in consumer spending per capita for communication leads to a 1.984% decrease in the number of crowd funding campaigns ceteris paribus. Also, the coefficient of consumer spending per capita for education is statistically significant at 5% significance level. We can observe that a 1% increase in consumer spending per capita for education contributes to a 0.429% increase in the number of crowd funding ceteris paribus. The results also suggest that the coefficient of consumer spending per capita for restaurants and hotels is statistically significant at 1% significance level. The model predicts that a 1% increase in consumer spending per capita for restaurants and hotels leads to a 0.589% decrease in the number of crowd funding campaigns ceteris paribus. Further, we notice that the coefficient of consumer spending per capita for miscellaneous is statistically significant at 1% significance level. The model estimates that a 1% increase in consumer spending per capita for miscellaneous leads to a 1.498% increase in the number of crowd funding campaigns ceteris paribus. We also find evidence to acceptive Hypothesis 7 that institutional features have a significant impact on the frequency of crowd funding campaigns. We can observe that the efficient of ease of doing business is statistically significant at 1% significance level and negative indicating that crowd funding is often favorable in countries where there is low score for ease of doing business. The study estimates that a 1% increase in ease of doing business leads to a 4.485% decrease in the number of crowd funding. Also, the coefficient of strength of legal rights is statistically significant at 5% significance level. We can notice that a 1% increase in the strength of legal rights score leads to a 0.451% increase in the number of crowd funding campaigns ceteris paribus. The study also provides evidence for us to accept Hypothesis 8 that labour force has a significant impact on the frequency of crowd funding campaigns. We can see that the coefficient of labour force in industries statistically significant at 1% significance level. We notice that a 1% increase in labour force in industries leads to a 1.942% increase in the number of crowd funding ceteris paribus. Also, we can notice that labour force in services is statistically significant at 1% significance level. The study predicts that a 1% increase in labour force in services leads to a 4.107% decrease in the number of crowd funding ceteris paribus. We reject Hypothesis 9 that unemployment has a significant impact on the frequency of crowd funding campaigns. We can observe that the coefficient of unemployment is not statistically significant at 10% significance level. Consequently, we find no evidence to accept Hypothesis 9.

Table 3: Hypothesis testing results summary

Hypothesis		Outcome
H1	Economic situation has a significant impact on the frequency of crowd funding campaigns.	Accepted
H2	Financial development has a significant impact on the frequency of crowd funding campaigns.	Rejected
H3	Technological development has a significant impact on the frequency of crowd funding campaigns.	Accepted
H4	Education has a significant impact on the frequency of crowd funding campaigns.	Accepted
H5	Population characteristics has a significant impact on the frequency of crowd funding campaigns.	Accepted
H6	Wealth has a significant impact on the frequency of crowd funding campaigns.	Accepted
H7	Institutional features have a significant impact on the frequency of crowd funding campaigns.	Accepted
H8	Labour force has a significant impact on the frequency of crowd funding campaigns.	Accepted
H9	Unemployment has a significant impact on the frequency of crowd funding.	Rejected

Conclusion

Securing funding by business startups in many economies has always been a difficult hurdle for many entrepreneurs. Luckily disruptive financial technology and models are providing innovative ways of alternative financing of including crowd funding. However, the market share of the African crowd funding market volume compared to other regional markets is very small. Nevertheless, crowd funding continues to gain in popularity in Africa. This study investigates the determinants of the frequency of crowd funding in Africa. The findings from this study have significant implications for policymakers.

Policymakers should take an intent cue from our findings and make crowd funding growth an essential economic planning goal. Economic planners should increase their awareness of crowd funding to provide support for the crowd funding industry. The economy plays an important role in the demand for crowd funding entrepreneurs. As previously discussed, a prosperous economy ensures the supply of entrepreneurs since individuals can acquire enough wealth and savings to venture into entrepreneurship. Hence, efforts to ensure economic growth must incorporate measures that stimulates entrepreneurs to engage in crowd funding.

One of such efforts include building stronger national institutions to oversee crowd funding activities. Crowd funding regulation at the moment is not available in many African countries, this makes crowd funding a risky business since there are no guarantees that the funds raised shall be applied to the project as promised by the fundraisers. At the same time settling on the right regulations might also be problematic since over regulating would discourage entrepreneurs from participating in crowd funding. However, creating a general national sense of institutional strength would help to groom trust for crowd funding activities. As previously observed in preceding chapters, the strength of national institutions is crucial for the supply of crowd funding entrepreneurs. This is because stronger institutions promote the sense of security of investing in an economy. Therefore, economic planners can achieve both the demand and supply of crowd funding entrepreneurs in their countries. Also, policy makers and economic planners can pay closer attention to education in order to ensure the supply of entrepreneurs who might engage in crowd funding. This is because talent is crucial for anyone who would like to venture into entrepreneurship and the provision of good quality education would ensure that individuals can receive the necessary entrepreneurial skills. Policymakers and economic planners must also pay attention to the population characteristics of their country. The preceding chapters established that certain age groups have significant impact on the supply of entrepreneurs who engage in crowd funding. This finding is beneficial, in that, it can help in the short term and long-term economic planning and also policymakers can easily identify which feature of the population to focus their plans to boost the supply of entrepreneurs. For instance, when policy makers wish to predict the recurrence of crowd funding in their economies, the findings from this study pinpoint that the population of the age group between 35 years to 40 years is the most crucial variable to consider.

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