

Does innovation matter for firm's financial inclusion? Evidence from Enterprise Surveys in Cameroon

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Abstract

This study aims at evaluating the impacts of innovation on financial inclusion in Cameroon. This specifically involves evaluating the effects of innovation on access, availability, use and the composite index of financial inclusion of companies in Cameroon. To achieve these goals, we used data from the World Bank (Enterprise Survey) from a survey of 361 manufacturing and service companies in 2016. Using the probit model, several results were obtained. (i) The more the company's new products or services are new to its main market, the more it invests in Research & Development activities, and the more access it has to financial services. (ii) The more the company invests in Research & Development, the more it has overdraft or overdraft facilities. (iii) The more a company invests in Research & Development, the more it is financially included. Thus, we can recommend to Cameroonian companies to invest more in Research & Development in order to benefit from financial services granted by financial institutions.

Keywords: innovation, Research & Development, financial inclusion, Cameroon.

JEL : C52, D22, G20, O55.

Introduction

Over the past decades the effects of financial inclusion have been widely analysed in the economic literature. The role of financial inclusion as a driver of economic development has been at the heart of a vast empirical literature. Many studies have shown how financial inclusion promotes structural transformation and poverty reduction in developing countries (Beck, 2016; Karlan et al. 2016), wealth creation, consumption smoothing and the development of entrepreneurial activities (Demirgüç-kunt et al. 2008), economic growth (Prahdan et al. 2016; Kim et al. 2018; Van et al. 2021), investment in human capital accumulation (Karen et al. 2010; Bruhn and Love, 2014), women's empowerment (Swamy, 2014) and financial stability (Han and Melecky, 2014).

The issue of financial inclusion is recurrent not only for its beneficial effects on economies, but more especially for the disparities observed across the regions of the world. Recent data from the World Bank shows that Cameroon is one of the countries with low financial inclusion relative to the average for Sub-Saharan Africa (SSA). Specifically for Cameroonian businesses, 79% of businesses have a current or savings account compared to 86.2 for SSA, 14.2% have a bank loan compared to 19.9 for SSA, 41% of businesses have not had a loan compared to 38% in SSA and finally 35.5% of businesses have had their loan application rejected compared to only 15.4% in SSA (Enterprise Surveys, 2016).

Previous theoretical and empirical studies have identified a plethora of explanatory factors for financial inclusion. Initially, the possibility theory of access boundaries and the theory of access barriers (Beck and de la Torre, 2006) helped to circumscribe the framework for analysing the determinants of financial inclusion. These theories have shown that financial inclusion can be explained by demand and supply factors. Furthermore, the development of the theory of financial intermediation (Diamond, 1984) has highlighted the importance of transaction costs, information asymmetries and uncertainty in explaining problems of access to financial services. Thus, even in equilibrium, information problems can lead to credit rationing and exclusion from financial markets (Stiglitz and Weiss, 1981). Similarly, economic development theories

(Boyd and Smith, 1998) have noted the role of macroeconomic variables in determining the determinants of financial inclusion. Factors such as high transaction costs, low infrastructural development, high levels of poverty and bank charges, population density and illiteracy determine financial inclusion (Ajide, 2017). Finally, the risk management theory of financial intermediation predicts that technological deepening could ameliorate information asymmetry problems and reduce transaction costs associated with SME lending (Allen and Santomero, 1997; Sharpe, 1990).

A second wave of work has highlighted the role of innovations (Islam et al. 2016; Bellucci et al. 2014) with the emphasis mainly on financial technology or “*fintech*” or “mobile money” (Demirgüç-kunt et al., 2020). In recent years, Cameroon has recorded significant, albeit mixed, innovation performance. From 12th/24th in Sub-Saharan Africa in 2018, it ranks 17th out of 26 countries in Sub-Saharan Africa in 2020. In terms of the innovation efficiency ratio, Cameroon performed strongly in 2018, ranking 75th worldwide. According to the OECD (2005), innovation is the implementation of a new or significantly improved product (good or service) or process, a new marketing method or a new organisational method in business practices, work organisation or external relations. Authors agree that it is a key factor in the competitiveness of industries (Walker, 2004) and a means of generating growth (Solow, 1957; Demirel and Mazzucato, 2012). It can be internal (case of R&D, know-how, etc.) or external (suppliers, customers, analysis of the competition, the case of financial technologies or “*fintech*”, etc.).

