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Financial inclusion and women economic empowerment in Ghana

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ABSTRACT

Although the impact of micro-credit and direct cash transfers on women economic empowerment has been extensively studied, the impact of having access to a bank account remains relatively understudied. This paper uses a detailed national representative dataset of female household heads in Ghana to analyze the relation between access to formal and informal financial accounts and women's economic empowerment. Using propensity score matching, our results elicit that women who have a financial account are more likely to be employed and tend to have higher income. The results are mainly driven by ownership of a formal account (i.e., in a commercial bank) while the impact of informal account ownership is not statistically significant. Thus our findings call for higher promotion of formal banking, particularly among women in rural and poorer areas where financial inclusion is lower.

1. Introduction

Women in developing countries significantly lag behind their counterparts in developed nations with regards to economic empowerment. In most developing regions, factors such as lower labour force participation, existing cultural norms and early marriages interact and reinforce each other to put women in a position where they are economically dependent on men—whether spouses or intimate partners—for sustenance (Duflo, 2012; Doepke et al., 2012). Women economic empowerment is not only an end in itself, but also a means to achieving other development goals. Available evidence suggests that economic empowerment of women helps break the vicious cycle of poverty and is essential for economic growth and development.

Among the factors conducive to women empowerment, one aspect that has been relatively overlooked is financial inclusion. This entails access to financial services such as credit, a bank account, and other related services. Evidence shows a gender gap in financial inclusion, with women having less access to financial instruments and resources than men (see for example, Ghosh and Vinod, 2017; Demirgüç-Kunt et al., 2013). However, the evidence on the relation between certain types of financial inclusion and women economic empowerment is not all that conclusive. While most studies have focused on the effect of access to micro-credit on women (see, among others, Swain and Wallentin, 2009; Banerjee et al., 2015a; Duvendack and Palmer-Jones, 2012; Banerjee et al., 2015b), much less is known about the impact of access to financial instruments such as a bank account or informal financial services like rotation and accumulating savings and credit associations (ROSCA), known in Ghana as Susu, or mobile money. Having a bank account can nudge women to save, invest, and take out loans which will then help to empower them economically (Timmons et al., 2022). Moreover, owning a bank account gives women the opportunity to have control over their own resources which also entails economic

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empowerment. In this paper, we examine the link between access to financial instruments, in particular access to formal and informal accounts, and some indicators of women empowerment in Ghana.

Ghana is an interesting example of a large developing country in sub-Saharan Africa. With a total population of about 31 million people, almost 51% of them are women (GSS, 2021 Pop. Census). As the indicators in Table 1 show, there is still an important imbalance in empowerment along the gender dimension. For example, 85.4% of the seats in parliament are occupied by men and only 14.6% by women; 21.2% of males receive retirement pensions as opposed to 7.2% of the females; and 61.8% of males own a financial account whereas this percentage is 53.7% for women. It is thus interesting to investigate the possible avenues by which Ghanaian women might improve their economic and social outcomes.

The main contribution of this paper to the literature on financial inclusion and women economic empowerment is twofold. First, we focus on access to a financial account as our measure for financial inclusion and distinguish between ownership of formal bank accounts and informal financial services such as less regulated savings and credit accounts, Susu (merry go round contributions) or mobile money. This distinction is particularly important in developing countries where barriers to formal banking make informal financial means a viable alternative to access financial services. Indeed, we obtain a different impact on women empowerment with regards to each type of financial account. We find that it is the ownership of formal accounts, and not informal ones, what is significantly associated with women employment and income. Second, methodologically, we use propensity score matching to deal with the potential endogeneity in the relationship between financial access and economic outcomes, which represents an improvement with respect to other papers analysing financial inclusion and women empowerment in Ghana -e.g. Ganle et al. (2015), Salia et al. (2018).

The remainder of the paper is organized as follows. Section 2 briefly analyzes the related literature on which the conceptual framework is based upon. Section 3 overviews the state of women financial inclusion in Ghana. The empirical methodology, including the description of the data, model specification and estimation, is addressed in Section 4 while Section 5 reports the results. Finally, Section 6 concludes.

