The Role of Education in Filling the Gender Gap in Financial Inclusion in Low-income Economies

SCHOLARONE™
Manuscripts

The Role of Education in Filling the Gender Gap in Financial Inclusion in Low-income Economies

Purpose: This study aims to investigate whether gender predicts financial inclusion and whether education can fill the gender gap in financial inclusion when controlling for the effects of supply side factors of financial inclusion in low-income economies.

Design/methodology: The data consisted of 22,504 individuals aged 15 and older from 23 low-income economies extracted from 2017 World Bank Global Financial Inclusion Database. Using a 10-fold cross-validation procedure this study developed a logistic classifier model to minimize the bias associated with random sampling of the training and validation sets. RapidMiner version 9.3 was used to conduct the performance assessment.

Findings: The findings provided support for the gender gap in financial inclusion using the most basic measure of financial inclusion. However, using formal savings and access to credit, the gender gap hypothesis is not supported. Moreover, the results revealed that education reduces the gender gap in the basic form of financial inclusion. However, this study could not find any significant difference between men and women's financial inclusion in terms of saving at a bank or borrowing from a bank though men tend to save more than women informally.

Originality: The current study contributes to the literature by examining the role of education in the relationship between gender gap and financial inclusion when controlling for the effects of heterogeneous infrastructure and the supply side factors of financial inclusion among the selected countries.

Keywords: financial inclusion, gender gap, education, low-income

Introduction

Financial inclusion, which has evolved from opening a formal bank account to a more complex process of access to credit (Cámara and Tuesta, 2014, Park and Mercado, 2018, Ozili, 2018), is considered one of the drivers of inclusive development enhancing the socio-economic status of underprivileged groups (Atkinson and Messy, 2013, Sahay et al., 2015). This role in development has placed financial inclusion as a high priority by developing economies as they pursue the attainment of the 17 Sustainable Development Goals (SDGs) by 2030 (United Nation Capital Development Fund). Failure to increase financial inclusion has many repercussions that include the risk of poverty (Mosley and Lenton, 2012), unemployment (Corr, 2006, Conroy, 2005) and social exclusion (Fernández-Olit et al., 2018). Such concerns have upheld the importance of financial inclusion in contemporary literature (Park and Mercado, 2018, Li, 2018, Lal, 2018, Inoue, 2019, Ozili, 2018, Babajide et al., 2015, Kim et al., 2018, Sethi and Acharya, 2018, Sharma, 2016) with women as amongst the notable financially deprived segments (Delechat et al., 2018, Demirguc-Kunt et al., 2018). The World Bank's 2017 Global Findex Database observes that women constitute 56% of the 1.7 billion global unbanked population without a bank account. Only 65% of the women population have a bank account, lower than men's 72%. The gender gap is wider in low income economies where women are 9% points less likely to have an account with a formal financial institution than men (Demirguc-Kunt et al., 2018).

Achieving gender equality in financial inclusion unblocks resources fostering economic growth and social development (Morsy, 2020a). The microeconomic perspective observes the advantages of women's financial inclusion as elevating the self-esteem motivations for growing business, enabling financial independence, family contribution, and, consequently, community development. The argument explains the notion that 'women have become the agent of their own development' (Cabeza-García et al., 2019). With this perspective, a reduction in the gender disparities in financial inclusion is thus vital for spurring development of the least developed

economies where the gender gap in formal access to financial services is more pronounced (Delechat et al., 2018, Cabeza-García et al., 2019). The concern of enhancing financial inclusion has converged the research focus of many studies towards *women* financial inclusion and therefore *inclusive* economic development. Even with the emergence of the financial inclusion gender gap concept in contemporary literature (Adegbite and Machethe, 2020, Cabeza-García et al., 2019), gender balance remains a persistent challenge (Alliance for Financial Inclusion, 2016). The first perspectives exploring this phenomenon investigated supply-side barriers limiting women's access to financial services (Morsy, 2020a) primarily addressing access issues to financial services (Di Giannatale and Roa, 2019). However, the evidence on the efficiency of supply side initiatives in improving financial inclusion of vulnerable individuals remains inconclusive (Cavallo and Serebrisky, 2016) and has resulted in new studies shifting to understand demand-side barriers over the "less-than-stellar results of supply-side efforts" (Di Giannatale and Roa, 2019). Demand side studies have identified trust in financial institutions (Lyons and Kass-Hanna, 2019, Mehrotra et al., 2019), income level (Lyons and Kass-Hanna, 2019, Mndolwa and Alhassan, 2020a, Kara et al., 2021) and social restrictions (Karlan et al., 2014, Lyons and Kass-Hanna, 2019) as affecting financial inclusion. Many of the demand side studies support education's role as a vital predictor (Mndolwa and Alhassan, 2020a, Kara et al., 2021, Aterido et al., 2013) since it enhances financial literacy (Lyons and Kass-Hanna, 2019) or the chances of a household's high-income-earning capacity (Lotto, 2018) and access to credit thereby reducing the gender disparity in financial inclusion (Aterido et al., 2013, Lotto, 2018, Morsy, 2020a).

Despite the acknowledged significance of education in financial inclusion (Fernandes et al., 2014, Lusardi and Mitchell, 2014), few studies have implicitly addressed the role of education in closing the gender gap. Explicit analysis of this interaction and its effect on financial inclusion is almost entirely absent in the literature. Given the urgent need to achieve universal financial access, and the scarcity of studies in this context, the current study aims to fill this gap by

examining the role of education in the relationship between gender gap and financial inclusion when controlling for the effects of heterogeneous infrastructure and the financial inclusion supply side factors in low-income countries. The objectives of this study are therefore twofold. First, to examine whether gender predicts financial inclusion in low-income economies, and second, to examine whether the interaction of education and gender gap can increase financial inclusion. Financial inclusion is measured beyond the basic definition, incorporating advanced indicators which consider the acknowledged evolving nature of the phenomenon.

Literature Review

Gender and Financial Inclusion

It is widely accepted that development of the financial system is one of the main pillars of economic development (Van and Linh, 2019). Therefore, inclusive economic development seems unachievable when globally 31% of the adults do not own an account (Demirguc-Kunt et al., 2018). The financial inclusion concept originated from a simple ownership of a bank account and has recently evolved to broader access to financial services such as loans and credit lines. Access to one type of financial products aids individuals to accumulate more wealth and facilitate access to other types of products (Atkinson and Messy, 2013). Banked individuals are able to invest in more robust assets, accumulate wealth in interest bearing accounts, have better access to credit and subsequently face lower financial strains (Célerier and Matray, 2019, Fitzpatrick, 2015).

Despite the importance of financial inclusion, evidence for gender gap in various shapes of financial inclusion comes into view. Empirical evidence indicates that irrespective of measures of financial inclusion (e.g., univariate or multidimensional measures), men are more financially included than women (Ghosh and Vinod, 2017, Allen et al., 2016, Lotto, 2018, Calcagnini et al., 2015, Delechat et al., 2018, Demirguc-Kunt et al., 2013, Demirgüç-Kunt and Klapper, 2012, Botric and Broz, 2017). However, gender bias in financial inclusion varies across countries

(Demirgüç-Kunt and Klapper, 2013, Jahan et al., 2019, Botric and Broz, 2017) and tends to be more pronounced in low-income economies and rural areas (Allen, Demirguc-Kunt et al. 2016). According to Demirguc-Kunt et al. (2018), while the gender gap in high-income countries has narrowed, in developing economies, the gender gap remains unchanged. In South Asia access to formal credit for women is limited to about 10%. In Bangladesh for example, although women hold a quarter of total bank deposits, access to bank credit is just 2% (Ghosh and Vinod, 2017). Studying the SMEs in emerging markets, out of 35% of women-owned SEMs, close to one third encountered more critical barriers compared to the male entrepreneurs (Ghosh and Vinod, 2017). Such barriers and reluctance by financial institutions to offer credit exists despite evidence which found women to be relatively more creditworthy borrowers than men as they are regarded as more risk averse (Almenberg and Dreber, 2015) and feel less comfortable with debts (Almenberg et al., 2018).

Gender gap in economic literature can be translated as *disequilibrium*, a situation where market's demand and supply are mismatched. To resolve the disequilibrium in the market, there should be a change in supply, demand or both which transitions the market into a new state of equilibrium. To analyze the gender disparity driven disequilibrium (gender gap in financial inclusion), both demand-and-supply side barriers for women to be financially included have been addressed in the literature extensively (Di Giannatale and Roa, 2019). The supply side factors refer to *access* to financial products and services whereas, the demand side factors apply to *usage* of those services (Di Giannatale and Roa, 2019).

To resolve the supply side barriers (e.g. access to financial institutions), the primary initiatives taken by governments in many of the developing countries have been to develop the enabling infrastructure to support the opening of bank branches, provision of automated teller machines (ATMs) or mobile telephone banking services in remote areas. However, these initiatives have not been sufficient to enhance financial inclusion especially for women. Indeed,

many of the supply barriers are associated with the eligibility of women to own basic financial products such as a saving account and various types of credits.