With particular regard to the effect of innovations on financial inclusion, some authors have tried to analyse the influence of the innovative character of firms’ activity on their financing from the perspective of financial constraints. Some authors believe that belonging to the category of innovative enterprises increases the probability of being financially constrained or of having a lower probability of borrowing than other firms and higher interest rates that increase with the amount borrowed (Guiso, 1998; Savignac and Sevestre, 2007). Others, on the other hand, believe that innovative firms are more likely to be financially included (Ali, 1994).

Referring to Schumpeter’s (1934) theory of innovation, which assumes that banks should be careful to deny loan to firms that lack the potential for innovation and to grant credit only to those that have it, it is possible to establish a link between internal innovation and the financial inclusion of firms.

Empirically, Mai et al. (2019) study the lasting effects of innovation on firm profitability in Vietnam. Using a single panel dataset for the period 2005-2015, their results show that innovators achieve higher profits than non-innovating firms. Thus, the positive effects of innovation on firm profitability are observed not only in the short term but also in the longer run. The benefits of innovation for firm profitability are reflected in a higher probability of exporting, better productivity, better access to formal credit and the ability to obtain government support, but only after the innovation. For these authors, innovation increases the creditworthiness of the firm and improves access to formal credit. It can also ensure greater creditworthiness to obtain formal credit, through a firm's profile of past successful innovation projects or the presence of trusted partners in innovation projects (Ali, 1994; Freeman, 1994).

Other studies (e.g. Ali, 1994; Greve and Taylo, 2000) show that innovation plays an important role in firm profitability, as it helps firms to produce new brands, strengthen their market position, gain competitive advantages and increase productivity. All of which, by strengthening repayment capacities, can help them gain access to loan. In the same vein, Walker (2004) found that innovation is considered one of the main factors with a positive effect on financial performance, as it helps firms to improve their position, establish a competitive advantage and achieve better performance.

Shields and Young (1994) note that when firms spend large amounts of capital on research and adopting new technologies for product innovation, their financial performance tends to decline because the benefits of introducing new products are only seen after customers use and adopt them. On the other hand, the risks associated with innovation projects may be offset by the potential higher returns to innovators. The signalling perspective reveals that high-performing firms are likely to engage in innovative activities (Freeman, 1994). This suggests that innovation serves as an indicator that only the best firms are likely to innovate. Therefore, innovation may help firms to have better access to formal credit and better government support programmes.

Using a sample of 256 small firms that applied for bank loans, Freel (2007) investigates the extent to which ‘innovation’ is associated with a lower level of successful loan applications. The author recorded the proportion of successful loan applications and estimated a series of tobit models using a number of proxy measures of innovation (in terms of inputs, outputs and commercial importance to the firm) and

incorporating standard controls. In general, the models suggest that more innovative firms do less well in credit markets than their less innovative counterparts, although there is some proxy variation. Furthermore, the author finds tentative evidence that “a little innovation can be a good thing”.

Bellucci et al (2014) analyse the access to credit of innovative firms on the price and non-price dimensions of bank credit using information from both datasets. Using a propensity score matching procedure to estimate the impact of the innovative nature of firms on the interest rate of loans, the probability of having to post collateral security and the probability of overdraft, they find, among other things, that innovative firms have a lower probability of being credit rationed than their non-innovative counterparts.

In the light of this literature, there are several reasons for the present work. First, the existing empirical studies between innovation and financial inclusion of firms are not consensual. While some studies show that innovation improves the financial inclusion of firms, others indicate a negative link. These studies mostly focus on the effect of external innovation (e.g. *fintech*), from financial institutions or others, on the financial inclusion of individuals. The lack of clarity in the results motivates us to look further into this subject in the Cameroonian context. Cameroon is chosen because its economy is numerically dominated by SMEs. Secondly, this work proposes to analyse the role of internal innovations as a guarantee or signal for access, use and availability of financial services at the level of manufacturing and service firms. Finally, to the limit of our knowledge, the existing literature on innovation as a factor of financial inclusion of firms in Cameroon is rare and almost non-existent. The studies that have been carried out only note the effect of mobile money on the performance of firms (Talom & Tengeh, 2020). Thus, the following question deserves to be asked: *what is the effect of innovation on firms' financial inclusion in Cameroon?* Therefore, the objective of this study is to analyze internal innovation as a factor of financial inclusion of Cameroonian firms.

The rest of this article is structured as follows. The next section discusses the methodology. In the third section, the empirical results obtained are interpreted and discussed. The last section concludes this work.

2. Methodology

The presentation of the methodology of this work will be in two parts. First, we discuss the data and their sources and second, we present the econometric model and the robustness tests.