2. Conceptual framework and related literature

Women's financial inclusion is one of the important facets of women empowerment which, in turn, is key to human development and growth (Doepke and Tertilt, 2019; Duflo, 2012; Fielding and Lepine, 2017; Orso and Fabrizi, 2016). Several indicators have been used in the literature as proxies for financial inclusion, including access to micro-credit, ownership of a savings or other type of bank account and, more recently, access to mobile money. Likewise, a review of the literature reveals different channels through which women's financial inclusion can contribute to development and growth. First, female ownership of an account or other financial services leads to an increase in household consumption, particularly biased towards children, and to investment in durables. For example, Dupas and Robinson (2013) shows that having private savings accounts increases women bargaining power in the household and enables them to make choices regarding durable goods. Suri and Jack (2016) finds that increased access to mobile money in Kenya led to increased long-term consumption and reduced the number of households in poverty with a more pronounced effect for female headed household. A field experiment carried out in Nepal that offered no-fee savings accounts to female-headed households living in slums boosted spending on education, nutritious food, and health.¹ Second, having a bank account can serve as a savings commitment device and a nudge for women to put some money aside for precautionary or future transactions, thereby increasing the savings rate (Dupas and Robinson, 2013; Suri and Jack, 2016). Third, in addition to allowing them to save, owning a financial account exposes women to the possibility of acquiring credit. This, in turn, provides resources to cover daily expenses and invest in business ventures, education or other opportunities.

The last two channels (increased savings and the possibility to take on loans) might increase the possibilities of employment and business activities of women, as some of the available evidence shows. For instance, Bruhn and Love (2011) find that access to financial services in Mexico leads to an increase in the number of informal business owners among men and an increase in formal employment among women. Their results also show that income levels increase, particularly for women. Similarly, Sedai et al. (2021) find that rotating savings and credit associations membership of women in India increase their likelihood of employment and business activities. Suri and Jack (2016) document that access to mobile money services in Kenya improved labour market outcomes of women and their transition from agriculture into business ownership. The impact of financial inclusion on women empowerment outcomes, and ultimately growth, through the different channels discussed above is summarized in Fig. 1, and constitutes the basis for our first research hypothesis.

H1. Access of women to a financial account leads to female economic empowerment.

Empirically, we will examine the relationship between women's financial access and their income and employment likelihood. That is, we will focus on the the right part of the diagram in Fig. 1. Most of the existing studies on female financial inclusion and development have focused on access to micro-credit (Banerjee et al., 2015b; Orso and Fabrizi, 2016; Al-Shami et al., 2018; Swain and Wallentin, 2009; Khandker and Samad, 2014).² By contrast, in this paper we focus on ownership of financial accounts. More specifically, we consider formal financial accounts (i.e, access to a bank account) and informal financial accounts, a less studied means of

¹ The increase in household spending, particularly on food, education and health for children, is typically confirmed in studies on cash transfers targeted at women too -see for example Haushofer and Shapiro (2016); Doepke and Tertilt (2019).

² Ganle et al. (2015) looks at the effect of micro-credit on empowerment of rural women in Ghana, using a completely different methodological approach from ours.

Table 1
Some Indicators of Welfare of Men and Women in Ghana.

Indicator Name	Women	Men
Seats in Parliament (%)	14.6	85.4
Pop. above pensionable age receiving pension (%)	7.2	21.2
Ownership of Mobile (%)	68	79.9
Account at a Financial Inst. (%)	53.72	61.8

Sourced from UN Women Data Hub, 2020.