The main deficiency marginalizing women in accessing financial services originates from their social position. For example, in regional jurisdictions within developing countries women are unemployed and do not possess any savings, property or earn fixed-income, thus fail to provide the collateral in support of credit requests (Cabeza-García et al., 2019). This is to some extent because of the existing land and property rights and cultural norms that discriminate against women (Demirguc-Kunt et al., 2013, Morsy, 2020a, Kulkarni and Ghosh, 2021). Marginalization based on women's social position results in a vicious cycle of financial exclusion and further degrades the existing social status. For example, financial institutions are mandated by law to audit customer financial transactions before they can access various formal financial services. In the absence of existing formal financial transactions at the point of applying for services, women in developing countries tend to be excluded from financial markets (Kairiza et al., 2017). Financial exclusion in turn, further exacerbates women's social position, since credit constrained individuals are more likely to revert to the shadowy underground lending sector (i.e., the informal economy, Honohan (2008)), and other sources of informal credit (Kairiza et al., 2017, De Koker and Jentzsch, 2013) where terms are not too stringent (Mndolwa and Alhassan, 2020a). Such sources of credit tend to place a premium on borrowing, especially on the poorest segments of society (Rosenberg et al., 2009). Therefore, recent policies have focused on encouraging banks to recognize women as a distinct entity requiring products with terms aligned at their financial inclusion (Robino et al., 2019).

Nonetheless, when it comes to the actual increase in the number of women to be engaged in financial services, the demand side barriers must be considered as well. Demand-side barriers refer to the factors causing the low desire among women to participate in the formal financial system. Individuals' traits such as cognitive ability (particularly numeracy), personality type and

preference may affect financial knowledge and thus *willingness* to deal with financial matters (OECD, 2013, Lyons and Kass-Hanna, 2019). Consequently, the gender gap in demand for financial products and services could be associated with gender-specific risk attitude, numeracy, self-confidence and financial literacy. A recent study on teenagers in Germany purported that while male and female teenagers have shown similar levels of numeracy, risk attitude and self-confidence, both genders believe that males are more competent in finance (Driva et al., 2016).

The above explanation brings forth the gender-difference stereotype in this context by supporting the existence of attitudinal biases towards one gender, for instance, regarding the ability to deal with financial matters. The underpinning gender-difference stereotype is conceptualized under the gender role congruity theory developed in part from social role theory. This theory captures the descriptive norms versus the injunctive norms which are the consensual expectation of "*what is*" vis-a-vis "*what should be"* the appropriate social roles of men and women (Powell and Butterfield, 2003, Eagly and Karau, 2002, Pahlevan Sharif et al., 2020).

However, many gender stereotypes are inaccurate because of exaggerations which inflate actual gender differences to appear larger than they truly are (Roszkowski and Grable, 2005). For women, the consequences include internalizing the sense of an inferior competence (Bonnot and Croizet, 2007) which can be incorporated into their self-perception. Consequentially, they become less likely to engage in financial activities disqualifying themselves prematurely as less financially literate and risk tolerant compared to men (Meyll and Pauls, 2019). This inferior financially literacy feeling discourages participation in broader financial activities such as stock markets (Almenberg and Dreber, 2015), retirement planning (Lusardi and Mitchell, 2008), credit card usage (Mottola, 2013), and willingness in taking debt (Almenberg et al., 2018).

Given this overwhelming evidence indicating gender bias in financial inclusion in favor of men, this study hypothesizes the following:

H1. Gender predicts financial inclusion in low-income economies

Financial inclusion is fundamentally measured using access to a bank account. In the last few years, and with the increased attention of the phenomenon in facilitating economic development, the measure has extended to including savings and credit access. The gender disparities inherent in these new definitions remain unexplored though low-income countries indicate disproportionate credit usage by women when compared with their formal savings holdings (Ghosh and Vinod, 2017, Kara et al., 2021). While these indications have been noted in specific countries, this study explores if the narrative can be substantiated by generalizing the gender interaction on the extended financial inclusion definitions in the context of low-income economies. The study thus, responds to the need to understand the extent of discrimination concerns indicated in recent financial inclusion studies (Lyons and Kass-Hanna, 2019, Kara et al., 2021). Thus, based on these discussions, three sub-hypotheses are established to evaluate whether the interaction between the gender disparity is the same across the new measures of financial inclusion as follows:

H1a. Gender predicts financial inclusion as measured by having a bank account in low-income countries),

H1b. Gender predicts financial inclusion as measured by formal savings in low-income countries),

H1c. Gender predicts financial inclusion as measured by formal credit access in low-income countries.

Suturing the gender bias and the endeavor to improve financial inclusion and greater financial stability, both the supply side (e.g. providing access to various financial services) of and the demand side (e.g. improving consumers' awareness and knowledge) for financial products should be fostered. A mere focus on the supply side factors is not sufficient to enhance financial inclusion, thus necessitating the demand side solutions as well. This justifies the notion that

financial inclusion may not be achieved without spreading the knowledge about the benefits of financial services to consumers; and education is the key to achieve this.

Education, Gender and Financial Inclusion

Education has been emphasized in a large body of research as one of most critical factors to improve financial inclusion (Lotto, 2018, Allen et al., 2012, Allen et al., 2016, Morgan and Trinh, 2019, Hogarth and O'Donnell, 1999, Tambunlertchai, 2018, Sahoo et al., 2017, Zins and Weill, 2016, Pena et al., 2014). Better access to educational opportunities make people aware of availing the benefits of financial extension facilities (Datta and Singh, 2019). Moreover, consistent with standard economic theories, individuals with greater income are more likely to save (Späth and Schmid, 2018, Schmidt-Hebbel et al., 1992) and have greater demand for credit due to greater loan eligibility (Cooter et al., 1998). Given that educated individuals have greater employment opportunities (Chen and Wu, 2007, Riddell and Song, 2011) and income (De and Lee, 2002, Wiles, 1974) lower education is viewed as the main factor restricting the demand for financial products and services. A study conducted on households in India showed that low income levels, education and financial education among households are the barriers for household financial inclusion in the investigated states (Bhanot et al., 2012). The aforementioned evidence indicates that inherent to educational attainment are greater employment opportunities, income and financial literacy, all of which would result in greater financial inclusion.

Although there are some studies that failed to support the effect of education on financial inclusion in general (Park and Mercado, 2015, Honohan, 2008), a vast evidence indicates that a more educated female labor force raises the demand for financial products due to substantial skills accumulation, expertise and wealth (Ghosh and Vinod, 2017, Shihadeh, 2018). Education provides women the skills and the knowledge necessary to promote themselves in a social context and contribute more to the economy. Women with a higher level of education would have more confidence to gain control over earnings and participate in economic aspects of life (Kulkarni and

Ghosh, 2021). Education increases women's stock of knowledge and enhances information processing (Samarakoon and Parinduri, 2015). As more women determine the rightful use of financial products capacitated by enhanced financial literacy, and higher incomes, the narrower the gender disparity gap becomes. Thus, in the conscious effort to reach to a financially inclusive society, education plays a central role. In this regard, Allen et al. (2016) found that public policies on lifting the supply barriers worldwide were incapacitated to enhance financial inclusion for females which highlights the importance of paying attention to the demand side factors and education.

Therefore, the current study proposes that education as a demand side determinant would reduce the gender bias in financial inclusion. The study hypothesizes that education moderates the impact of gender gap on financial inclusion. The formulated hypothesis considering the above claim is as follows:

H2. Education reduces the gender gap in financial inclusion in low-income countries

Education enhances financial literacy and gives confidence in women to participate in financial activities(Lyons and Kass-Hanna, 2019). Lower levels of formal education increase the possibility of owning an account by women in some African countries. The impact is similar when broadened to be explained in terms of increasing savings by women. However for credit, both in developed and least developed countries alike, the impact of education in reducing gender disparities is inconclusive(Kara et al., 2021). These different discussions provide a basis for testing the interaction of education and financial inclusion gender disparities in low-income countries. Thus, three additional sub-hypotheses are established to also examine the extent of education in explaining gender disparities on advanced financial inclusion definitions as follows:

H2a. Education reduces the gender gap in financial inclusion as measured by having a bank account in low-income countries,

H2b. Education reduces the gender gap in financial inclusion as measured by formal savings in low-income countries,

H2c. Education reduces the gender gap in financial inclusion as measured by formal credit access in low-income countries.

METHODS

Samples

The data for this study mainly comes from the 2017 World Bank Global Financial Inclusion Database (Demirguc-Kunt et al., 2018). The data consisted of 150,000 individuals aged 15 and older from 144 countries. Approximately 1000 individuals in each country were asked a broad range of questions on their account ownership, saving, borrowing, and spending behavior. The current study used 22504 samples from 23 low-income economies including Afghanistan, Benin, Burkina Faso, Central African Republic, Congo, Dem. Rep., Ethiopia, Guinea, Haiti, Liberia, Madagascar, Mali, Mozambique, Malawi, Niger, Nepal, Rwanda, Sierra Leone, South Sudan, Chad, Togo, Tajikistan, Tanzania, and Uganda (The World Bank Group, 2020). As the data for eight low-income economies including Burundi, Eritrea, The Gambia, Guinea-Bissau, North Korea, Somalia, Syria, and Yemen was not available, they were excluded from the analysis. The data for other variables comes from the 2018 International Monetary Fund's Financial Access Survey dataset (International Monetary Fund, 2018) and the World Bank indicators database (World Bank, 2020)

Variables

Financial inclusion was measured using three variables including having an account at a bank or another type of financial institution (Park and Mercado, 2018, Ozili, 2018), saving or setting aside any money at a bank or another type of financial institution in the past 12 months (Mndolwa and Alhassan, 2020b, Morsy, 2020b), and borrowing any money from a bank or

another type of financial institution in the past 12 months (Mndolwa and Alhassan, 2020b, Kulkarni and Ghosh, 2021). We also included saving or setting aside any money in the past 12 months for old age to address informal saving behavior for further analysis (Mndolwa and Alhassan, 2020b). Respondents reported their gender, age, education level (i.e. completed primary or less, secondary, and completed tertiary or more), income (five groups from poorest 20% to richest 20%), and employment status (i.e. out of workforce and in workforce). In addition to individual attributes, some macro variables were used to assess the infrastructure and access to financial services in each country (Morsy, 2020b). Internet use was measured by the percentage of the individuals using the Internet in the last 3 months. Fixed broadband refers to the percentage of individuals with fixed broadband subscriptions to high-speed access to the public Internet. Mobile cellular refers to the percentage of individuals with mobile cellular telephone subscriptions to a public mobile telephone service. Commercial banks and ATMs refer to number of commercial banks branches per 100,000 adults and number of Automated Teller Machines (ATMs) per 1000 km^2, respectively.