2.1.Data

The data source used in this paper is enterprise level surveys for Cameroon conducted by the World Bank *Enterprise Surveys*. The questionnaire is addressed to registered manufacturing and service firms with 5 or more employees. Most of the information refers to the 2016 fiscal year.

2.2.Econometric model

Econometric modelling is carried out according to the nature of the dependent variable. The model specified in this study is taken from the model developed by Cuong and Hoang (2020). For the financial inclusion model, a probit form is specified to capture the probability that a firm is financially included. Assuming that our dependent variable is dichotomous (dummy variable) symbolized by 1 if the firm is financially included and 0 otherwise.

The probability of financial inclusion is assumed to depend on innovation (variable of interest) and other firm characteristics that promote access, use and availability of financial services.

Two models are generally used in cases. The Logit and Probit models. Thus, if the error term follows a logistic distribution, it will be the logit model and the probit model, if it follows a normal distribution. It should be noted that the two models provide practically similar results. Thus, the work is indifferent as to the use of one or the other model.

In order to achieve the results, the model is specified as follows:

$$FI_i = \beta_0 + \beta_1 Nat_i + \beta_2 Formel_i + \beta_3 Exp_i + \beta_4 Pr\ opfem_i + \beta_5 Dirfem_i + \beta_6 Innovation1_i + \beta_7 Innovation2_i + \beta_8 RD_i + \varepsilon_i \quad (2)$$

With i the firm, FI a measure of financial inclusion that is either access ($FI1$), usage ($FI2$), availability ($FI3$) or financial inclusion index (FII), Nat the nature of the firm, $Formel$ the formal status of the firm, Exp the experience of the leader, $Pr\ opfem$ women business owners, $Dirfem$ women managers, $Innovation1$

innovation is new to the firm's main market, *Innovation2* process innovation, *RD* Research and Development, β parameters and ε the error term.

However, before drawing a final conclusions from our results and making recommendations, it is useful to assess the reliability of the probit model. In most cases, a number of post-estimation tests are used in such models. These include the classification table, the Pearson or Hosmer-Lemeshow goodness-of-fit test, the sensitivity/specificity test against the probability threshold and the ROC (receiver operating characteristic) diagram. We will check the robustness of our model by also applying these different tests.

3. Statistical and econometric results

This section analyses first the statistical results and then the econometric results.

3.1. Statistical results

The dependent variable of this work is financial inclusion. It is captured on the one hand by three dimensions which are access, availability and use of financial services and on the other hand by the financial inclusion index that we calculated using factor analysis. Indeed, there is a lively debate on the indicators for measuring financial inclusion. While some studies favour partial measures (Agyekum et al. 2016; Evans, 2016), others prefer composite measures (Sarma and Pais, 2011; Sethy, 2016), and other works integrate both approaches in the same study (Ongo and Song, 2020). The description is given in table 1.

As regards the statistical results, of the sample of enterprises surveyed by the World Bank, 73.13% stated that they had a current or savings account, 40.10% stated that they had an overdraft facility, 17.45% stated that they had taken out a line of credit or loan with a financial institution and 43% stated that they had access to, had access to and used financial services.

As regards the variables of interest, three are highlighted in this work. Their description is given in the table. It can be seen that 63.01% of the new or significantly improved products or services are also new to the company's main market. Only 14.40% of the companies have introduced one or more process innovations and 10.24% of the companies have invested in formal research and development activities. Indeed, studies covering the technological factors of innovation (Napolitano, 1991; Leblanc et al. 1997) stress the importance of research and development (R&D) for innovation. Research and development is thus a *front-edge* of innovative firms. Sirilli and Evangelista (1998) and Chiaromonte (2002) point out that research and development is not only limited to manufacturing firms, but also to service firms.

With regard to the control variables, five variables were considered in this work. Thus, about 28.65% of the responding companies are manufacturing companies. 79.50% of the responding enterprises stated that they were formally registered at the beginning of their activities. 36% of the enterprises surveyed are owned by women and 15.51% are managed by women. Finally, the average manager of companies in the sector has 2.72 years of experience.