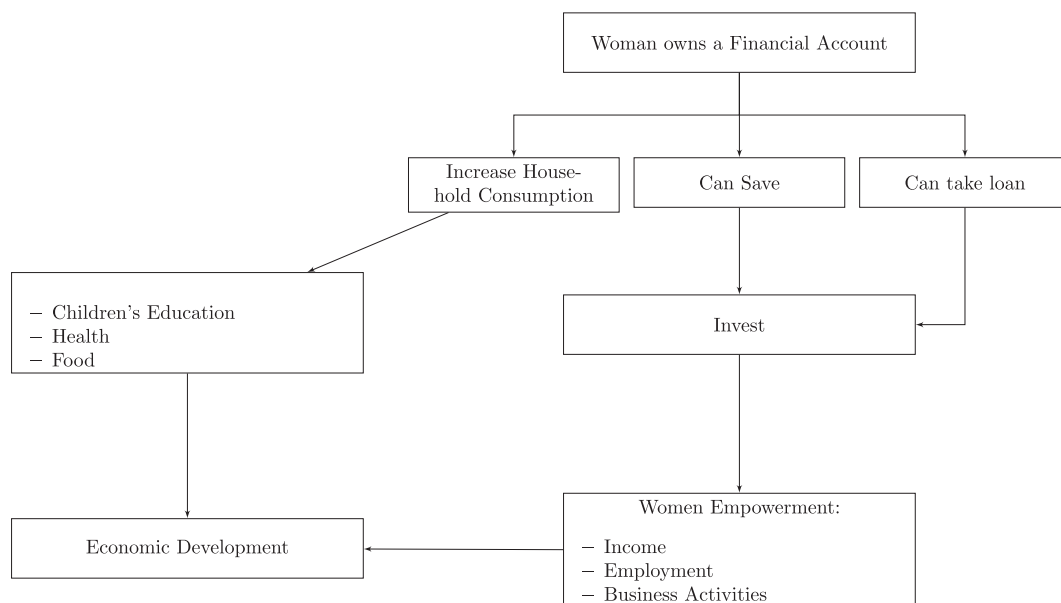


Fig. 1. Conceptual link between Bank Accounts and Economic Empowerment.

financial assets, which include non-regulated saving and credit accounts, Susu (a scheme of collective contributions) or mobile money. This is an important distinction of financial accounts that has not received much attention so far, and that might have different implications for women economic outcomes as stated in our next hypothesis.

H2. Access to a formal and to an informal account are not to have the same impact on women empowerment.

To summarize, the empirical evidence so far on the nexus between financial access and women economic empowerment or, more generally, between financial access and women's economic outcomes is inconclusive. While some studies find a positive link (Brune et al., 2011; Sedai et al., 2021; Suri and Jack, 2016), other studies obtain a limited impact of account ownership on female empowerment outcomes. For example, in a study for Uganda, Malawi and Chile, Dupas et al. (2018) find that policies simply aimed at expanding access to basic accounts are unlikely to improve welfare significantly as the effects, even if present, are small. McDougal et al. (2019) highlight the limitations of bank account ownership in fostering women's economic autonomy in the presence of social and cultural norms that exert control over women's behaviour. Finally, although the type of financial asset does make a difference, Sakyi-Nyarko et al. (2022) find no gender differences on the impact of financial inclusion on financial resilience. In short, the relationship between financial inclusion and women empowerment remains, by and large, an open question, and this paper aims at shedding further light on it.

3. Financial inclusion in Ghana

In Ghana, as in some other developing countries, there is a dual financial sector. On the one hand, there are commercial and investment banks supervised by the Bank of Ghana, granting them the status of formal banks. These institutions must adhere to various regulations, including meeting minimum paid-up capital requirements and ensuring the safety of deposits. On the other hand, there is a wide range of financial services, to which we will refer to as informal financial sector, that are subject to less strict regulations (for

example, lower minimum paid-up capital requirements) or minimal regulations. They include financial NGOs, money lender companies, credit unions, Susu and mobile money. Credit unions are member-based cooperatives (i.e., not open to the general public) that provide savings, loan and insurance services to their members.³ They can be workplace-based, church-based, or community-based. They are de facto supervised by the Ghana Cooperative Credit Union Association and the Department of Cooperatives. Susu, a particularly important financial service in rural areas, consists of rotating and accumulating savings and credit associations which use member savings as the main source of capital. The way they work is the following; group members meet regularly (e.g., weekly) and make contributions that would be used during a given period of time or cycle, to make loans to members in need of funding. The borrowers pay interest at a rate set by the group, and at the end of the cycle the capital and the interest earnings are shared among the members in proportion to the contributions made. Finally, mobile money gives relatively easy access to funds to individuals in possession of a mobile. For instance, owners of a Mobile Telephone Network (MTN) money account in Ghana can easily obtain a loan through Qwikloan initiative, a mobile financial service offered by the MTN mobile network in partnership with the African Financial Bank (AFB). It provides instant short-term loans to customers in times of need without the necessity to do extensive paperwork or provide proof of collateral.

Notably, the informal financial services are mostly used by businesses in the informal economic sector and in rural areas. For instance, Susu is estimated to be used by a quarter of a million villagers (Group World Bank, 2016). In contrast, commercial banks are more prevalent in urban areas.