Data analysis

Descriptive statistics

Table 1 compares having an account at a bank or another type of financial institution, saving or setting aside any money at a bank or another type of financial institution in the past 12 months, borrowing any money from a bank or another type of financial institution in the past 12 months, as well as saving or setting aside any money in the past 12 months for old age among male and female respondents as well as respondents with primary education or less and secondary education or more in the included countries. Figure 1 visualizes the variation of having an account at a bank or another type of financial institution among included individual economies.

Logistic regression

This study performed a binominal logistic regression analysis to examine the gender gap and the role of education in financial inclusion using SPSS version 20. Logistic regression describes the relationships between a categorical target variable (i.e. financial inclusion variables) and explanatory variables (i.e. gender, education level, other personal variables, and infrastructural variables) in terms of event probability. Logistic regression allows for an easy interpretation of the model outcomes since the conditional probability is modeled as a function of x. The classification model using binominal logistic regression is defined as follows:

$$g(x) = log\left(\frac{p}{1-p}\right)$$

$$= \beta_0 + \beta_1\beta_{x_1} + \beta_2\beta_{x_2} + ... + \beta_i\beta_{x_i}$$

$$= \beta_0 + \sum_{i=1}^{p} \beta_i\beta_{x_i}$$

Where p is the probability of financial inclusion proxied through the respective indicator variables. β_0 is an intercept parameter, β_1, ..., β_i are the logit coefficients associated with each variable and x_1, ..., x_i are the potential explanatory variables. β_i is determined from log-likelihood function through iterative methods. The constant effect of the explanatory variables on the likelihood of being financially included is given by the odds ratio $\left(\frac{p}{1-p}\right)$, where $log\left(\frac{p}{1-p}\right)$ is the log odds ratio. Logit transformation was applied with an unbounded range in order to generate a linear model for predicting the likelihoods of a class. This is a common model for binary classification that uses a smooth non-linear logistic transformation over a multiple regression algorithm through estimating the class probabilities. Thus, we minimize the misclassification rate and we are able to predict $y = 1$ when $p \geq 0.5$ and $y = 0$ when $p < 0.5$.

Performance assessment

Using a 10-fold cross-validation procedure this study developed a logistic classifier model to minimize the bias associated with random sampling of the training and validation sets. RapidMiner version 9.3 was used to conduct the performance assessment. The dataset was randomly divided into 10 mutually exclusive subsets. Each time, nine subsets were used to train the model and one subset was used to test the trained model and subsequently performance measures were computed. The overall performance measures were the average of the 10 computed performance measures obtained from the 10-fold cross-validation procedure. Accuracy, Kappa, true positive rate, true negative rate, precision, recall, F-measure, ROC, and AUC were used to assess the accuracy and predictive power of the proposed classifiers.

Accuracy measure refers to the percentage of correct predictions over the total number of input samples. While true positive rate (sensitivity) refers to the model's ability to correctly detect financial included participants, true negative rate (specificity) measures the percentage of financial excluded participants who were correctly identified as not being included. The sensitivity and specificity measures are known as two competing but non-exclusive measures of classification performance. Precision and recall also called positive and negative predictive values refer to the proportions of positive and negative results that are true positive and true negative, respectively. F-measure is a weighted harmonic mean of the test's precision and recall. By considering both precision and recall, F-measure provides a more realistic measure of a classifier performance. Kappa measures the agreement between the instances classified by the model and the data labeled as ground truth, controlling for the accuracy of a random classifier (Congalton and Green, 2008). Kappa is normalized at the baseline of random chance on the dataset and can handle both multi-class and imbalanced class problems.

This study also generated receiver operating characteristic (ROC) curve for each model to visually compare the quality of the classifiers' prediction (Fawcett, 2006). ROC curve is a classification performance measurement that plots the sensitivity against specificity for a range of

different cutoff points. The closer the ROC curve is to the upper left corner, the higher the overall sensitivity and specificity of the classification (Hosmer Jr et al., 2013). The area under the ROC curve (AUC) indicates model accuracy so that an AUC greater than 0.5 is considered as an acceptable discrimination. An area of 1 represents a perfect classifier and an area of 0.5 indicates that the model is not able to discriminate between the two outcomes.

A parameter-selection procedure using F-measure was utilized to determine the cutoff point for each classifier. More specifically, several classifiers were constructed using different cutoff points (i.e. from 0.1 to 1, a step of one-tenth). Using a 10-fold cross-validation procedure each model was trained and the most favorable cutoff point (based on the cross-validated performance) was selected for further analysis.

RESULTS

Logit model

The results of conducting logistic regression are reported in Table 2. The first model (Model 1) measured the basic financial inclusion definition which utilizes an account with a formal institution. Model 1 containing all predictors was statistically significant (χ^2 ($df = 16$) = 1620.790, $p < .001$), indicating that the model distinguished between participants who had or did not have an account at a bank or a financial institution. Based on the odds ratio, women were 0.441 times less likely compared with men to have a bank account ($p < .001$) that supported H1a. The odds of having a bank account is 2.484 times greater for higher educated as opposed to lower educated participants ($p < .001$). Moreover, the results indicated that age ($p < .001$), income level ($p < .001$) and employment status ($p < .001$) among the individual factors, as well as Internet use ($p < .001$), fixed broadband ($p < .001$) from the infrastructure factors significantly predicted having a bank account. The statistically significant interaction of education and gender ($p < .001$) indicated that education could reduce the gender gap in having an account, supporting H2a. However, in this study the interaction effects of gender and the infrastructural factors could not

significantly predict having an account. The model explained 16.7% of the variance of having a bank account and correctly classified 88.4% of the cases.

The second model (Model 2) measured financial inclusion based on savings held in a formal institution. This model predicted participants' saving in a bank account or any type of formal financial institution in the past 12 months (χ^2 (df = 16) = 1364.318, p < .001). However, this study failed to support the effects of gender (p = .314) and its interaction with education (p = .974) on saving in banks and financial institutions. The results indicated that the effects of education (p < .001), age (p < .01), income (p < .001), employment status (p < .001), and Internet use (p < .01) on saving at a bank or financial institution were statistically significant. The model explained 14.8% of the variance of saving at a bank and correctly classified 89.4% of the cases.

The third model (Model 3) measured financial inclusion based on borrowings attained from a formal financial institution. This model could distinguish between participants who borrowed money from a bank or any type of formal financial institution in the past 12 months and those who did not borrow any money from these financial intermediaries (χ^2 (df = 16) = 86.591, p < .001). The model could not support H1c and H2c on the effects of gender (p = .954) and its interaction with education (p = .353) on borrowing money from banks and financial institutions. The results showed that Internet use significantly predicted borrowing from formal financial intermediaries (p < .001). The model only explained 1.2% of the variance of borrowing and correctly classified 92.7% of cases.

To improve our understanding of gender gap in saving, this study developed the fourth model (Model 4) containing all predictors that could distinguish between respondents who had saved or have not saved in the past 12 months for their old age (χ^2 (df = 16) = 539.605, p < .001). Based on the odds ratio, women were 0.621 times less likely compared with men to save for old ages (p < .05). Among the individual factors, education (p < .05), age (p < .001), income (p < .001), and employment status (p < .001) were significant predictors of saving for old age. Among

the infrastructural factors, fixed broadband ($p < .05$) and mobile cellular ($p < .01$) were significant predictors of saving for old age. The interaction of gender and education statistically predicted the outcome ($p < .01$) indicating that education significantly reduced the gender gap in saving for old age. However, the interaction between gender and the infrastructural factors did not significantly predict saving for old age. The model explained 5.9% of the variance of saving for old age and correctly classified 89.2% of cases.

Model Performance

This study first determined a cutoff point for each model. Next, the accuracy and predictive power of the proposed classifiers were examined using various measures. Although the regression models using a pre-defined cutoff point of .5 could classify the cases with a high accuracy (from 88.4% to 92.7%), the models are susceptible to other types of error. For example, the model to predict saving for old age as well as the models to predict saving and borrowing using a bank or financial institution always predict no financial inclusion. Thus, the study determined the cutoff point for the classifiers using F-measure and 10-fold cross-validation procedure. Precision, recall, and F-measure for different cutoff points are reported in Table 3. A cutoff point of 0.2 was selected for having a bank account and saving at a bank, and a cutoff point of 0.1 was selected for borrowing from a financial institution and saving for old ages.

