



Article

Can Digital Financial Inclusion Promote Women's Labor Force Participation? Microlevel Evidence from Africa

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Abstract: Our study analyzes the relationship between digital financial inclusion and women's labor force participation, as well as shedding light on the barriers to women's digital financial inclusion. We have mobilized a microeconomic database that covers 15,192 African women. Our database is extracted from the Global Findex database, 2021 edition, based on nationally representative surveys of 29 African countries. The Probit model estimation methodology is used to examine the empirical results. Our findings reveal that financial inclusion via the digital channel is positively associated with women's labor force participation more than the traditional channel. A significant and positive impact of formal financial services channels on the level of women's participation in the labor market was uncovered. Our research has shown that women face a variety of obstacles when it comes to accessing financial services, both through traditional channels and digital means. These barriers include nonvoluntary obstacles in traditional financial inclusion channels. However, as a woman's income level increases, the intensity of these barriers decreases. When it comes to digital financial inclusion, women often face a unique set of obstacles, such as the high cost of mobile financial services, lack of money, and lack of access to a cellphone. The study contributes to the existing literature by investigating the impact of digital financial inclusion on women's labor force participation in African countries and identifying barriers that hinder women's digital financial inclusion based on individual-level data. It suggests that African policymakers should increase women's financial inclusion through digital channels to improve their participation in the labor market.

Keywords: digital financial inclusion; labor force participation; woman; probit model; Africa



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1. Introduction

It is well known that gender inequality is deeply rooted throughout the world (Jayachandran 2015). Women face greater difficulty in achieving higher levels of education, accessing better opportunities in the workplace, occupying high positions of power in their companies (the glass ceiling theory) (Akpınar-Sposito 2013), and having less economic power than men (Sahraoui 2016; Ibourk and Elouaourti 2023). Women's voices throughout the world are protesting and demanding their right to gender equality. The fifth sustainable development goal (SDG) is to achieve gender equality and the empowerment of all women; a goal that cannot be achieved without breaking down all gender-based barriers, including legal, economic, and social barriers. Eliminating gender inequality has become a concern and priority of global development policies.

Although some regions, such as Scandinavia and the Nordic countries, have made significant strides in terms of gender equality and opportunities for women (OECD 2018; Schulstok and Wikstrand 2020), in other regions such as Africa, the Middle East, and parts of Asia, women continue to face significant discrimination and barriers to advancement (Chamboko et al. 2018; Ameratunga Kring 2018; International Labour Organization (ILO) (2017)). In terms of participation in the labor market, globally, women are less likely to be employed and to work in formal sector jobs than men. The gap is particularly pronounced in low-

and middle-income countries. According to the International Labour Organization (ILO), in 2022, the global gender gap in labor force participation was 25% points, with women's participation at 47% compared to 72% for men. This gap is even wider in some regions, such as in the Arab States, South Asia, and Africa, where it can reach 50% at points. Additionally, women are often paid less than men for the same work and are underrepresented in leadership positions. The ILO also reported that globally, women are more likely to work in vulnerable employment, such as in informal or part-time work, and they are also more likely to work in low-paying occupations. In 2022, women are paid about 20% less than men. [The World Economic Forum's Global Gender Gap Report \(2021\)](#), shows that the global gender gap in economic participation and opportunity is still wide and that women are underrepresented in leadership positions, with only 27% of all manager positions held by women.

The COVID-19 pandemic has had a disproportionate impact on women, particularly in terms of their participation in the labor market ([Wenham et al. 2020](#); [United Nations 2020](#)). Many women have been forced to leave the workforce to care for children or other family members due to school closures and other disruptions ([Power 2020](#)). Furthermore, women are more likely to work in industries that have been hit hard by the pandemic, such as retail and hospitality ([OECD 2020](#); [Lopes et al. 2021](#)). This has led to significant job losses for women ([Thompson 2022](#)), and it is expected that it will take longer for women to return to the labor market than for men. According to [The World Economic Forum's Global Gender Gap Report \(2021\)](#), achieving gender parity will take longer than previously expected. The report estimates that due to the ongoing effects of the COVID-19 pandemic, the time frame for closing the global gender gap has been extended by an entire generation, from 99.5 years to 135.6 years.

In most African countries, economic growth has increased considerably over the last decade, along with an improvement in education rates ([Eggoh et al. 2015](#); [Ezzahid and Elouaourti 2018](#)). However, this progress has not been reflected in women's active participation in the economy. Participation rates have declined markedly and remain the lowest in the world ([ILO 2020](#)). Moreover, women are in more vulnerable and lower-paying jobs ([Barcus 2022](#)), and they were most affected by unemployment and job stagnation during the COVID-19 crisis ([Oo and Lim 2021](#)). This crisis has been particularly hard on working women who face not only health risks but also high unemployment, deterioration of income, and difficult working conditions ([Neetha 2021](#)). In a study conducted by [Casale and Posel \(2021\)](#), who analyzed the initial effects of the crisis and the COVID-19 lockdown on South Africa's female and male workers in the paid and unpaid economy, using survey data from 7074 South African adults aged 18 and older, the effect of the COVID-19 crisis was severe on women from the vulnerable segment of society. Women workers suffered two-thirds of the net job losses and took on more childcare responsibilities as a result of school closures.