Table 1 Descriptive statistics

Categorical variables		
Variables	Measure	Proportion
Access	1 if the company has a current or savings account	0.7313019
	0 otherwise	0.2686981
Use	1 if the company has an overdraft facility	0.401662
	0 otherwise	0.598338
Availability	1 if the company has taken out a line of credit or loan at a financial institution	0.1745152
	0 otherwise	0.8254848
Financial inclusion	1 if the company is financially included	0.432133
	0 otherwise	0.567867
Nature of the business	1 if manufacturing	0.2865169
	0 if service and/or retail business	0.7134831
Formal status of the company	1 if the company is formally registered at the start of its activities	0.7950139
	0 otherwise	0.2049861

Female ownership	1 if a woman is the owner of the business 0 otherwise	0.3601108 0.6398892			
Women managers	1 if the manager of the company is a woman 0 otherwise	0.1551247 0.8448753			
Innovation is new for firm's main market	1 if new product/service is new to the company's main market 0 otherwise	0.630137 0.369863			
Process innovation	1 the company has introduced new production processes 0 otherwise	0.1440443 0.8559557			
Research & Development	1 if the company has invested in research and development activities 0 otherwise	0.1024931 0.8975069			
Continuous variables					
Variable	Measure	Average	Standard deviation	Min	Max
Experience	Number of years of experience of the main manager in the sector	2.728072	0.7068178	0	4.219508

Source: Authors based on World Bank data

3.2. Econometric results

The results of the econometric estimations are presented in Table 2 below. The table shows that the models are globally significant at the 1% (model 1) and 5% (models 2, 3 and 4) levels.

In the econometric estimates themselves, we assess the effect of innovation on the three dimensions of financial inclusion and on the composite index. Overall, research and development is found to significantly affect models 1, 2 and 4; innovation that is new to the firm's main market has a significant effect in model 1 only. As for the control variables, the formal status of the firm has a significant effect in all four models and the experience of the manager has a significant effect in models 1, 2 and 4.

In the first model, which seeks to evaluate the effect of innovation on access to financial services, it is found that two indicators of innovation are significant. Moreover, the formal status of the firm and the experience of the manager significantly explain the access to financial services of firms.

With regard to the first variable of interest, we find that firms that have introduced new or significantly improved products/services that are new to their main market have a higher probability of 0.2025 of accessing financial services in terms of holding a current or savings account. This is because when a company introduces a new product that is new to its main market, the consumption of that product allows the company to make a profit. Thus, the popularity of this product in the main market can be seen as a signal to financial institutions that it is an opportunity to finance the company's activities.

With regard to the second significant variable of interest, if one moves from a company that has invested in formal research and development activities, either in-house or through other companies, excluding market research, it has a higher probability of 0.2496 of accessing a current or savings account.

For the control variables in Model 1, firms that are formal have a 0.3417 higher probability of having a current or savings account. This result is consistent with McKenzie and Sakho (2010) who show that tax registration leads to significantly higher profits for firms affected by the instrument. Indeed, informality is pervasive among firms in developing countries, but simple comparisons between formal and informal firms generally reveal that formal firms are more productive and profitable. However, it is in contrast to the study by Mel *et al.* (2013) who find that firms that formalise are no longer likely to obtain a business bank account or a business loan. Firms with an experienced manager have a 0.1091 higher probability of accessing a current or savings account.

In the second model, which seeks to measure the effect of innovation on the use of financial services, only research and development significantly affects the use of financial services and two control variables significantly affect it. Thus, a firm that invests in formal research and development activities, either in-house or contracted with other companies, excluding market research, has a 0.2638 higher probability of using overdraft facilities than one that does not. Indeed, investments in innovations have financial consequences. It has been shown that innovative value-added offerings sell at higher prices and higher volumes, which increases revenues. The higher the value gap, the higher the revenue growth, driven by both price and volume. Ali (1994) and Freeman (1994) believe that innovation can also ensure a higher probability of obtaining formal credit, due to a firm's profile of successful past innovation projects or the presence of

trusted partners in innovation projects. Therefore, innovative activities can help firms to obtain better access to formal credit. In the same vein, Bellucci et al (2014) argue that innovative firms, as opposed to traditional firms, tend to experience rapid growth rates and attract more and more external funding. However, he opposes the work of Bah and Dumontier (2001) and Aghion et al. (2004) who show that the R&D effort of large listed companies has a negative influence on their debt ratio. In the same vein, Savignac and Sevestre (2007) find that firms engaged in innovative activities have a lower probability of taking out bank loans, all other things being equal.

Furthermore, firms that formally registered their activities at the outset have a 0.2738 higher probability of having cash or overdraft facilities compared to those operating informally. This result is consistent with Farazi's (2014) study which shows that registered firms are 54% more likely to have a bank account and 32% more likely to have a loan. Similarly, firms with experienced managers have a 0.1338 higher probability of having an overdraft or cash facility. This result is in line with the study by Ogubazghi and Muturi (2014) who, using logistic regression, found that the age of the owner/manager has a significant effect on SMEs' access to bank loans. Also, firms run by experienced people have a higher probability of 0.1338 to benefit from overdraft facilities.