Next, the performance of the models was assessed using several measures. The performance metrics for the four models are shown in Table 4. The results revealed that the model predicting having a bank account is the best performer with high accuracy (84.27%), as well as acceptable precision (62.49%), recall (66.06%), and F-measure (64.23%). Figure 2 shows ROC curves for the four classifiers. The ROC curve for the first model predicting having a bank account has the highest area under the curve (AUC = 0.763) and outperforms all other models. The model showed fair acceptance based on both AUC (0.763) and Kappa (0.279). The model predicting saving at a bank or financial institution showed acceptable accuracy evidence by true positive rate

(71.64%), true negative rate (63.47%), Precision (60.43%), recall (63.47%), F-measure (61.91%), and AUC (0.744). However, Kappa of 0.161 was slight. The other two models for borrowing from a bank or financial institution should be used with caution as they did not show acceptable performance evidenced by poor Kappa and AUC measures.

Table 1. Financial inclusion among low-income countries (% age 15+)

Variables	Afghanistan	Benin	Burkina Faso	Central African Republic	Congo, Dem. Rep.	Ethiopia	Guinea	Haiti	Liberia	Madagascar	Mali	Mozambique	Malawi	Niger	Nepal	Rwanda	Sierra Leone	South Sudan	Chad	Togo	Tajikistan	Tanzania	Uganda
Having an account at a bank or financial institution	15	32	23	14	15	35	15	28	22	10	18	33	23	10	45	37	12	9	9	34	47	21	33
Male	22	41	26	18	16	41	16	29	29	11	27	40	29	11	50	41	15	13	13	40	52	23	39
Female	7	23	20	10	14	29	13	27	14	8	10	26	18	8	42	33	10	5	5	29	42	19	27
Primary education or less	9	26	20	10	12	30	10	16	15	7	14	26	17	8	42	34	7	7	6	27	39	17	23
Secondary education or more	30	46	34	29	17	65	31	36	37	23	32	65	39	36	59	52	30	24	27	44	50	36	46
Saving any money at a bank or financial institution in the past 12 months	10	12	6	3	5	26	6	12	11	4	9	6	11	17	2	19	5	4	11	6	12	13	4
Male	12	12	6	4	5	33	7	11	13	5	12	8	13	16	2	23	6	5	13	8	14	15	6
Female	7	12	5	2	4	20	5	13	8	3	6	4	9	18	2	16	4	3	9	4	10	11	1
Primary education or less	8	10	4	1	2	22	5	10	8	3	6	4	8	15	1	16	3	3	9	4	8	8	2
Secondary education or more	14	19	14	10	6	51	12	14	18	11	16	12	25	26	11	40	14	8	12	14	17	18	7
Borrowing any money from a bank or financial institution in the past 12 months	9	9	3	3	3	11	4	11	8	4	8	6	5	13	3	8	4	3	15	5	8	14	3
Male	10	9	4	3	4	13	5	11	8	4	9	8	5	13	3	9	3	4	16	6	7	14	3
Female	8	9	3	2	2	9	4	12	7	3	8	4	5	14	3	6	5	2	13	5	8	13	3
Primary education or less	9	8	3	2	2	11	3	5	7	3	8	6	4	14	3	3	3	3	15	5	8	11	3
Secondary education or more	7	13	5	7	4	6	9	15	8	9	10	6	9	13	7	15	7	6	15	8	8	18	3
Saving any money in the past 12 months for old age	12	14	10	5	6	9	7	10	11	16	4	16	7	12	4	11	9	13	11	6	8	14	7
Male	14	17	12	7	6	12	8	12	15	18	5	16	9	10	3	12	9	16	12	6	11	14	11
Female	11	10	7	3	6	6	7	8	7	15	4	15	4	15	5	10	9	11	11	6	6	14	4
Primary education or less	12	12	9	4	5	8	7	10	10	16	4	15	6	13	3	10	8	13	10	5	8	11	7
Secondary education or more	12	18	12	12	6	17	10	10	12	20	5	18	9	9	15	18	12	17	12	9	10	17	9

Table 2. The results of logistic regression analysis, odds ratio and the respective 95% confidence intervals

Variables	Holding an account with a formal institution	Formal saving in the past 12 months	Borrowing money from a formal institution in the past 12 months	Saving money in the past 12 months for old age
Gender	0.441*** [0.296, 0.658]	0.807 [0.531, 1.225]	0.988 [0.643, 1.516]	0.621* [0.425, 0.907]
Education level	2.484*** [2.245, 2.748]	1.984*** [1.784, 2.206]	0.943 [0.822, 1.082]	1.112* [1.002, 1.234]
Age	1.014*** [1.01, 1.017]	1.005** [1.002, 1.009]	1.003 [0.999, 1.007]	1.012*** [1.009, 1.015]
Income	1.361*** [1.31, 1.415]	1.413*** [1.357, 1.471]	1.011 [0.971, 1.053]	1.272*** [1.227, 1.32]
Employment status	1.569*** [1.393, 1.766]	2.252*** [1.969, 2.575]	1.091 [0.959, 1.24]	2.053*** [1.813, 2.326]
Internet use	1.028*** [1.02, 1.036]	1.015** [1.007, 1.024]	1.031*** [1.02, 1.042]	1.002 [0.993, 1.011]
Fixed broadband	1.261*** [1.165, 1.365]	0.951 [0.859, 1.053]	0.997 [0.89, 1.118]	0.881* [0.795, 0.975]
Mobile cellular	0.997 [0.994, 1.001]	1.001 [0.997, 1.005]	0.995* [0.991, 1]	1.006 [1.002, 1.009]
Commercial banks	1.03 [0.97, 1.093]	0.996 [0.937, 1.058]	0.910* [0.838, 0.989]	1.009 [0.949, 1.073]
ATMs	0.987 [0.964, 1.011]	1.090*** [1.067, 1.113]	0.996 [0.967, 1.027]	0.999 [0.976, 1.022]
Education level x Gender	1.391*** [1.187, 1.63]	0.997 [0.846, 1.175]	1.1 [0.899, 1.347]	1.276** [1.089, 1.496]
Internet use x Gender	1.011 [0.998, 1.024]	0.999 [0.985, 1.013]	0.991 [0.975, 1.006]	0.987 [0.972, 1.002]
Fixed broadband x Gender	0.917 [0.813, 1.034]	1.036 [0.894, 1.201]	1.037 [0.891, 1.207]	1.061 [0.921, 1.223]
Mobile cellular x Gender	1 [0.994, 1.005]	0.999 [0.993, 1.005]	0.996 [0.99, 1.003]	1.002 [0.996, 1.007]
Commercial banks x Gender	1.01 [0.923, 1.105]	1.063 [0.973, 1.16]	1.117* [1.001, 1.246]	1.016 [0.932, 1.108]
ATMs x Gender	0.983 [0.948, 1.019]	0.976 [0.947, 1.006]	0.973 [0.934, 1.014]	1.007 [0.975, 1.041]
R^2	16.70%	14.80%	1.20%	5.90%

Note: $^*p < 0.5$, $^{**}p < .01$, $^{***}p < .001$

Gender: Male = 0, Female = 1

Table 3. Precision, Recall, and F1 for different cutoff points

	Cutoff points	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
Having an account at a bank or financial institution	Precision	58.27	**62.49**	62.75	65.76	71.91	74.85	68.96	44.69	44.69	44.69
	Recall	70.01	**66.06**	57.48	54.15	51.75	50.59	50.17	50.00	50.00	50.00
	F-measure	63.60	**64.23**	60.00	59.39	60.19	60.37	58.08	47.20	47.20	47.20
Saving any money at a bank or financial institution in the past 12 months	Precision	57.12	**60.43**	64.16	65.95	66.95	72.37	44.52	44.52	44.52	44.52
	Recall	67.56	**63.47**	56.86	52.46	50.62	50.24	50.00	50.00	50.00	50.00
	F-measure	61.90	**61.91**	60.29	58.44	57.65	59.31	47.10	47.10	47.10	47.10
Borrowing any money from a bank or financial institution in the past 12 months	Precision	**53.75**	56.15	58.77	46.27	46.27	46.27	46.27	46.27	46.27	46.27
	Recall	**59.03**	51.06	50.08	50.00	50.00	50.00	50.00	50.00	50.00	50.00
	F-measure	**56.27**	53.48	54.08	48.06	48.06	48.06	48.06	48.06	48.06	48.06
Saving any money in the past 12 months for old age	Precision	**54.02**	56.30	58.04	44.60	44.60	44.60	44.60	44.60	44.60	44.60
	Recall	**60.42**	53.45	50.17	50.00	50.00	50.00	50.00	50.00	50.00	50.00
	F-measure	**57.04**	54.84	53.82	47.15	47.15	47.15	47.15	47.15	47.15	47.15

Note: The results of the cutoff points with the highest F1 are bold

Table 4. The results of performance assessment

	Having an account at a bank or financial institution	Saving any money at a bank or financial institution in the past 12 months	Borrowing any money from a bank or financial institution in the past 12 months	Saving any money in the past 12 months for old age
Accuracy	84.27%	64.37%	76.96%	54.73%
Kappa	0.279	0.161	0.098	0.081
True positive rate	42.94%	71.64%	37.95%	67.68%
True negative rate	89.19%	63.47%	80.11%	53.17%
Precision	62.49%	60.43	53.75	54.02
Recall	66.06%	63.47	59.03	60.42
F-measure	64.23	61.91	56.27	57.04
AUC	0.763	0.744	0.660	0.653