Given the larger presence of banks in big cities, financial inclusion in Ghana (i.e., access to a financial account whether formal or informal) is highly correlated with urbanization. Moreover, as Fig. 2 shows, there is an evident geographical pattern in the distribution of financial inclusion. In the Greater Accra region (the darker area in Fig. 2), which includes the country's capital, 52% of the households are in possession of a bank account, followed by the Ashanti region, the second most urbanized region in Ghana, and the Western region where 43% and 39% of households respectively have a bank account. By contrast, financial inclusion is the lowest in the Upper East, Northern, and Upper West regions, all located in the northern part of the country.

Financial inclusion varies significantly across gender too. As in many other African countries, men are traditionally in control of household resources and tend to be more in possession of financial accounts than women. Besides traditional norms, the gender gap in financial inclusion can be attributed to a variety of factors that we can broadly classify into three groups: i) demand-side barriers such as lower income, lack of bargaining power in the household, lack of asset ownership and lower rate of cell phone ownership among women (Ghosh and Vinod, 2017; Zhang and Posso, 2019); ii) supply-side barriers including the absence of appropriate financial products and marketing targeted towards women as well as gender-specific policies (Sakyi-Nyarko et al., 2022) and iii) legal and regulatory barriers such as account opening requirements (like the need of a formal work contract) that put women at a disadvantage (Sakyi-Nyarko et al., 2022).

Since many barriers to financial access encountered by women primarily affect the formal financial sector, as research hypothesis H2 states, it seems reasonable to expect different effects of ownership of formal and informal financial accounts on women's empowerment. We empirically investigate that with the estimation model below.

4. Empirical model

4.1. Data description

The primary data source for this study is the Ghana living standard survey (GLSS). This is an exhaustive nationwide household survey carried out by the Ghana Statistical Service with support from the World Bank (Social Dimensions of Adjustment Project Unit). The first Ghana Living Standards Survey was conducted in 1987, followed by a series of subsequent surveys. For this study, we use data from the sixth and seventh waves of the GLSS, conducted in 2012–2013 and 2016–2017, respectively. To the best of our knowledge, the GLSS is the most comprehensive database in Ghana that provides household and community level information on gender, including details of access to and use of finance. Therefore, it is the ideal dataset for this study. The uniqueness of waves 6 and 7 of the GLSS is that these rounds gathered data on the demographic characteristics of households, education, employment, household agriculture, non-farm household enterprises, financial services, and other key variables to our study.

The GLSS data collection process typically unfolds in two stages. Initially, 1200 Enumeration Areas (EAs) are selected from Ghana's ten regions using a method based on probability proportional to population size. Subsequently, in the second stage, a total of 18,000 individuals are reached within these 1200 Enumeration Areas. However, during the sixth and seventh waves, interviews were conducted with 16,772 and 14,009 households, respectively. Upon merging data from these two waves, we aggregated a sample comprising 21,686 males and 9095 females.

A first exploration of the data reveals clear differences between male and female household heads. As Table 2 shows, on average male heads own more accounts than female heads and this difference is statistically significant at the 1% significance level. Moreover, it mainly stems from the fact that male heads own more formal accounts than female heads. In terms of income, the average income for male household heads is 1394 Cedis or 91.44 US dollars while that of female household heads is 438 Cedis or 28.7 US dollars.⁴ However, this difference is not statistically significant. Similarly, employment and self-employment is significantly higher for men than

³ Some examples include, Accra Academy Cooperative Credit Union Ltd., University of Ghana Credit Union and Bole Community Cooperative Credit Union.

⁴ The exchange rate between Cedis and US dollars is 1 USD =15 Cedis

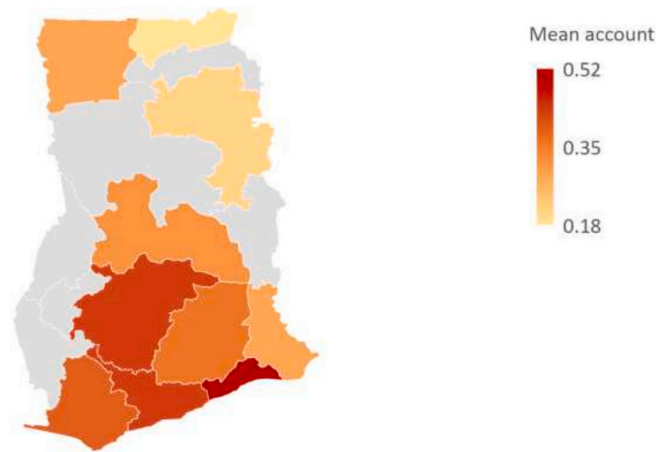


Fig. 2. Average financial account ownership by region.
Notes: No data available for grey-shaded regions.

women. Geographically, in 9 out of 10 regions in Ghana, men have on average more financial accounts than women with these differences being statistically significant at the 1% level for all but one region. In short, the statistics in Table 2 show that female heads fall behind male heads with regard to income and employment status, and also financial inclusion. This suggests that financial inclusion should also be explored as a possible channel through which women could be empowered.