African women are suffering the most and are requesting to achieve gender equality in employment. Women are both doing unpaid work in their homes to care for their children, their elderly, and sick family members ([López Rodríguez and Corona 2019](#)) and may decide to work outside for paid work voluntarily or be forced into it. Their participation in the labor market can be affected by several determinants (N. [Mujahid 2014](#)). Two main distinctions can be identified: long-term determinants (education, fertility, culture, and gender norms) and medium- and short-term determinants (family structure, females' potential wages, and the husbands' social and working status). In this context, there is a relatively unexplored area of research that explores the role of financial inclusion in affecting women's labor force participation rates, and more specifically the impact of digital financial inclusion.

Financial inclusion has opened a new avenue of research beyond the links between finance and economic growth, to the role of finance in reducing poverty and inequality ([Ezzahid and Elouaourti 2021b](#)), equally contributing to the empowerment of individuals by increasing their capabilities and providing them with access to financial services that are both appropriate to their needs and at an affordable price ([Ezzahid and Elouaourti 2021a](#)). Finan-

cial inclusion focuses on attracting less privileged groups, including women, into the formal financial system (Ajide 2021). Women's financial inclusion refers to the idea of increasing access to financial services and resources for women (Chamboko et al. 2020), with the goal of promoting economic development and empowerment (Cabeza-García et al. 2019). Some of the key strategies for promoting female financial inclusion include increasing access to credit and other financial services (Yang et al. 2022; Ezzahid and Elouaourti 2021b), providing financial education and training for women (Bhutoria and Vignoles 2018), and addressing cultural and social barriers that may prevent women from participating fully in the economy (Zamberi Ahmad 2011). Women's economic participation through financial inclusion is possible since it will provide them with the necessary tools to build assets, earn income, handle financial risks, and become active in the economy (International Labour Organization, ILO).

Recent literature shows that digital financial inclusion can increase women's empowerment. It has a significant effect on entrepreneurship among vulnerable women with low levels of education who live in areas characterized by significant persistent gender inequality or who have a lack of financial autonomy (Yang et al. 2022). The results of a study conducted by Morsy (2020) using the World Bank Global Findex data for 141 countries, assert that women are more likely to be excluded from the financial sector. With gender gaps existing in almost all sectors, it is not surprising that women have limited access to formal financial services in Africa (Ajide 2021). As opposed to other sectors, the COVID-19 crisis had a revolutionary effect on access to and use of financial services. According to the Global Findex survey (2021), only 42% of adults in developing economies had a bank account, now this rate has increased to 71%. Globally, 78% of men and 74% of women have an account. However, gender remains significantly related to financial service use (Demirguc-Kunt et al. 2013). In a study entitled Financial Inclusion and Legal Discrimination against Women: Evidence from Developing Countries which was based on individual Global Findex data from 98 developing countries, the existence of significant gender gaps in the use of financial services was highlighted (Demirguc-Kunt et al. 2013).

Despite the importance of women's digital financial inclusion, studies on the relationship between digital financial inclusion and women's labor force participation remain under-researched. In this paper, we advance our understanding of the link between financial inclusion and women's economic participation by studying, first, the impact of digital financial inclusion on women's labor force participation in African countries. Second, the identification of barriers that prevent women from being numerically included financially.

This article advances the existing literature in two ways. First, it forwards our knowledge by investigating the association between financial inclusion and women's labor market participation in African countries characterized by the lowest participation rates in the world. Second, it is the first study in the literature to identify barriers to women's digital financial inclusion based on a large individual-level database.

In terms of policy implications, at a practical level, our study will guide policymakers in Africa as well as international institutions working to both enhance women's participation in the labor market through the channel of digital financial inclusion, as well as identifying key barriers to African women's digital financial inclusion. At the research level, our study fills the gap in the literature by exploring for the first time the barriers to women's digital financial inclusion in contrast to the majority of studies that have been limited to financial inclusion via traditional channels (i.e., banks).

This paper is structured as follows. We present a literature review (Section 2), Then, we present the empirical methodology used to verify the empirical validity of our research hypotheses (Section 3), the empirical results obtained and their discussion (Section 4), and finally, we conclude with some final remarks (Section 5).

2. Literature Review

Women represent half of the population (Leach and UN Women 2014); they are an important factor in supporting economic development of any country and have a

significant effect on the overall economy (Boserup et al. 2007). The poor inclusion of women caused by their low integration into the labor market is reflected in declining female participation rates (Stewart et al. 2012). The paradox of the decline in women's participation rate in the labor market (Desai and Joshi 2019), even during the period of economic growth, has been explained by several works. The women's labor force participation rate initially declines, then increases as countries develop, following a U-shape. In low-income countries, the initial decline in women's labor force participation is due to the transfer of household production from the family farm and small business and share their productivity between household products and childcare to the larger market (Goldin 1994). With the transition to an industrial society, new opportunities are appearing in female-friendly jobs. A recent study (Altuzarra et al. 2019) was conducted in 28 European Union countries to investigate the existence of a relationship between women's labor force participation and economic development over the period 1990–2016. The data were obtained from the World Bank and Eurostat. both static (fixed effects) and dynamic (generalized moments model) models were used. The results for all European countries were consistent with the hypothesis that there is a U-shaped relationship between female labor force participation and economic development.