For the third model, no variable of interest has a significant effect on the use of financial services in terms of taking out a line of credit at a financial institution. Regarding the control variables.

With regard to the explanatory variables, only the formal status of the firm significantly affects the use of financial services. Thus, a formal firm has a 0.1965 higher probability of taking out a line of credit at a formal institution than a non-formal one.

In the fourth model, we find that the research and development variable, measuring innovation, significantly explains the financial inclusion index. Thus, firms that invest in formal research and development activities, either in-house or through other firms, excluding market research have a 0.3051 higher probability of accessing, having and using financial services compared to those that have not introduced research and development activities. This result is consistent with the work of Mai et al. (2019) who show that innovation increases firm creditworthiness and improves access to formal credit.

In terms of the control variables, it follows from this table of results that firms that are formal have a higher probability of 0.2797 of being financially included compared to those that are not formalized. This result is in line with the study by Farazi (2014) who found that informal firms may have difficulties in accessing finance through conventional sources, which may result in sub-optimal levels of investment in physical capital, research, technology and innovation and training programmes to upgrade the skills of their employees. Furthermore, according to data collected by the World Bank through informal enterprise surveys, informal sector enterprises identify lack of access to finance as the greatest obstacle they face, demonstrating that the formal status of enterprises positively affects the financial inclusion of enterprises.

In addition, firms with experienced managers have a higher probability of being financially included of 0.1356 compared to informal firms.

Table 2: Effects of innovation on financial inclusion and its dimensions in Cameroon

	(1)	(2)	(3)	(4)
Variables	<i>FI 1</i>	<i>FI 2</i>	<i>FI 3</i>	<i>FII</i>
Nature	-0.112997 (0.09355)	0.0057568 (0.10669)	-0.0193609 (0.7539)	-0.008409 (0.10596)
Formal	0.3417291*** (0.0346)	0.2738252*** (0.09454)	0.1965374*** (0.06349)	0.2797234*** (0.09632)
Experience of the leader	0.1091595* (0.05595)	0.1338013* (0.0741)	0.0515501 (0.05548)	0.135621* (0.07565)
Female owner	-0.0086934 (0.09885)	0.1075133 (0.1088)	-0.0739423 (0.07522)	0.093078 (0.11013)
Women managers	-0.0229983 (0.12464)	-0.0994033 (0.13639)	-0.0487244 (0.09634)	-0.1326531 (0.13961)
Innovation 1	0.2025953** (0.08312)	0.0991828 (0.0932)	-0.0760635 (0.07601)	0.0374079 (0.09332)
Innovation 2	-0.0409843 (0.08255)	0.0432824 (0.10164)	0.1083099 (0.08161)	0.0300441 (0.10296)
R & D	0.2496927*** (0.05022)	0.2638481* (0.13733)	0.1356827 (0.1189)	0.3051159** (0.12426)

Chi-square probability	0.0001	0.0138	0.0431	0.0189
Pseudo-R2	0.2215	0.1254	0.1037	0.1321
Number of observations	135	135	135	135

Source: Author's estimate; (***) , (**), (*) represent significance at 1%, 5% and 10% respectively

NB: The calculated parameters represent the marginal effects and the values in brackets are the standard deviations.

In order to check the robustness of our results, we will present the classification table, the Pearson or Hosmer-Lemeshow goodness-of-fit test, the sensitivity/specificity test, the ROC (receiver operating characteristic) diagram for model 4 which groups the four indicators of financial inclusion and the robustnesses

The classification table (Appendix A1) showed that the model has an overall percentage of correct classification of 77.11%, a percentage of sensitivity of 81.94% and a percentage of specificity of 58.73%. This shows that the model is very reliable in classifying the observations accurately.

The Pearson goodness of fit test χ^2 is a test of the number of observed responses versus the number of expected responses. For our model (Appendix A2), we can see that the value is 0.1742; a probability much higher than 0.05, showing that there is no reason to doubt the reliability of the probit regression model. However, the number of covariate models is close to the number of observations (124/135), making the applicability of the Pearson χ^2 test questionable but not necessarily inappropriate. However, Hosmer, Lemeshow and Sturdivant (2013) suggest regrouping the data by ordering on the predicted probabilities and then forming, say, 10 nearly equal-sized groups. This allows our model to fit reasonably well and allows the number of covariate models to move away from the number of observations (10/135), which finally makes the applicability of the χ^2 Pearson test appropriate. Once again, we cannot reject our model.