AUC: the area under the receiver operating characteristic curve

Legend:
- 0% – 10% Chad, South Sudan, Madagascar, Niger
- 11% – 20% Sierra Leone, Central African Republic, Afghanistan, Congo, Guinea, Mali
- 21% – 30% Tanzania, Liberia, Burkina Faso, Malawi, Haiti
- 31% – 40% Benin, Mozambique, Uganda, Togo, Ethiopia, Rwanda
- 41% – 50% Nepal, Tajikistan
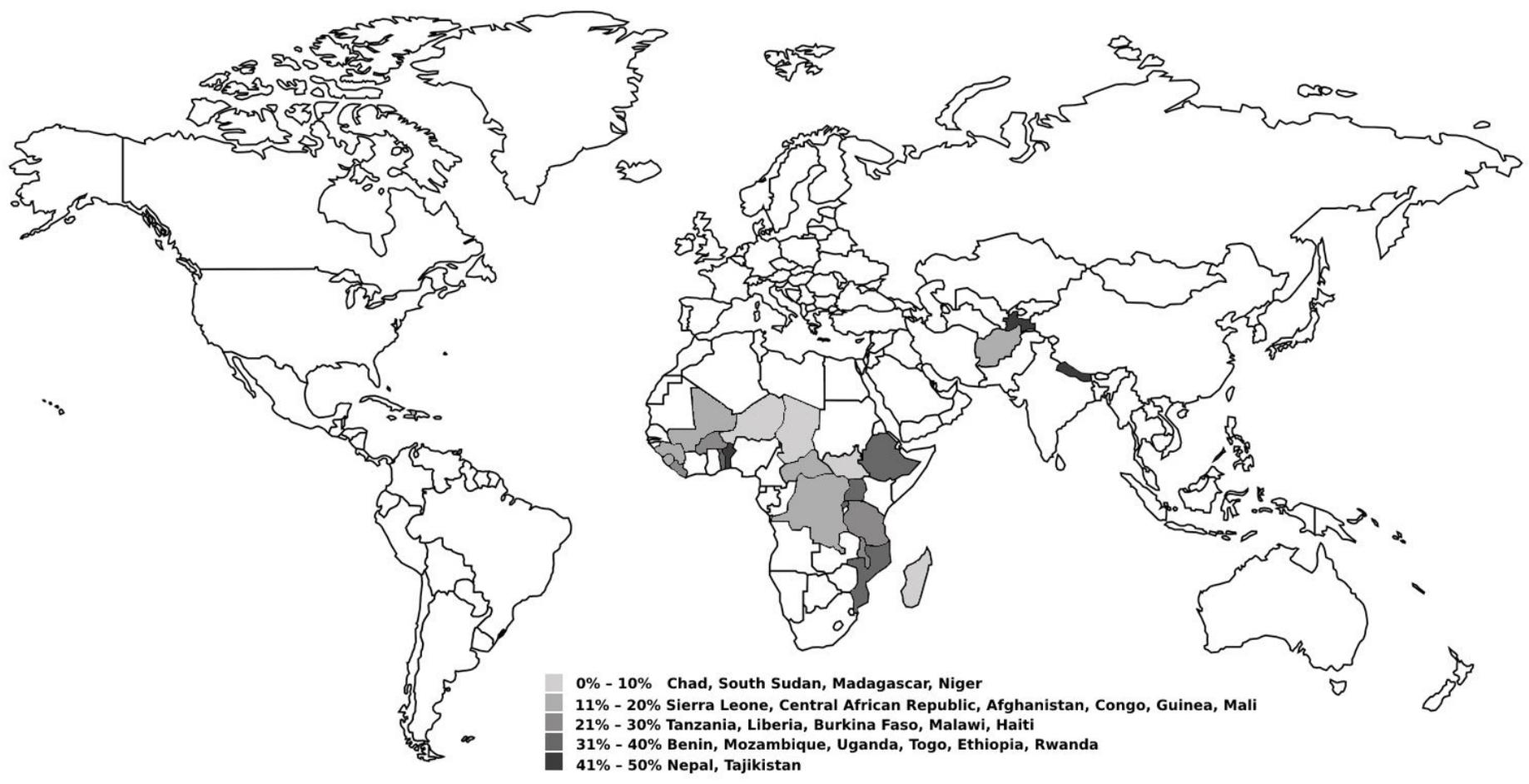
Figure 1. Having an account at a bank or another type of financial institution among low-income economies

Fin2

Fin22a

Fin16

Fin17a
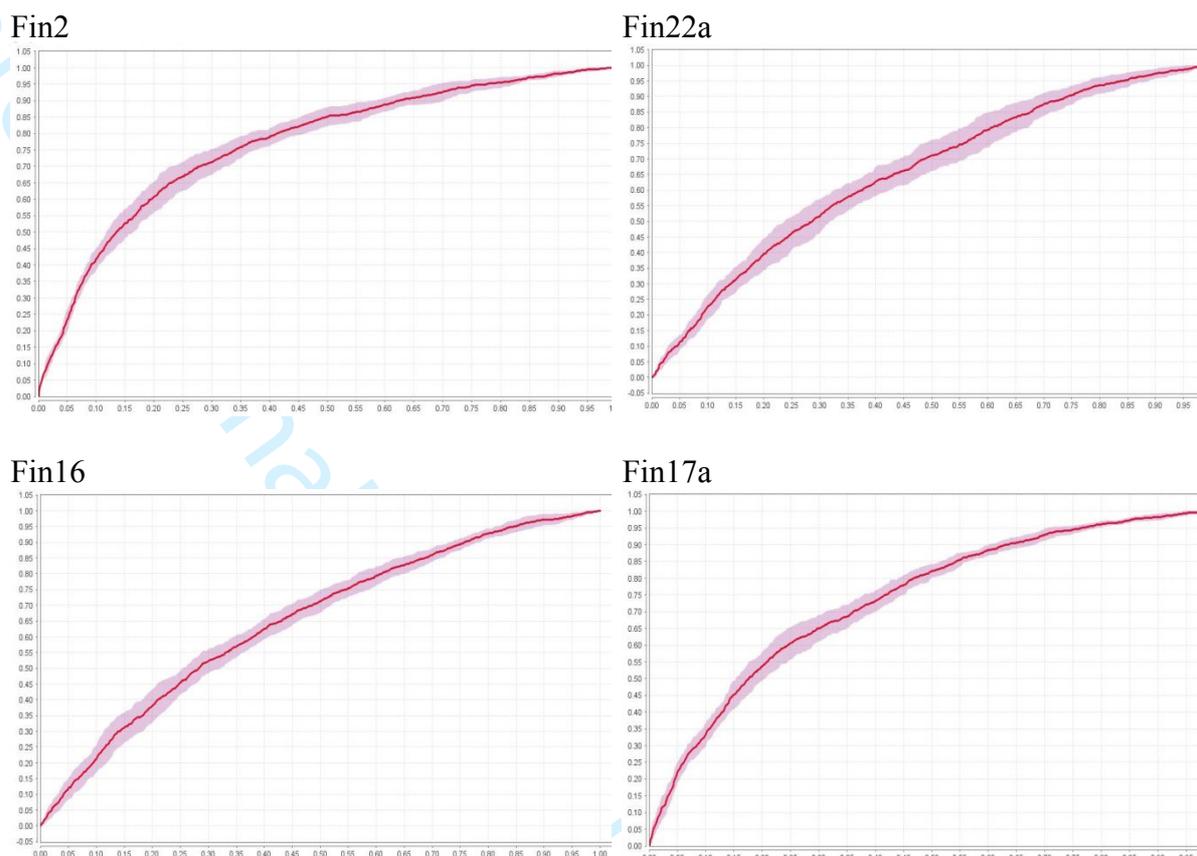
Figure 2. Receiver operating characteristic curve (ROC)

Discussion

The study examined if financial inclusion varies across gender and was motivated by an additional inquiry of whether education bridges the gender gap in financial inclusion. Interpretation of the findings and a discussion of their implications are presented accordingly.

The evolution of financial inclusion from the simplest to a more complex format in this study is reflected through utilization of three different indices measuring three levels of financial inclusion. These measures begin with the most basic financial inclusion indicator-having an account with a financial institution, then builds the next level as formal saving and lastly, the most advanced version reaches to demand for credit from a financial institution. The disaggregation of each indicator based on gender and education level is reported in Table 1. The table reveals that low-income countries have varying levels of possessing an account with a bank or financial institution. The levels vary from as low as 9% (Chad and South Sudan) to

47% (Tajikistan). When it comes to saving in a bank (ranges from 3% to 26%) and borrowing from a bank or financial institution (3% to 15%), the financial inclusion rate is substantially lower. Moving from the basic financial inclusion indicator towards the advanced one, the gender gap in financial inclusion drastically shrinks. More specifically, the gap between men and women's financial inclusion for saving in a bank (3.2%) and borrowing from a bank (1%) is substantially less compared with having a bank account (8.8%). This observation gives an indication that opening an account has more stringent requirements that exclude women and when overcome, there is a potential case for less restrictive assessment procedures and requirements for using the other bank products. The implication is that existing financial institutions' clients are most likely on a leveled playing field in terms of both access and usage of credit and savings products in low-income countries. Hence, the first obstacle (account opening) potentially affects the access and usage of the other products and services. The descriptive results also show that across all financial inclusion indicators, regardless of gender, the contribution of individuals with secondary school education and more is significantly higher than those with primary education or less. Financial inclusion of those with secondary school education or more was consistently higher than those with primary school education or less for having a bank account, saving at a bank, and borrowing from a bank or financial institution. Overall, the descriptive statistics indicate that financial inclusion in the included low-income countries is predominantly limited to having an account with a financial institution.