The decision to enter the labor market depends on several determinants related to the characteristics of women and their economic, social, and institutional environment in each country (Klasen et al. 2020). These determinants frequently include education level and improvements in educational attainment levels have positively affected women's participation in the labor market (Heath and Jayachandran 2017; Klasen et al. 2020). Similarly, fertility decrease has the same effect (Verme et al. 2016). Life expectancy and high unemployment rates lead to the existence of the discouraged worker effect (A. Tansel 2002; Y. Ozerkek 2013). Policies designed to respond to women's concerns can increase their participation in the labor market, such as improving access to childcare, providing longer maternity leave, and allowing more flexibility in work organizations (Altuzarra et al. 2019). In some recent research, finance appears to be another important determinant of women's participation in the labor market.

Having access to and usage of financial products and services, also known as financial inclusion, can have a significant impact on reducing income inequality (Cabeza-García et al. 2019). This is because financial inclusion enables individuals to access credit, savings, insurance, and other financial services that can help them manage their finances invest in their future, and build their wealth (Ellis et al. 2010). When more people, particularly women, have access to these services, it can help to reduce gender inequality (Ghosh and Vinod 2017; Roy and Patro 2022). and the gap between the rich and the poor and promote greater economic equality (Burgess and Pande 2005). Increasing women's financial inclusion can lead to a variety of positive outcomes, such as increased economic growth, promoted economic development, reduced poverty and income inequality, and improved living standards for women and their families (Yeyouomo and Asongu 2022). In a study, the authors (Cabeza-García et al. 2019) used data from the Global Findex (2015) database and the World Bank to analyze a sample of 91 countries, which included both developed and emerging countries. The results from the analysis found that there is a positive relationship between the financial inclusion of women and economic development. Specifically, the study found that when women have greater access to a bank account and access to credit cards, it leads to a positive effect on economic development. This suggests that promoting financial inclusion for women can be an effective way to boost economic growth and development.

Furthermore, financial inclusion can also have a positive impact on social and physical wellbeing. In a recent study conducted to investigate the correlation between financial inclusion and poverty, and the vulnerability to poverty among Ghanaian households (Koomson et al. 2020) by using data obtained from the seventh round of the Ghana Living Standards Survey in 2016/17, the study found that financial inclusion has a positive impact on household poverty. First, it is linked to a decrease in the likelihood of households being

poor by 27%. Second, it reduces the exposure of households to future poverty by 28%. The study found that female-headed households have a greater potential for experiencing a larger reduction in poverty and vulnerability to poverty when they have access to financial services and are included in the financial system compared to male-headed households. This is likely because women face more barriers in accessing financial services and have less control over financial resources in many societies, therefore, when given the opportunity to access these services and resources, it can have a greater positive impact on their economic wellbeing. Additionally, research has shown that when women have control over financial resources, they are more likely to invest in their families and communities, leading to a more equitable distribution of resources and a reduction in poverty.

Additionally, financial inclusion can help to empower women and increase their participation in the workforce, which can lead to greater gender equality and better economic outcomes for families and communities. [Asongu and Odhiambo \(2018\)](#) conducted research on 48 African countries over the period 2004–2014 using data from the International Labor Organization and World Bank (World Development Indicators, Financial Development and Structure Database (FDSD), World Governance Indicators). The results of the study show the importance of financial inclusion in encouraging and promoting female participation in the labor market and the formal economic sector. Most importantly, there is a need for ICT (information and communication technology) to moderate women's access to financial services. Similarly, a study by [Ajide \(2021\)](#), on the relationship between financial inclusion and women's labor force participation in twelve African countries for the period 2005–2016. Using fixed effects, random effects, and generalized least-squares estimators on data collected from the World Bank Development Database and IMF International Financial Statistics. The author's results show that improving the level of financial inclusion up to a certain threshold would improve women's participation in economic activities in Africa.

In a study of the impact of social capital, financial inclusion, and care needs on women's labor force participation, [López Rodríguez and Corona \(2019\)](#) estimated individual and municipal level data from Mexican surveys with a Probit model. They found that when women have financial inclusion, they are more likely to work. [Hendriks \(2019\)](#) concluded that financial inclusion is a key pillar for advancing women's economic empowerment and gender equality. Encouraging women's access to and use of digital financial services is a useful way to improve not only their living conditions but also their families to escape poverty. A study explores the effect of microfinance on rural women entrepreneurs in Pakistan, using the difference-in-difference method. The results of the study show that with the financial stability attained by the increases in income and consumption of the women borrowers, new opportunities emerge for the entire local community ([Khan et al. 2020](#)).