Annex 3 shows a plot of sensitivity/specificity versus the probability of the cut-off point. The two graphs intersect quite close to the vertical axis (y-axis). This shows that the sensitivity and specificity of the model are good.

The figure in Appendix 4 shows the Receiver Operating Characteristic (ROC) chart. The size of the area under the ROC curve is a measure of the variation explained by the probit regression model. In this case, the area under the ROC curve is 76.83%. The unexplained proportion of the variation is equal to 23.17%. The high proportion of explained variation and the low proportion of unexplained variation show that the model is reliable in explaining the variability of firms' financial inclusion as a function of the explanatory variables used for the analysis in the probit regression.

4. Conclusion

The objective of this work was to examine the effect of firms' innovation on their financial inclusion in Cameroon. We noted that most studies focus more on the effect of external innovation (financial technologies), supply-side outcomes on firms' financial inclusion. Referring to Schumpeter's (1934) theory of innovation, which assumes that banks should be careful to deny loan to firms that lack the potential for innovation and to grant credit only to those that have it, we were able to identify that the types of innovations within a firm determine access, use and availability of financial services in Cameroon. In order to verify this at the Cameroon level, we used World Bank data (Enterprise Survey) from a survey of service and manufacturing firms for the year 2016. Using the Probit model, we found that certain types of internal innovation by firms have a significant effect on their financial inclusion. Specifically, (i) The more the company's new products or services are new to its main market, and the more it invests in Research & Development activities, the more access it has to financial services; (ii) the more the company invests in Research & Development, the more it has overdraft or overdraft facilities; (iii) the more a company invests in Research & Development, the more it is financially included. Thus, we can recommend that Cameroonian should companies invest more in Research & Development in order to benefit from financial services granted by financial institutions.

References

1. Aghion, P., Bond, S., Klemm, A., & Marinescu, I. (2004). Technology and financial structure : Are innovative firms different? *Journal of the European Economic Association*, 2(2-3), 277-288.

2. Agyekum, F. K., Reddy, K., Wallace, D., & Wellalage, N. H. (2021). Does technological inclusion promote financial inclusion among SMEs? Evidence from South-East Asian (SEA) countries. *Global Finance Journal*, 100618.
3. Ajide, K. B. (2017). Determinants of financial inclusion in Sub-Saharan Africa countries: Does institutional infrastructure matter? *CBN Journal of Applied Statistics*, 8(2), 69-89.
4. Ali, A. (1994). Pioneering versus incremental innovation: Review and research propositions. *Journal of product innovation management*, 11(1), 46-61.
5. Allen, F., & Santomero, A. M. (1997). The theory of financial intermediation. *Journal of banking & finance*, 21(11-12), 1461-1485.
6. Bah, R., & Dumontier, P. (2001). R&D intensity and corporate financial policy: Some international evidence. *Journal of Business Finance & Accounting*, 28(5-6), 671-692.
7. Beck, T. (2016). Financial Inclusion—Measuring progress and progress in measuring. *This paper was written for the Fourth IMF Statistical Forum “Lifting the Small Boats: Statistics for Inclusive Growth. Cass Business School, City, University of London, CEPR, and CESifo*.
8. Beck, T., & De la Torre, A. (2006). *The basic analytics of access to financial services*. WB.
9. Boyd, J. H., & Smith, B. D. (1998). The evolution of debt and equity markets in economic development. *Economic Theory*, 12(3), 519-560.
10. Bruhn, M., & Love, I. (2014). The real impact of improved access to finance: Evidence from Mexico. *The Journal of Finance*, 69(3), 1347-1376.
11. *Cameroon—Enterprise Survey 2016 (ES 2016) | Data Catalog*. (s. d.).
12. Chiaromonte, F. (2002). Innovation and R&D management: Are new paradigms observable? *International Journal of Technology Management*, 23(5), 374-409.
13. De Mel, S., McKenzie, D., & Woodruff, C. (2013). The demand for, and consequences of, formalization among informal firms in Sri Lanka. *American Economic Journal: Applied Economics*, 5(2), 122-150.
14. Demirel, P., & Mazzucato, M. (2012). Innovation and firm growth: Is R&D worth it? *Industry and Innovation*, 19(1), 45-62.
15. Demirgüç-Kunt, A., Demirgüç-Kunt, A., & Levine, R. (2008). *Finance and economic opportunity*. World Bank Washington, DC.
16. Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2020). The Global Findex Database 2017: Measuring financial inclusion and opportunities to expand access to and use of financial services. *The World Bank Economic Review*, 34(Supplement_1), S2-S8.
17. Diamond, D. W. (1984). Financial intermediation and delegated monitoring. *The review of economic studies*, 51(3), 393-414.
18. Evans, O. (2016). *Determinants of financial inclusion in Africa: A dynamic panel data approach*.
19. Farazi, S. (2014). Informal firms and financial inclusion: Status and determinants. *Journal of international commerce, Economics and policy*, 5(03), 1440011.
20. Freel, M. S. (2007). Are small innovators credit rationed? *Small Business Economics*, 28(1), 23-35.
21. Freeman, C. (1994). The economics of technical change. *Cambridge journal of economics*, 18(5), 463-514.
22. Guiso, L. (1998). High-tech firms and credit rationing. *Journal of Economic Behavior & Organization*, 35(1), 39-59.
23. Han, R., & Melecky, M. (2013). *Financial inclusion for financial stability: Access to bank deposits and the growth of deposits in the global financial crisis*. The World Bank.
24. Hosmer Jr, D. W., Lemeshow, S., & Sturdivant, R. X. (2013). *Applied logistic regression* (Vol. 398). John Wiley & Sons.
25. Karlan, D., Kendall, J., Mann, R., Pande, R., Suri, T., & Zinman, J. (2016). *Research and impacts of digital financial services*. National Bureau of Economic Research.
26. Kim, D.-W., Yu, J.-S., & Hassan, M. K. (2018). Financial inclusion and economic growth in OIC countries. *Research in International Business and Finance*, 43, 1-14.
27. Mai, A. N., Van Vu, H., Bui, B. X., & Tran, T. Q. (2019). The lasting effects of innovation on firm profitability: Panel evidence from a transitional economy. *Economic research-Ekonomska istraživanja*, 32(1), 3411-3430.