We decided to focus on women who are household heads for two main reasons. Firstly, to ensure that women are the decision-makers regarding household income, serving as a critical proxy for economic empowerment within the household. Additionally, because the variable of interest—ownership of a financial account—is derived from the responses to the survey question of whether the household head possesses a financial account. Thus, this variable effectively captures female financial inclusion but exclusively within the context of female-headed households. This is a limitation that should be borne in mind when considering the external validity of the results for non household-head women.

After data cleaning and the elimination of observations for which some of the variables of interest had missing values, we are left with a final sample size of 4569 female household heads for our analysis. Definitions and descriptive statistics for all the variables used in the empirical estimations are provided in the Appendix in Tables A1 and A2, respectively.

4.2. Model specification

Following previous research (Attanasio et al., 2011; Blattman et al., 2014; Suri and Jack, 2016), we estimate the following model for female economic empowerment:

$$WE_{iht} = \beta_1 FI_{iht} + \beta_2 X_{iht} + \beta_3 U_r + \beta_4 Wave_t + \varepsilon_{iht} \quad (1)$$

where i denotes a woman, h is the household she lives in, r refers to the region and t is time. WE is women empowerment and, as we explain in detail below, we use two different proxies for it. FI represents financial inclusion and constitutes our explanatory variable of interest. We expect the coefficient associated to this variable, β_1 , to be positive. X is a vector of controls at the individual and household levels including age, marital status, level of education, household income quintile, and religion. Region and wave fixed effect are included. Finally, ε is the error term.

Women empowerment, our dependent variable, constitutes a multidimensional concept which entails different spheres of life. As defined by Duflo (2012, p.1053) it consists of “improving the ability of women to access the constituents of development—in particular health, education, earning opportunities, rights, and political participation”. Similarly, Bandiera et al. (2020, p.210) states “women’s empowerment has three key dimensions: political, economic, and control over one’s body”. Therefore, a challenge arises when it comes to empirically measure empowerment. As the focus of this study is economic empowerment, we use proxies related to the earnings and earning ability of women such as income and employment status. Income is defined as the natural log of household income measured in Ghana Cedis divided by household size. This proxy of women empowerment has previously been used in studies such as Westenberg and d’Exelle (2015), Al-Shami et al. (2018) or Annan et al. (2021). Regarding employment status we consider two different indicators: a binary variable for whether the woman is employed or not, and a categorical variable indicating whether the woman is formally employed, self-employed or unemployed. Employment status has been used as a proxy for women empowerment

Table 2
Mean Acct Ownership, Income and Occupation Status by Gender.

Variables	Avg. of Males (I)	Avg. of Females (II)	Difference (III)
Panel A: Socio Economic Characteristics			
Financial Account	0.36	0.30	0.06 (0.0000)
Formal Account	0.17	0.12	0.05 (0.0000)
Informal Account	0.16	0.17	- 0.006 (0.8872)
Income per Capita (Ghana Cedis)	1394	438	955 (0.6131)
Employed & Financial Acct	0.29	0.26	0.03 (0.0000)
Employed & Formal Account	0.12	0.10	0.02 (0.0000)
Employed & Informal Account	0.15	0.14	0.008 (0.0800)
Self Employed & Financial Acct	0.26	0.18	0.08 (0.0000)
Self Employed & Formal Account	0.08	0.04	0.04 (0.0000)
Self Employed & Informal Account	0.16	0.13	0.03 (0.0003)
Employed	0.69	0.56	0.12 (0.0008)
Self Employed	0.28	0.18	0.10 (0.0000)
Panel B: Location Characteristics			
Western Region	0.42	0.29	0.13 (0.0000)
Central Region	0.36	0.29	0.075 (0.0000)
Greater Accra Region	0.6	0.4	0.14 (0.0000)
Volta Region	0.31	0.24	0.07 (0.0000)
Eastern Region	0.38	0.30	0.08 (0.0000)
Ashanti Region	0.45	0.38	0.07 (0.0000)
Brong Ahafo Region	0.35	0.29	0.06 (0.0002)
Northern Region	0.21	0.26	-0.05 (0.1000)
Upper East Region	0.19	0.17	0.018 (0.1532)
Upper West Region	0.3	0.22	0.07 (0.008)