Overall, promoting digital financial inclusion has the potential to improve economic opportunities for women and contribute to greater gender equality in the labor force. It is an important step towards promoting economic development and improving the wellbeing of individuals, families, and communities.

3. Data, Variables, et Model

3.1. Data

Our database is extracted from the World bank Global FINDEX database 2021 edition and it covers 15,192 African women. The 2021 edition contains information about the use of digital financial services and individuals' characteristics.

3.2. Empirical Model

To investigate the association between financial inclusion and women's labor market participation in African countries and the barriers that hinder women's digital financial

inclusion, we mobilize an econometric specification based on binary models of logit type. The empirical specification of our models on microeconomic data is as follows:

$$\text{Women's Workforce}_i = \alpha_1 + \alpha_2 \text{Digital financial inclusion}_i + \alpha_3 \text{Age}_i + \alpha_4 \text{Age2}_i + \alpha_5 \text{Income}_i + \alpha_6 \text{Education}_i + \alpha_7 \text{Location}_i + \varepsilon_i \quad (1)$$

$$\text{Barriers to digital financial inclusion}_i = \alpha_1 + \alpha_2 \text{Age}_i + \alpha_3 \text{Age2}_i + \alpha_4 \text{Income}_i + \alpha_5 \text{Education}_i + \alpha_6 \text{Location}_i + \varepsilon_i \quad (2)$$

3.3. Variables

We mobilize two models, the first with the dependent variable capturing women's labor force participation and controlling the model by variables on digital financial inclusion and individual characteristics. The purpose of this model is to study the impact of women's digital financial inclusion on their labor market participation (Table 1).

Table 1. Descriptive statistics.

Variables	N	Mean
Dependant variable		
Women's participation in the labor market	15,192	0.625
Individuals characteristics		
Age ¹	15,192	34.40
Education		
Completed primary or less	15,079	0.487
Secondary	15,079	0.460
Completed tertiary or more	15,079	0.0535
Income level		
Poorest	15,192	0.188
Second2	15,192	0.178
Middle2	15,192	0.196
Fourth2	15,192	0.206
Richest	15,192	0.232
Location (urban = 1)	13,322	0.475
Digital financial inclusion access dimension		
Account at a financial institution	15,192	0.335
Account at a mobile banking	14,732	0.343
Barriers to financial inclusion		
If does not have account: b/c too far away	10,397	0.271
If does not have account: b/c too expensive	9915	0.329
If does not have account: b/c lack documentation	10,367	0.343
If does not have account: b/c lack trust	10,272	0.201
If does not have account: b/c religious reasons	10,406	0.0861
If does not have account: b/c lack of money	10,515	0.791
If does not have account: b/c family member already has one	10,301	0.147
If does not have account: b/c no need for financial services	10,340	0.239
Barriers to digital financial inclusion		
Reason for not have a mobile money account: too far	7083	0.276
Reason for not have a mobile money account: too expensive	6845	0.297
Reason for not have a mobile money account: lack of documentation	7124	0.334
Reason for not have a mobile money account: lack of money	7209	0.636
Reason for not have a mobile money account: use agent	7159	0.205
Reason for not have a mobile money account: no mobile phone	7256	0.397
Financial inclusion: use dimension		
Saved in past 12 months: for old age	15,082	0.126
Saved in past 12 months: using an account at a financial institution	15,074	0.123
Saved in past 12 months: using a mobile money account	6048	0.320
Saved in past 12 months: using an informal savings club	15,096	0.261
Borrowed in past 12 months: for medical purposes	15,147	0.197
Borrowed in past 12 months: from a financial institution	15,105	0.0739
Borrowed in past 12 months: from family or friends	15,124	0.362
Borrowed in past 12 months: from an informal savings club	3924	0.460
Mobile owner	15,173	0.753
Internet access	15,192	1.613

Source: authors' calculations.

The second model aims to identify barriers to women's digital financial inclusion. With the exception of the age variable, which is a continuous variable, all variables are binary and equal to one if women participate in the labor market or are financially included and equal to zero otherwise. Our model includes several exogenous variables that provide

insight into the characteristics of the individual, including: “Age”: the age of the individual, and “Age²” is included to test for a possible nonlinear relationship between age and the endogenous variables. The “Income” variable captures the individual’s income level by distinguishing four quantiles (poor, second, third, and fourth quantiles) which are binary variables with the value of one if the individual’s income level belongs to the said quantile, and zero otherwise; the fifth quantile “rich” is the omitted binary variable. The “Education” variable captures the level of education of the individual with three levels: primary or less, secondary, and tertiary or more, and it is a binary variable equal to one if the individual belongs to the said education level, and zero otherwise.

4. Empirical Results and Discussion

Financial inclusion via the digital channel positively correlated with women’s labor force participation more than the traditional channel (Table 2). Having a bank account positively associated with women’s labor force participation by 14.5%, while mobile banking stimulates their participation by 17.3%, which are results significant at the 1% level.

Table 2. Association between women’s financial inclusion and participation in the labor market in relation to the access dimension.