The results of regression analysis showed that after controlling for the effects of socioeconomic characteristics (e.g. education, income, and employment status) as well as infrastructure relating factors (e.g. Internet use, fixed broadband, and mobile cellular) which assure that the effect of gender on financial inclusion is not due to the heterogeneity in the infrastructure across countries, women are less likely than men to own an account with

25

financial institutions. This implies that the results provided support for the gender gap in financial inclusion using the most basic measure of financial inclusion. However, using formal saving (saving with financial institutions) and access to credit (in contrast with the findings of Pablo et al. (2019), the gender gap hypothesis is not supported.

This study also tested the gender gap in informal saving or setting aside any money in the past 12 months for old age. The results surprisingly showed a significant difference in favor of men. In other words, while men save more than women in general, when it comes to saving in a financial institution the gender gap disappears. Previous studies reported similar results of low formal saving rate in the whole world (Demirguc-Kunt et al., 2015), though more pronounced in developing countries where informal saving for unforeseen circumstances prevail (Collins et al., 2009). While opening an account exposes individual to financial system, it does not enforce them to adopt the saving habit with financial institutions for both men and women. Women in poor countries are claimed to be 'inherent savers' who have the mindset of putting aside some money for rainy days (Gatchalian and Salma, 2014). However, empirical evidence indicates that in low-income countries, women's participation in the labor market, earning and even access to property is far behind men. Since low income is one of the factors associated with low saving rate, lack of steady income-generating employment among women (Ntuli and Kwenda, 2020, Doss et al., 2019) could be a reason for low informal saving of women compared to men.

When it comes to formal saving, value of household assets and income are intertwined with the usage of account for saving purposes. In the economies where many people are daily wage or salaried workers, the transaction cost of saving in financial institutions (e.g. travel to the bank branch) outweighs the amount of savings. The cost-benefit analysis becomes the primary reason for low-income individuals to keep the money at home rather than travelling to deposit a small amount of money in a financial institution. Having money in the bank thus

limits the immediate access to it (Di Giannatale and Roa, 2019) especially for impoverished individuals who live under the tension of a sudden need of cash in emergencies which justify higher informal savings.

From another angle, high incidence of informality in financial transactions (saving and borrowing) is discussed as one of the main financial concerns inherent in many low-income countries' financial systems. Going along with the financial systems expansion in these countries are dominant informal financial systems as friends and family play an important role in the lives of the poor (Beck et al., 2015). For example, in Africa many businesses operate in informal sectors, which hinders large monetary circulation in the formal system. It is documented that in developing countries using informal financial channels (e.g. informal financial service providers from small retailers over deposit collector to money lenders) has penetrated extensively into people's lives (Collins et al., 2009) that it has become an ubiquitous norm. In this vein, it is claimed that informal financial transactions are more associated with low income individuals (Tchamyou, 2020).

Likewise, consistent with past studies, the yielded results showed that older individuals with a higher level of education, higher income and employment status are more likely to be financially included, measured by having a bank account as well as saving at a formal financial institution (Soumaré et al., 2016, Shihadeh, 2018, Azevedo et al., 2019). However, when it comes to accessing credit, none of these variables sufficiently explain financial inclusion. This supports the argument that opening a bank account is the first step which grants access to other bank services. The bank account is thus the first point of contact with any prospective client, thus if the requirements are stringent at the onset and for women, then only those afforded formal accounts can use the other services (credit and savings opportunities). In addition, the insignificant gender disparity of the formal savings and credit access potentially implies that the processes subsequent to account opening are less gender discriminant. This aspect can be

compared with the observations that informal credit access proves less gender discriminant as account opening is less stringent for example in countries where mobile money platforms have helped advanced virtual accounts promoting financial inclusion (Mndolwa and Alhassan, 2020b). As discussed earlier, the gender gap in financial inclusion is considered the mismatch between the demand and supply factors for financial inclusion. One of the proposed solutions to resolve the disequilibrium is to enhance the demand for financial inclusion through education. In the scenario when education is shown incapable to enhance financial inclusion, we may conclude that supply side barriers would be largely effective. While the education can enlighten the public on the necessity of having an account with financial institutions and save for the future, it does not enhance credit access. Previous studies show that in regards to obtaining loans, the gender gap is larger in high and middle income countries (Morsy, 2020a). Similarly, the findings of another study highlighted the primacy of both men and women to use their own savings than to use credit to purchase any asset in selected African countries (Doss et al., 2019).

Further analysis of the regression results showed that the interaction effect of gender and education is positive and significant only considering the basic form of financial inclusion which is owning an account in financial intermediaries. However, considering higher levels of financial inclusion in the form of formal saving and access to credit, the interaction effect of education and gender fails to support the hypothesis on the role of education in bridging the gender gap. The implication is that while education plays a significant role in making women financially included in terms of having a bank account and/or ATM/debit card, it is inadequate in enhancing formal savings and access to credit for them.

The significant interaction effect may support that education is effective in improving the self-confidence and awareness of women. Therefore, they would feel the necessity of having an account and informally save for future. However, the rigid and specific requirements

for both men and women to obtain credit may act as a barrier for them to borrow form formal financial institutions (Kairiza et al., 2017). Therefore, although they may be interested in borrowing from financial institutions, they may not be able to satisfy the requirements regardless of their education level. This highlights the importance of policies to relax these barriers such as strict collateral requirements so that individuals perceive financial services as being within their reach (Allen et al., 2016).

Moreover, the insignificant odds ratio of the interaction of ICT diffusion and gender showed that ICT diffusion failed to decrease the gender gap in all forms of financial inclusion. It can be inferred that increase in supply of financial products and services through ICT might not be sufficient to increase female financial inclusion. Considering the significant effect of Internet use on all three financial inclusion variables found in this study, the results suggest that availability of ICT would improve financial inclusion for both men and women but is ineffective in reducing the gender gap.

Conclusion

The current study investigated gender gap in financial inclusion and whether education is capacitated to bridge the gender gap in financial inclusion in low-income economies, after controlling for the effects of socioeconomic characteristics and infrastructure related factors. Three financial inclusion variables include having an account at a bank or another type of financial institution, saving any money at a bank or any financial institution in the past 12 months, and borrowing any money from a bank or financial institution in the past 12 months. The results not only provided support for the hypothesized gender gap in financial inclusion using the simplest form of financial inclusion (i.e. having a bank account) but also revealed that education reduces the gender gap in financial inclusion. However, this study could not find any significant difference between men and women's financial inclusion in terms of saving at a bank or borrowing from a bank though men tend to save more than women informally.

Policy Implications and Limitations

The results from the present research primarily serve as a cautionary note to policy makers. Policies that seek to promote financial inclusion amongst men and women do not necessarily close the gender gap in financial inclusion. The two are mutually exclusive. For example, our results raised skepticism regarding the role of ICT in reducing the gender gap in financial inclusion despite noting its effectiveness in promoting financial inclusion amongst men and women. Subsequently, efforts aimed at closing the gender gap in financial inclusion must go beyond availability and development of ICT infrastructure.

While the promotion of education is widely seen as a natural avenue to close the gender gap in financial inclusion, however, our results indicated that the role of education is limited in this regard. Education appears to be effective in closing the gender gap in financial inclusion only in terms of bank account ownership, however, at greater financial depth, the effectiveness of education diminishes. Consequently, sole focus on promoting education in the hope that financial inclusion would naturally follow is a risky proposition given that women's financial depth can be constrained even in well-educated societies due to societal constraints codified into laws (e.g., Yamaguchi, 2019). Policy makers must therefore compliment women's educational attainment with financial empowerment. Women's financial empowerment has implications for their financial behavior and financial inclusion, above and beyond that of education alone. This has been well documented in literature (Farrell et al., 2016, Mindra et al., 2017).

Nonetheless, our study did not test the latter assertion. Subsequently, caution must be exercised when inferring the implications of our results. A primary limitation of our study spurs from the cross-sectional nature of the included data. Specifically, the data did not permit for a simultaneous examination of potential reverse causality within the model. For example, our results indicated that income is a significant predictor financial inclusion, however, there is

also evidence to indicate that financial inclusion predicts income and further decreases

inequality at all quantiles of the inequality distribution (Demir et al., 2020, Park and Mercado,

2015). Given this limitation, we recommend future researchers to take an instrumental variable

approach when examining predictors of financial inclusion to deal with potential endogeneity

concerns. Lastly, the study did not consider the impact of culture on the models. Any future

studies can enrich the insights by observing the impact of a multigroup analysis classifying

countries with similar cultural or religious contexts on the dependent variable.

Reference List

ADEGBITE, O. O. & MACHETHE, C. L. 2020. Bridging the financial inclusion gender gap in smallholder agriculture in Nigeria: An untapped potential for sustainable development. *World Development,* 127**,** 104755.

ALLEN, F., DEMIRGUC-KUNT, A., KLAPPER, L. & MARTINEZ PERIA, M. S. 2016. The foundations of financial inclusion: Understanding ownership and use of formal accounts. *Journal of Financial Intermediation,* 27**,** 1-30.