28. McKenzie, D., & Sakho, Y. S. (2010). Does it pay firms to register for taxes? The impact of formality on firm profitability. *Journal of Development Economics*, 91(1), 15-24.
29. Napolitano, G. (1991). Industrial research and sources of innovation : A cross-industry analysis of Italian manufacturing firms. *Research Policy*, 20(2), 171-178.
30. Nkoa, B. E. O., & Song, J. S. (2020). Does institutional quality affect financial inclusion in Africa? A panel data analysis. *Economic Systems*, 44(4), 100836.
31. OECD (2005), The Measurement of Scientific and Technological Activities, Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data, 3rd Ed., Paris, France: Organisation for Economic Co-operation and Development (OECD).
32. Ogubazghi, S. K., & Muturi, W. (2014). The effect of age and educational level of owner/managers on SMMEs' access to bank loan in Eritrea: Evidence from Asmara City. *American journal of industrial and business management*, 4(11), 632.
33. Pradhan, R. P., Arvin, M. B., Nair, M. S., Hall, J. H., & Bennett, S. E. (2021). Sustainable economic development in India : The dynamics between financial inclusion, ICT development, and economic growth. *Technological Forecasting and Social Change*, 169, 120758.
34. Sarma, M., & Pais, J. (2011). Financial inclusion and development. *Journal of international development*, 23(5), 613-628.
35. Savignac, F., & Sevestre, P. (2006). *Bank loans : Do innovative firms face specific financial constraints*. Citeseer.
36. Schumpeter, J. (1934). The theory of economic development Harvard University Press. *Cambridge, MA*.
37. Sethy, S. K. (2016). Developing a financial inclusion index and inclusive growth in India. *Theoretical and applied economics*, 23(2), 607.
38. Sharpe, S. A. (1990). Asymmetric information, bank lending, and implicit contracts : A stylized model of customer relationships. *The journal of finance*, 45(4), 1069-1087.
39. Sirilli, G., & Evangelista, R. (1998). Technological innovation in services and manufacturing : Results from Italian surveys. *Research policy*, 27(9), 881-899.
40. Stiglitz, J. E., & Weiss, A. (1981). Credit rationing in markets with imperfect information. *The American economic review*, 71(3), 393-410.
41. Swamy, V. (2014). Financial inclusion, gender dimension, and economic impact on poor households. *World development*, 56, 1-15.
42. Talom, F. S. G., & Tengeh, R. K. (2020). The impact of mobile money on the financial performance of the SMEs in Douala, Cameroon. *Sustainability*, 12(1), 183.
43. Walker, R. M. (2004). Innovation and organisational performance : Evidence and a research agenda. *Advanced Institute of Management Research Paper*, 002.
44. World Bank Enterprise Survey Database (2016). <https://www.enterprisesurveys.org/en/enterprisesurveys>.