Variables	Women’s Labor Force Participation	
<i>Account at financial institution</i>	0.145 *** (0.00962)	
<i>Digital financial inclusion (Mobile money account)</i>		0.173 *** (0.00890)
Age	0.0139 *** (0.000902)	0.0140 *** (0.000888)
Age ²	−0.000285 *** (1.62e−05)	−0.000276 *** (1.60e−05)
Location (Urban = 1)	−0.0540 *** (0.00861)	−0.0529 *** (0.00858)
Secondary	−0.00866 (0.00921)	−0.0133 (0.00914)
Completed tertiary or more	−0.00457 (0.0246)	0.0279 (0.0241)
Poorest	−0.0406 *** (0.0130)	−0.0310 ** (0.0129)
Second2	−0.00118 (0.0133)	0.00281 (0.0133)
Middle2	0.0124 (0.0129)	0.0135 (0.0129)
Fourth2	0.00346 (0.0126)	−0.000820 (0.0126)
Observations	13,204	13,204

Source: Authors’ elaborations. *p*-value: *** *p* < 0.01, ** *p* < 0.05, * *p* < 0.1. Estimated marginal effects without stars are statistically insignificant.

Age exercises a significant positive effect on women’s participation in the labor market in Africa, but only from a certain age, due to the nonlinear relationship captured by the negative sign of the Age² variable. As to the area of residence, women from urban regions participate less in the labor market, which can be explained by the nature of the jobs exercised in urban areas in comparison with rural regions where women participate actively in the primary sectors (agriculture, farming, etc.).

In addition, the level of education has a negative effect on women's participation in the labor market, a result that is not significant. For the level of income, women in the poorest quantiles participate less in the labor market, and as the level of income increases, women's participation increases.

The use of financial services and their impacts on women's labor force participation showed that this dimension through the different variables affects positively and significantly the level of women's labor force participation (Table 3). However, there are differences in the uses of savings and the sources of borrowing. The use of informal savings clubs increases the probability that a woman will participate in the labor market by 15%, while the use of financial institutions has the same effect, however, at 19%; These results indicate that formal channels of financial services significantly and positively impact women's participation in the labor market more than informal channels. The impact of borrowing from financial institutions increases the probability of labor market participation for women by twice as much as borrowing through informal channels (17.8% borrowed from a financial institution; 8% from family and friends; and 6% borrowed from informal clubs). Overall, this presents evidence that access to formal financial services can play a significant role in increasing women's participation in the labor market.

Table 3. The association between women's financial inclusion and workforce participation in relation to the usage dimension.

Variables		Women's Labor Force Participation				
Saved financial institution	0.195 *** (0.0153)					
Saved used mobile banking		0.0846 *** (0.0130)				
Saved using informal club			0.150 *** (0.00954)			
Borrowed financial institution				0.178 *** (0.0180)		
Borrowed family and friends					0.0897 *** (0.00861)	
Borrowed informal saving club						0.0625 *** (0.0144)
Age	0.0145 *** (0.000900)	0.0137 *** (0.00146)	0.0138 *** (0.000901)	0.0149 *** (0.000904)	0.0148 *** (0.000904)	0.0112 *** (0.00172)
Age ²	−0.000290 *** (1.62e−05)	−0.000259 *** (2.77e−05)	−0.000276 *** (1.62e−05)	−0.000297 *** (1.63e−05)	−0.000292 *** (1.63e−05)	−0.000237 *** (3.16e−05)
Location (Urban = 1)	−0.0506 *** (0.00864)	−0.0160 (0.0122)	−0.0446 *** (0.00864)	−0.0482 *** (0.00866)	−0.0464 *** (0.00867)	−0.0194 (0.0149)
Secondary	0.00117 (0.00912)	−0.0352 *** (0.0133)	0.0149 * (0.00902)	0.0161 * (0.00906)	0.0140 (0.00908)	−0.0166 (0.0154)
Completed tertiary or more	0.0106 (0.0246)	0.00920 (0.0300)	0.0708 *** (0.0241)	0.0476 * (0.0243)	0.0616 ** (0.0242)	−0.0498 (0.0388)
Poorest	−0.0422 *** (0.0130)	−0.0522 *** (0.0191)	−0.0401 *** (0.0130)	−0.0528 *** (0.0130)	−0.0545 *** (0.0130)	−0.0391 * (0.0232)
Second2	−0.00476 (0.0134)	−0.0139 (0.0193)	−0.00869 (0.0133)	−0.0128 (0.0134)	−0.0182 (0.0134)	−0.0145 (0.0226)
Middle2	0.00989 (0.0130)	−0.00895 (0.0177)	0.00468 (0.0129)	0.00302 (0.0130)	−0.00308 (0.0130)	0.00723 (0.0215)
Fourth2	0.00111 (0.0127)	0.00108 (0.0166)	−0.00327 (0.0126)	−0.00806 (0.0127)	−0.00984 (0.0127)	0.000565 (0.0206)
Observations	13,097	5518	13,115	13,123	13,139	3586

Source: Authors' elaborations. *p*-value: *** *p* < 0.01, ** *p* < 0.05, * *p* < 0.1. Estimated marginal effects without stars are statistically insignificant.