ALLEN, F., DEMIRGUC-KUNT, A., KLAPPER, L. & PERIA, M. S. M. 2012. *The foundations of financial inclusion: Understanding ownership and use of formal accounts*, The World Bank.

ALLIANCE FOR FINANCIAL INCLUSION 2016. Nigeria confronts a chanllenging financial inclusion gender gap: a case study of policy change to support women's financial inclusion. *In:* AFI-GLOBAL (ed.) *Bridging the gap.* Malaysia: AFI.

ALMENBERG, J. & DREBER, A. 2015. Gender, stock market participation and financial literacy. *Economics Letters,* 137**,** 140-142.

ALMENBERG, J., LUSARDI, A., SÄVE-SÖDERBERGH, J. & VESTMAN, R. 2018. Attitudes toward debt and debt behavior. *NBER Working Paper Series.* National Bureau of Economic Research.

ATERIDO, R., BECK, T. & IACOVONE, L. 2013. Access to finance in Sub-Saharan Africa: is there a gender gap? *World development,* 47**,** 102-120.

ATKINSON, A. & MESSY, F.-A. 2013. Promoting Financial Inclusion through Financial Education, OECD/INFE Evidence, Policies and Practice. *OECD Working Papers on Finance, Insurance and Private Pensions.* Paris: OECD Publishing.

AZEVEDO, V., GARONE, L. F., MAFFIOLI, A. & RODRıGUEZ, L. O. 2019. Credit cards issued by non-financial companies: An alternative tool for financial inclusion and economic development? Washington D.C., United States: Strategy and Development Department, IDB Invest.

BABAJIDE, A. A., ADEGBOYE, F. B. & OMANKHANLEN, A. E. 2015. Financial inclusion and economic growth in Nigeria. *International Journal of Economics and Financial Issues,* 5**,** 629-637.

BECK, T., SENBET, L. & SIMBANEGAVI, W. 2015. Financial inclusion and innovation in Africa: An overview. *Journal of African Economies,* 24**,** i3-i11.

BHANOT, D., BAPAT, V. & BERA, S. 2012. Studying financial inclusion in north-east India. *The International Journal of Bank Marketing,* 30**,** 465-484.

BONNOT, V. & CROIZET, J.-C. 2007. Stereotype Internalization, Math Perceptions, and Occupational Choices of Women With Counter-Stereotypical University Majors. 66**,** 169-178.

BOTRIC, V. & BROZ, T. 2017. Gender differences in financial inclusion: Central and South Eastern Europe. *South-Eastern Europe Journal of Economics,* 15**,** 209-227.

CABEZA-GARCÍA, L., DEL BRIO, E. B. & OSCANOA-VICTORIO, M. L. Female financial inclusion and its impacts on inclusive economic development. Women's Studies International Forum, 2019 Pergamon. Elsevier, 102300.

CALCAGNINI, G., GIOMBINI, G. & LENTI, E. 2015. Gender differences in bank loan access: An empirical analysis. *Italian Economic Journal,* 1**,** 193-217.

CÁMARA, N. & TUESTA, D. 2014. Measuring financial inclusion: A muldimensional index. *BBVA Research Paper*.

CAVALLO, E. & SEREBRISKY, T. 2016. *Saving for development: how Latin America and the Caribbean can save more and better,* USA, Springer Nature.

CÉLERIER, C. & MATRAY, A. 2019. Bank-branch supply, financial inclusion, and wealth accumulation. *The Review of Financial Studies,* 32**,** 4767-4809.

CHEN, Z. & WU, Y. 2007. The relationship between education and employment: A theoretical analysis and empirical test. *Frontiers of Economics in China,* 2**,** 187-211.

COLLINS, D., MORDUCH, J., RUTHERFORD, S. & RUTHVEN, O. 2009. *Portfolios of the poor: how the world's poor live on $2 a day,* USA, Princeton University Press.

CONGALTON, R. G. & GREEN, K. 2008. *Assessing the accuracy of remotely sensed data: principles and practices,* Boca Raton, CRC press, Taylor & Francis Group.

CONROY, J. 2005. APEC and financial exclusion: Missed opportunities for collective action? *Asia Pacific Development Journal,* 12**,** 53-80.

COOTER, R., BROSS, T. M. & ERDMANN, J. B. 1998. Factors influencing students' borrowing that may affect their specialty choices and other after-graduation behaviors. *Academic medicine: journal of the Association of American Medical Colleges,* 73**,** 71-76.

CORR, C. 2006. *Financial Exclusion in Ireland: An exploratory study and policy review*, Combat Poverty Agency.

DATTA, S. K. & SINGH, K. 2019. Variation and determinants of financial inclusion and their association with human development: A cross-country analysis. *IIMB Management Review,* 31**,** 336-349.

DE, G. J. & LEE, J.-W. 2002. Education and Income Inequality: New Evidence from Cross-Country Data. *Review of income and Wealth,* 48**,** 395-416.

DE KOKER, L. & JENTZSCH, N. J. W. D. 2013. Financial inclusion and financial integrity: Aligned incentives? 44**,** 267-280.

DELECHAT, M. C. C., NEWIAK, M. M., XU, R., YANG, M. F. & ASLAN, G. 2018. *What is driving women's financial inclusion across countries?*, International Monetary Fund.

DEMIR, A., PESQUÉ-CELA, V., ALTUNBAS, Y. & MURINDE, V. 2020. Fintech, financial inclusion and income inequality: a quantile regression approach. *The European Journal of Finance***,** 1-22.

DEMIRGÜÇ-KUNT, A. & KLAPPER, L. 2012. *Financial inclusion in Africa: an overview*, The World Bank.

DEMIRGÜÇ-KUNT, A. & KLAPPER, L. 2013. Measuring financial inclusion: Explaining variation in use of financial services across and within countries. *Brookings Papers on Economic Activity,* 2013**,** 279-340.

DEMIRGUC-KUNT, A., KLAPPER, L. & SINGER, D. 2013. *Financial inclusion and legal discrimination against women: evidence from developing countries*, The World Bank.

DEMIRGUC-KUNT, A., KLAPPER, L., SINGER, D., ANSAR, S. & HESS, J. 2018. *The Global Findex Database 2017: Measuring financial inclusion and the fintech revolution*, The World Bank.

DEMIRGUC-KUNT, A., KLAPPER, L., SINGER, D. & VAN OUDHEUSDEN, P. 2015. *The global findex database 2014: Measuring financial inclusion around the world*, The World Bank.

DI GIANNATALE, S. & ROA, M. J. 2019. Barriers to formal saving: Micro- and macroeconomic effects. 33**,** 541-566.

DOSS, C. R., DEERE, C. D., ODURO, A. D., SWAMINATHAN, H., CATANZARITE, Z. & SUCHITRA, J. 2019. Gendered paths to asset accumulation? markets, savings, and credit in developing countries. *Feminist Economics,* 25**,** 36-66.

DRIVA, A., LÜHRMANN, M. & WINTER, J. 2016. Gender differences and stereotypes in financial literacy: Off to an early start. *Economics Letters,* 146**,** 143-146.

EAGLY, A. H. & KARAU, S. J. 2002. Role congruity theory of prejudice toward female leaders. *Psychological Review,* 109**,** 573-598.

FARRELL, L., FRY, T. R. & RISSE, L. 2016. The significance of financial self-efficacy in explaining women's personal finance behaviour. *Journal of Economic Psychology,* 54**,** 85-99.

FAWCETT, T. 2006. An introduction to ROC analysis. *Pattern recognition letters,* 27**,** 861-874.

FERNANDES, D., LYNCH JR, J. G. & NETEMEYER, R. G. 2014. Financial literacy, financial education, and downstream financial behaviors. *Management Science,* 60**,** 1861-1883.

FERNÁNDEZ-OLIT, B., PAREDES-GÁZQUEZ, J. D. & DE LA CUESTA-GONZÁLEZ, M. 2018. Are social and financial exclusion two sides of the same coin? An analysis of the financial integration of vulnerable people. *Social Indicators Research,* 135**,** 245-268.

FITZPATRICK, K. 2015. The effect of bank account ownership on credit and consumption: Evidence from the UK. *Southern Economic Journal,* 82**,** 55-80.

GATCHALIAN, G. & SALMA, J. 2014. Three reasons low-income women don't save in a bank. *Research & Perspectives*. USA: Women's World Banking.

GHOSH, S. & VINOD, D. 2017. What Constrains Financial Inclusion for Women? Evidence from Indian Micro data. *World Development,* 92**,** 60-81.

HOGARTH, J. M. & O'DONNELL, K. H. 1999. Banking relationships of lower-income families and the governmental trend toward electronic payment. *Fed. Res. Bull.,* 85**,** 459.

HONOHAN, P. 2008. Cross-country variation in household access to financial services. *Journal of Banking & Finance,* 32**,** 2493-2500.

HOSMER JR, D. W., LEMESHOW, S. & STURDIVANT, R. X. 2013. *Applied logistic regression,* New Jersey, John Wiley & Sons.

INOUE, T. 2019. Financial inclusion and poverty reduction in India. *Journal of Financial Economic Policy,* 11**,** 21-33.

INTERNATIONAL MONETARY FUND 2018. Financial Access Survey. *In:* INTERNATIONAL MONETARY FUND (ed.).

JAHAN, M. S., DE, J., JAMALUDIN, M. F., SODSRIWIBOON, P. & SULLIVAN, C. 2019. *The financial inclusion landscape in the Asia-Pacific region: a dozen key findings*, International Monetary Fund.