ANNEXE : Robustness test of the global model

Annexe A1 classification table

Probit model for financial

Classified	True		Total
	D	~D	
+	59	26	85
-	13	37	50
Total	72	63	135

Classified + if predicted $\Pr(D) \geq .5$
 True D defined as financial $\neq 0$

Sensitivity	$\Pr(+ D)$	81.94%
Specificity	$\Pr(- \sim D)$	58.73%
Positive predictive value	$\Pr(D +)$	69.41%
Negative predictive value	$\Pr(\sim D -)$	74.00%
False + rate for true ~D	$\Pr(+ \sim D)$	41.27%
False - rate for true D	$\Pr(- D)$	18.06%
False + rate for classified +	$\Pr(\sim D +)$	30.59%
False - rate for classified -	$\Pr(D -)$	26.00%
Correctly classified		71.11%

Annexe A2 Pearson or Hosmer–Lemeshow goodness-of-fit test

Probit model for financial, goodness-of-fit test

number of observations = 135
 number of covariate patterns = 124
 Pearson $\chi^2(115) = 129.10$
 Prob > $\chi^2 = 0.1742$

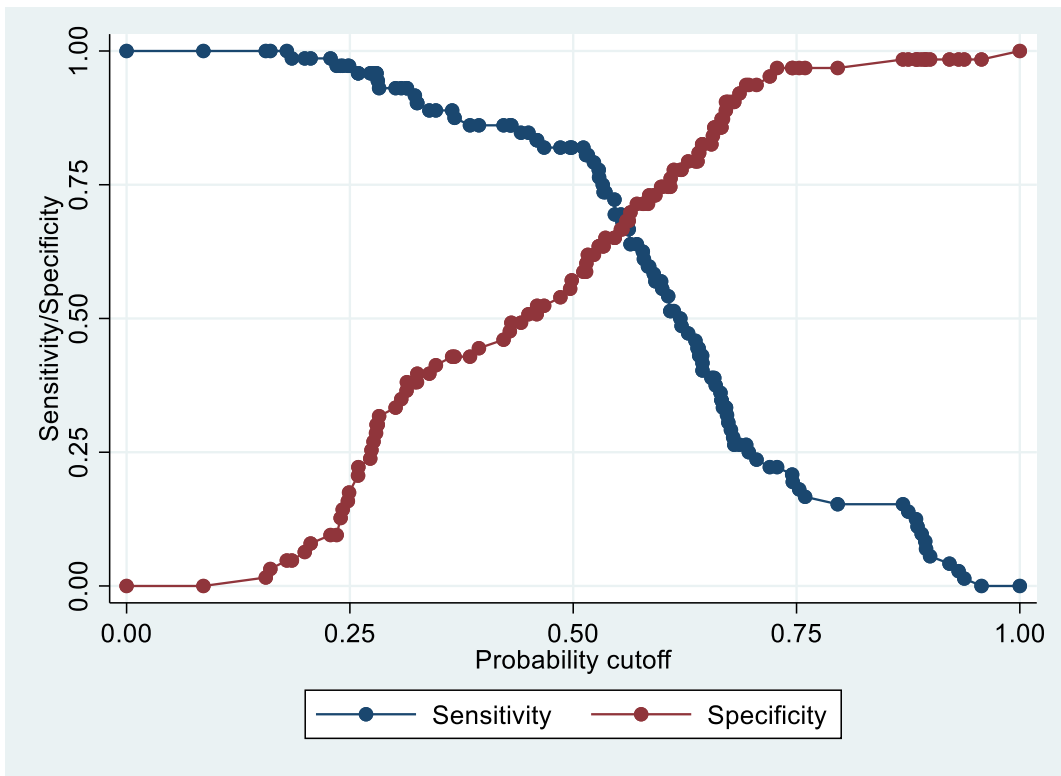
Annexe A3 correction for variance of covariates and number of observations.

Probit model for financial, goodness-of-fit test

(Table collapsed on quantiles of estimated probabilities)

number of observations = 135
 number of groups = 10
 Hosmer-Lemeshow $\chi^2(8) = 4.13$
 Prob > $\chi^2 = 0.8450$

Annexe A3 sensitivity/specificity test



Annexe A4 ROC curve