These results provide an important guide for policymakers to consider the following implication: encouraging the use of formal financial services, such as banks and credit unions, for savings and borrowing can have a significant positive impact on women's participation in the labor market.

Providing financial education and literacy programs to women can help them better understand the benefits and risks of using formal financial services and increase their likelihood of using these services. Governments and the private sector can also consider investing in financial institutions such as microfinance institutions to provide easy access to credit and savings for women. Governments can also review laws, regulations, and policies that may create barriers for women to access formal financial services and make necessary changes. Partnerships between financial institutions and organizations that provide support and resources to women, such as mentorship and networking opportunities, may be beneficial in increasing women's participation in the labor market.

For older women, the main barrier to inclusion is a lack of money. Women living in urban areas and those with a higher educational level face similar barriers to their inclusion, namely "No need for financial institution" and "Family members has one", may indicate that these women may not see the value in using formal financial services themselves or may rely on the financial services of their family members. One possible explanation for this is that these women may have access to other financial resources or may have higher income levels, which reduces the perceived need for formal financial services. Additionally, these women may have a lack of awareness or understanding of the benefits that formal financial services can provide, such as access to credit and savings options. Another possible explanation is that these women may face cultural or societal expectations that prioritize the financial needs of male family members, which results in women relying on the financial services of their family members. The latter corresponds to what is called social norms which are rules dictated by society, which determine the behavior of individuals according to their gender.

Moreover, income level suggests that regardless of their social class, women face similar nonvoluntary barriers when it comes to accessing formal financial services. These barriers include factors such as the distance to financial institutions, the cost of accessing these services, lack of documentation, lack of trust in financial institutions, religious reasons, and lack of money. However, the intensity of these barriers decreases as the woman's income level increases (Table 4). This can be explained by the fact that women with higher income levels have more resources available to them., such as transportation and financial resources, which can make it easier for them to access formal financial services. Additionally, women with higher income levels may have more disposable income, which can make it easier for them to afford the costs associated with accessing formal financial services. Another possible explanation is that women with higher income levels may have greater social and economic mobility, which can allow them to access financial services in different locations or to overcome barriers such as lack of documentation.

Based on these results, policymakers can consider the following implications: addressing the nonvoluntary barriers that women face when accessing formal financial services, such as distance, cost, lack of documentation, lack of trust, and religious reasons, can increase the likelihood that women will use these services and therefore increase their economic participation. Developing targeted programs and policies that specifically address the needs of low-income women, such as financial literacy programs, can help to reduce the intensity of these barriers. Government and private sector can invest in financial inclusion policies and programs that aim to increase access to financial services in remote and rural areas, where barriers to access are more intense. Governments and the private sector can also invest in building trust and creating awareness about financial services to help women overcome the lack-of-trust barrier, and to understand the benefits of formal financial services.

Table 4. Barriers to financial inclusion (traditional channel).

Variables	To Far Away	Too Expensive	Lack of Documentation	Lack of Trust	Religious Reasons	Lack of Money	Family Members Has One	No Need for Financial Institution
Age	4.81e−05 (0.000940)	−0.000297 (0.00102)	−0.00892 *** (0.000986)	0.000685 (0.000872)	−0.00125 ** (0.000572)	0.00378 *** (0.000832)	−0.00199 *** (0.000736)	−0.000880 (0.000895)
Age ²	−1.52e−05 (1.64e−05)	2.01e−06 (1.76e−05)	8.80e−05 *** (1.74e−05)	−1.91e−05 (1.54e−05)	1.08e−05 (1.00e−05)	−5.34e−05 *** (1.44e−05)	2.82e−05 ** (1.30e−05)	1.92e−05 (1.55e−05)
Location (Urban = 1)	−0.170 *** (0.00948)	−0.0561 *** (0.0104)	−0.0756 *** (0.0102)	−0.00636 (0.00875)	0.00398 (0.00594)	−0.0126 (0.00862)	0.0444 *** (0.00738)	0.0508 *** (0.00910)
Secondary	−0.0563 *** (0.0101)	−0.0532 *** (0.0109)	−0.0812 *** (0.0106)	−0.0238 *** (0.00919)	−0.0474 *** (0.00673)	−0.00682 (0.00901)	0.0326 *** (0.00766)	0.00435 (0.00960)
Completed tertiary or more	−0.114 ** (0.0489)	−0.0642 (0.0459)	−0.274 *** (0.0581)	−0.00377 (0.0362)	−0.0147 (0.0249)	0.00446 (0.0355)	0.0604 ** (0.0259)	0.0594 * (0.0346)
Poorest	0.0855 *** (0.0150)	0.0727 *** (0.0160)	0.0675 *** (0.0157)	0.0551 *** (0.0134)	0.0293 *** (0.00910)	0.0500 *** (0.0129)	−0.0315 *** (0.0114)	−0.0119 (0.0140)
Second2	0.0460 *** (0.0155)	0.0559 *** (0.0163)	0.0351 ** (0.0160)	0.0319 ** (0.0139)	0.0167 * (0.00950)	0.0606 *** (0.0133)	−0.00911 (0.0112)	0.00351 (0.0141)
Middle2	0.0674 *** (0.0152)	0.0320 ** (0.0163)	0.0254 (0.0159)	0.0226 (0.0138)	0.0129 (0.00947)	0.0495 *** (0.0129)	−0.0226 ** (0.0112)	−0.00399 (0.0139)
Fourth2	0.0394 ** (0.0155)	0.0147 (0.0164)	0.00824 (0.0160)	0.0148 (0.0138)	−0.00928 (0.0100)	0.0325 *** (0.0126)	−0.00235 (0.0107)	−0.00681 (0.0138)
Observations	9449	9015	9419	9338	9456	9560	9361	9399