KAIRIZA, T., KIPRONO, P. & MAGADZIRE, V. 2017. Gender differences in financial inclusion amongst entrepreneurs in Zimbabwe. *Small Business Economics,* 48**,** 259-272.

KARA, A., ZHOU, H. & ZHOU, Y. 2021. Achieving the United Nations' sustainable development goals through financial inclusion: A systematic literature review of access to finance across the globe. *International Review of Financial Analysis,* 77.

KARLAN, D., RATAN, A. L. & ZINMAN, J. 2014. Savings by and for the Poor: A Research Review and Agenda. *Review of Income and Wealth,* 60**,** 36-78.

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.

KULKARNI, L. & GHOSH, A. 2021. Gender disparity in the digitalization of financial services: challenges and promises for women's financial inclusion in India. *Gender, Technology and Development,* 25**,** 233-250.

LAL, T. 2018. Impact of financial inclusion on poverty alleviation through cooperative banks. *International Journal of Social Economics*.

LI, L. 2018. Financial inclusion and poverty: The role of relative income. *China Economic Review,* 52**,** 165-191.

LOTTO, J. 2018. Examination of the Status of Financial Inclusion and its Determinants in Tanzania. *Sustainability,* 10**,** 2873.

LUSARDI, A. & MITCHELL, O. S. 2014. The economic importance of financial literacy: Theory and evidence. *Journal of economic literature,* 52**,** 5-44.

LUSARDI, A. & MITCHELL, O. S. J. A. E. R. 2008. Planning and financial literacy: How do women fare? 98**,** 413-17.

LYONS, A. C. & KASS-HANNA, J. 2019. Financial Inclusion, Financial Literacy and Economically Vulnerable Populations in the Middle East and North Africa. *Emerging Markets Finance and Trade***,** 1-40.

MEHROTRA, R., SOMVILLE, V. & VANDEWALLE, L. 2019. Increasing Trust in Bankers to Enhance Savings: Experimental Evidence from India. *Economic Development and Cultural Change*.

MEYLL, T. & PAULS, T. 2019. The gender gap in over-indebtedness. *Finance Research Letters,* 31.

MINDRA, R., MOYA, M., ZUZE, L. T. & KODONGO, O. 2017. Financial self-efficacy: a determinant of financial inclusion. *International Journal of Bank Marketing,* 35**,** 338-353.

MNDOLWA, F. & ALHASSAN, A. 2020a. Gender disparities in financial inclusion: Insights from Tanzania. *African Development Review,* 32**,** 1-13.

MNDOLWA, F. D. & ALHASSAN, A. L. 2020b. Gender disparities in financial inclusion: Insights from Tanzania. *African Development Review***,** 1-13.

MORGAN, P. J. & TRINH, L. Q. 2019. Determinants and impacts of financial literacy in Cambodia and Viet Nam. *Journal of Risk and Financial Management,* 12**,** 19.

MORSY, H. 2020a. Access to finance–mind the gender gap. *The Quarterly Review of Economics and Finance,* 70**,** 12-21.

MORSY, H. 2020b. Access to finance–mind the gender gap. *The Quarterly Review of Economics and Finance,* Forthcoming.

MOSLEY, P. & LENTON, P. 2012. *Routledge advamces in social sciences. Financial exclusion and the poverty trap: Overcoming deprivation in the inner city,* USA and Canada, Routledge.

MOTTOLA, G. R. J. N. 2013. In our best interest: Women, financial literacy, and credit card behavior. 6**,** 1-15.

NTULI, M. & KWENDA, P. 2020. Gender Gaps in Employment and Wages in Sub-Saharan Africa: A Review. *In:* KONTE, M. & TIRIVAYI, N. (eds.) *Women and Sustainable Human Development: Empowering Women in Africa.* Cham: Springer International Publishing.

OECD 2013. Women and financial literacy: Oecd/infe evidence, survey and policy responses.

OZILI, P. K. 2018. Impact of digital finance on financial inclusion and stability. *Borsa Istanbul Review,* 18**,** 329-340.

PABLO, D. A., GIMENO, R. & MATEOS DE CABO, R. 2019. The gender gap in bank credit access. Banco de Espana Working Paper No. 1945.

PAHLEVAN SHARIF, S., AHADZADEH, A. S. & TURNER, J. J. 2020. Gender Differences in Financial Literacy and Financial Behaviour Among Young Adults: The Role of Parents and Information Seeking. *Journal of Family and Economic Issues***,** 1-19.

PARK, C.-Y. & MERCADO, R. 2015. Financial inclusion, poverty, and income inequality in developing Asia. *Asian Development Bank Economics Working Paper Series*.

PARK, C.-Y. & MERCADO, R. 2018. Financial inclusion: New measurement and cross-country impact assessment. *Available at SSRN 3199427*.

PENA, X., HOYO, C. & TUESTA, D. 2014. Determinants of financial inclusion in Mexico based on the 2012 National Financial Inclusion Survey (ENIF).

POWELL, G. N. & BUTTERFIELD, D. A. 2003. Gender, gender identity, and aspirations to top management. *Women in management review,* 18**,** 88-96.

RIDDELL, W. C. & SONG, X. 2011. The impact of education on unemployment incidence and re-employment success: Evidence from the US labour market. *Labour Economics,* 18**,** 453-463.

ROBINO, C., TRIVELLI, C., VILLANUEVA, C., SACHETTI, F. C., H., W., MARTINEZ, L. & MARINCIONI, M. 2019. Financial Inclusion for Women: A Way Forward. *Policy Briefs.* Argentina: G20.

ROSENBERG, R., GONZALEZ, A. & NARAIN, S. 2009. The new moneylenders: are the poor being exploited by high microcredit interest rates? *In:* WATKINS, T. A. & HICKS, K. (eds.) *Moving Beyond Storytelling: Emerging Research in Microfinance.* Bingley: Emerald Group Publishing Limited.

ROSZKOWSKI, M. J. & GRABLE, J. 2005. Gender Stereotypes in Advisors' Clinical Judgments of Financial Risk Tolerance: Objects in the Mirror Are Closer than They Appear. *Journal of Behavioral Finance,* 6**,** 181-191.

SAHAY, R., ČIHÁK, M., N'DIAYE, P. & BARAJAS, A. 2015. Rethinking financial deepening: Stability and growth in emerging markets. *Revista de Economía Institucional,* 17**,** 73-107.

SAHOO, A. K., PRADHAN, B. B. & SAHU, N. C. 2017. Determinants of financial inclusion in tribal districts of Odisha: an empirical investigation. *Social Change,* 47**,** 45-64.

SAMARAKOON, S. & PARINDURI, R. A. 2015. Does Education Empower Women? Evidence from Indonesia. *World Development,* 66**,** 428-442.

SCHMIDT-HEBBEL, K., WEBB, S. B. & CORSETTI, G. 1992. Household saving in developing countries: first cross-country evidence. *The World Bank Economic Review,* 6**,** 529-547.

SETHI, D. & ACHARYA, D. 2018. Financial inclusion and economic growth linkage: Some cross country evidence. *Journal of Financial Economic Policy,* 10**,** 369-385.

SHARMA, D. 2016. Nexus between financial inclusion and economic growth. *Journal of financial economic policy,* 8**,** 13-36.

SHIHADEH, F. H. 2018. How individual's characteristics influence financial inclusion: evidence from MENAP. *International Journal of Islamic Middle Eastern Finance and Management,* 11**,** 553-574.

SOUMARÉ, I., TCHANA TCHANA, F. & KENGNE, T. M. 2016. Analysis of the determinants of financial inclusion in Central and West Africa. *Transnational Corporations Review,* 8**,** 231-249.

SPÄTH, J. & SCHMID, K. D. 2018. The Distribution of household savings in Germany. *Jahrbücher für Nationalökonomie und Statistik,* 238**,** 3-32.

TAMBUNLERTCHAI, K. 2018. Determinants And Barriers To Financial Inclusion In Myanmar: What Determines Access To Financial Services And What Hinders It? *The Singapore Economic Review,* 63**,** 9-26.

TCHAMYOU, V. S. 2020. Financial Access, Governance and the Persistence of Inequality in Africa: Mechanisms and Policy instruments. *Journal of public Affairs: An International Journal,* e2201.

THE WORLD BANK GROUP. 2020. *World Bank Country and Lending Groups* [Online]. Available: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups [Accessed 2 May 2020].

UNITED NATION CAPITAL DEVELOPMENT FUND. *Financial inclusion and the SDGs* [Online]. United Nation Capital Development Fund. Available: https://www.uncdf.org/financial-inclusion-and-the-sdgs [Accessed 23 March 2020].

VAN, D. T. T. & LINH, N. H. 2019. The Impacts of Financial Inclusion on Economic Development: Cases in Asian-Pacific Countries. 22.

WILES, P. 1974. The correlation between education and earnings: the external-test-not-content hypothesis (ETNC). *Higher Education,* 3**,** 43-58.

WORLD BANK. 2020. *World development indicators* [Online]. World Bank. Available: https://data.worldbank.org/indicator [Accessed 5 May 2020].

YAMAGUCHI, K. 2019. Japan's gender gap: A lack of gender equality in career opportunity and long work hours perpetuate wage differences between men and women. *Finance & Development* 56.

ZINS, A. & WEILL, L. 2016. The determinants of financial inclusion in Africa. *Review of Development Finance,* 6**,** 46-57.