Source: Authors' elaborations. *p*-value: *** *p* < 0.01, ** *p* < 0.05, * *p* < 0.1. Estimated marginal effects without stars are statistically insignificant.

In addition, Table 5 presents the determinants of barriers to digital financial inclusion. Women living in urban areas may prefer using banking agencies since they may find them more accessible, more convenient, or more secure than digital channels. This could be due to a lack of awareness or knowledge of digital financial services, or a lack of trust in the digital financial system. On the other hand, women in the poorest income quantiles may be constrained from using digital channels because they cannot afford the high cost of mobile financial services or they do not have the necessary resources, such as money or a mobile phone. This can be due to poverty or lack of access to credit, which prevents them from purchasing a mobile phone or paying for mobile financial services.

These results suggest that policymakers should consider the costs of mobile financial services and access to mobile phones by making them more accessible and affordable, such as through subsidies or partnerships with mobile network operators and financial institutions, as well as increasing financial literacy and education programs for women to help them understand and effectively use digital financial services to overcome the barriers facing women in urban and low-income areas when it comes to digital financial inclusion. A regulatory framework should also be created for the digital financial inclusion of women, which will ensure the security and privacy of their data. Incentives can be offered for financial institutions to increase their outreach and services for women, including through the use of digital channels. Partnerships should exist between the government, private sector, and civil society organizations to promote digital financial inclusion for women, including through the use of digital identification systems, along with monitoring and evaluating the progress of these policies and programs to ensure they are effective in increasing women's participation in the labor market through digital financial inclusion.

Table 5. Barriers to digital financial inclusion.

Variables	To Far	To Expensive	Lack of Documentation	Lack of Money	Use Agent	No Mobile Phone
Age	−0.000397 (0.00109)	−0.000371 (0.00114)	−0.00703 *** (0.00113)	−6.14e−05 (0.00116)	0.000189 (0.00100)	−0.0125 *** (0.00113)
Age ²	−8.69e−06 (1.87e−05)	−6.63e−06 (1.97e−05)	6.91e−05 *** (1.96e−05)	4.33e−06 (1.99e−05)	−8.52e−06 (1.74e−05)	0.000169 *** (1.95e−05)
Location (Urban = 1)	−0.167 *** (0.0124)	−0.0711 *** (0.0127)	−0.0652 *** (0.0128)	−0.0295 ** (0.0125)	0.0292 *** (0.0108)	−0.0699 *** (0.0128)
Secondary	−0.0726 *** (0.0128)	−0.0589 *** (0.0132)	−0.0998 *** (0.0132)	−0.0706 *** (0.0128)	−0.00973 (0.0113)	−0.165 *** (0.0131)
Completed tertiary or more	−0.219 *** (0.0735)	0.00758 (0.0514)	−0.229 *** (0.0667)	−0.283 *** (0.0506)	−0.109 ** (0.0517)	−0.336 *** (0.0720)
Poorest	0.0256 (0.0179)	0.0635 *** (0.0187)	0.0299 (0.0188)	0.0599 *** (0.0184)	−0.0408 ** (0.0160)	0.0507 *** (0.0191)
Second2	0.0269 (0.0184)	0.0528 *** (0.0193)	0.0295 (0.0193)	0.0591 *** (0.0189)	−0.0240 (0.0163)	0.0487 ** (0.0196)
Middle2	−0.00412 (0.0187)	0.0289 (0.0196)	−0.00216 (0.0196)	0.0593 *** (0.0189)	−0.00794 (0.0161)	0.0450 ** (0.0197)
Fourth2	−0.0224 (0.0194)	−0.00857 (0.0204)	−0.0101 (0.0201)	0.00891 (0.0190)	−0.0195 (0.0165)	−0.00925 (0.0204)
Observations	6547	6337	6562	6643	6597	6677

Source: Authors' elaborations. *p*-value: *** *p* < 0.01, ** *p* < 0.05, * *p* < 0.1. Estimated marginal effects without stars are statistically insignificant.

The purpose of these policy implications is to promote gender equality in the workforce by increasing access to financial resources for women through digital channels, which will help to increase their participation in the labor market.

Women's financial inclusion reduces gender inequality, which contributes to women's empowerment (Cabeza-García et al. 2019). In sum, our study ruled both on the role of digital financial inclusion through its different dimensions in promoting African women's participation. In addition, our study identified the main barriers to African women's digital financial inclusion which are involuntary barriers related mainly to the high costs of mobile financial services, lack of money, and lack of access to a cellphone. The empirical results of our study corroborate those of several works (Benyacoub 2021; Elouaouri and Ezzahid 2022a).

In this sense, policymakers in Africa should work both downstream, to strengthen the financial literacy of African women to facilitate their inclusion via the digital channel, and upstream by expanding access to telephone and internet infrastructure which will strengthen women's financial inclusion and therefore boost their participation in the labor market.

African countries are male-dominated societies with large informal sectors and strong gender norms that limit the place of women in society. Gender norms consist of "perceived rules and collective expectations about how an individual should behave based on their gender, for example, in some societies women are restricted to family responsibilities, leaving them less time for income-generating activities. In other societies, women have no financial intimacy with their parents and husbands, and in others, women are not allowed to own a cell phone, which means they cannot benefit from mobile banking services" (Elouaouri and Ezzahid 2022b). Eliminating these gender norms through education and raising awareness of the role of women in development among different segments of African societies will help promote women's digital financial inclusion.

5. Conclusions

This paper analyzed the relationship between digital financial inclusion and women's labor force participation. In addition, our paper shed light on the barriers to women's digital financial inclusion. We have mobilized a microeconomic database that covers 15,192

African women. Our database is extracted from the Global Findex database, 2021 edition, based on nationally representative surveys of 29 African countries. The Probit model estimation methodology was used.

Empirical results have shown that financial inclusion via the digital channel is positively associated with women's labor force participation more than the traditional channel. Results indicate that formal channels of financial services significantly and positively impact the level of women's participation in the labor market more than informal channels.

There are barriers women face in accessing the traditional financial inclusion channel, including nonvoluntary barriers related to "to faraway, too expensive, lack of documentation, lack of trust, religious reasons, lack of money". However, the intensity of these barriers decreases as the woman's income level increases.

On the determinants of barriers to digital financial inclusion. Women living in urban areas prefer to use bank agencies, which explains why they do not use the digital channel. In addition, women in the poorest income quantiles cannot use the digital channel due to the high cost of mobile financial services, lack of money, and lack of access to a mobile phone.

Digital financial inclusion has been identified in the literature as a mediating channel to women's economic participation, although African women face several barriers to their inclusion. Our study contributes to the existing literature in two ways. First, it advances the field from the current state of knowledge by investigating the association between financial inclusion and women's labor market participation in African countries. Second, it is the first study in the literature that identifies barriers that hinders women's digital financial inclusion based on individual-level data.

The main implications of this study are twofold. For practice, African policymakers should act to increase women's financial inclusion through digital channels, considering the impact of these channels on women's participation in the labor market. Developing financial literacy and education programs for African women, to help them understand and effectively use digital financial services. Developing targeted financial inclusion programs and services for low-income women, such as microfinance or other small-scale credit and savings options that are designed to be more affordable and accessible. Creating a regulatory framework that promotes transparency, security, and accessibility of financial service providers will help to increase trust and confidence in formal financial services among women. Increasing the availability of financial services in remote and rural areas, such as through mobile banking or other digital channels, to reduce the barriers of distance and cost. For research, our study fills the gap in the literature by investigating the digital financial inclusion–women's labor force participation relationship, and by identifying, for the first time in the literature, barriers to women's digital financial inclusion, and understanding of these barriers will be helpful to inform public policies designed to increase women's participation in the labor market.

Despite the insights provided by our study, its main limitation is that it focuses on six specific barriers to digital financial inclusion proposed by the Global Findex database. This limitation of the database prevents the study from taking into account other potential barriers to digital financial inclusion, such as lack of digital literacy, security, or privacy issues. Further research is needed to fully understand the impact of these other barriers on women's labor market participation in African countries. Despite this limitation, our study provides important insights into the relationship between digital financial inclusion and women's labor market participation, as well as the barriers that impede women's financial inclusion through the digital channel.

Our research opens up new opportunities for further studies on increasing digital financial inclusion among African women. Future research could focus on several key areas, one important area of study would be to better understand the barriers and challenges that African women face in accessing and using digital financial services. This could include research on issues such as lack of access to technology, lack of digital literacy, and cultural or societal barriers to financial independence for women. Another important area

of future research could focus on the impact of digital financial inclusion on the economic empowerment of African women. This could include studies on how access to digital financial services affects women's ability to start and grow businesses, access credit, and improve their overall financial well-being.

Additionally, research could be conducted to develop and test interventions that aim to increase digital financial inclusion for African women. This could include initiatives aimed at increasing access to technology, providing training and education on digital financial services, and addressing cultural and societal barriers to financial inclusion for women. Overall, future research on digital financial inclusion for African women could have significant implications for improving the economic empowerment and overall well-being of women in Africa.

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Note

¹ The sample age range is between 15 and 98 years old.

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