This table reports mean value of some socio-economic variables of interest for males and females. Column (III) also reports mean difference between them and the p -values in brackets of a t -test testing the null hypothesis that male and female are equal across these socio-economic variables.

and in the evaluation of policies on female outcomes, among others, in [Westeneng and d'Exelle \(2015\)](#), [Bandiera et al. \(2020\)](#), [Attanasio et al. \(2011\)](#) or [Galasso et al. \(2004\)](#).⁵

As for financial inclusion, we use ownership of a financial account and we also disaggregate account ownership into formal and informal accounts. Formal account ownership is a dummy that takes the value of 1 if a female household head has an account at a commercial bank and 0 otherwise. Informal account ownership, on the other hand, is a dummy that takes value 1 if the woman owns a mobile money account, Susu, a credit union account or some other type of informal account, as explained in [Section 3](#).

With regard to the vector of control variables, $X_{ihr,t}$, the wealth of the GLSS dataset allowed us to include an exhaustive list of variables. The full list of all controls included can be found in [Table A1](#) in the Appendix.

⁵ Other dimensions of women empowerment that have been considered in the literature are women's autonomy to make household decisions - [Anderson and Eswaran \(2009\)](#), [Annan et al. \(2021\)](#)- or women's employment outside the home or the farm - [Annan et al. \(2021\)](#), [Aker et al. \(2011\)](#) and [Campos et al. \(2015\)](#).

4.3. Estimation strategy

Estimation of model (1) above is subject to a potential endogeneity problem for at least two reasons. One is reverse causality; that is, women with higher income and/or employed women might be more likely to have a financial account because their job or income status gives them access to it. For example, if employed by somebody else, wages might be received through a (formal) bank account. Likewise, higher income and employment can also make informal accounts (such as mobile money) more likely, as owning a mobile is also positively correlated with income. Another source of endogeneity is simultaneity, namely, there might be unaccounted factors (such as skills that are not completely captured by education) that make women more likely to having a financial account and be economically empowered too.

We deal with the potential endogeneity challenge by using a Propensity Score Matching (PSM) identification strategy.⁶ This method assumes that, conditional on some observable baseline characteristics, individuals who did not receive the treatment (in this case, women who do not possess a financial account) can be compared to treated individuals (women who do have an account) as if the treatment was randomized. PSM mimics randomized experiments to overcome the issue of selection bias. However, for PSM to be valid, two assumptions must be satisfied. The first one is the conditional independence assumption which states that, after controlling for all observable covariates, the potential outcomes of treated (Y^1) and non-treated (Y^0) individuals are independent of the treatment T . In other words, after controlling for all observable covariates (X) the treatment assignment is as good as random (Heinrich et al., 2010). That is,

$$(Y^1, Y^0) \perp T \mid X \quad (2)$$

The second assumption is the overlapping or common support assumption which states that for each value of X , there exists a positive probability of being both treated and untreated:

$$0 < P(T = 1|X) < 1 \quad (3)$$

This assumption was proposed by Rosenbaum and Rubin (1983, 2023) to address the dimensionality problem associated with matching over numerous individual covariates. If both assumptions are satisfied, then the treatment assignment is referred to as strongly ignorable (Rosenbaum and Rubin, 1983), and the average effect on the treated in a propensity score matching model can be safely estimated. Below is the mathematical specification of the model:

$$ATT = E(\Delta|X, T = 1) = E(Y^1 - Y^0|X, T = 1) = E(Y^1|X, T = 1) - E(Y^0|X, T = 1) \quad (4)$$

where ATT is the average effect of the treatment on the treated. The matrix X comprises pre-treatment variables. $E(Y^1|X, T = 1)$ is the potential outcome after treatment, which is observable, and $E(Y^0|X, T = 1)$ is the counterfactual outcome which is not observed. However, the matching method produces this counterfactual outcome for the treated by computing the probability of receiving the treatment, known as propensity score. The approach matches individuals with similar propensity score across those who received treatment (i.e., have a financial account) and those without treatment (i.e., without a financial account). The propensity score, also referred to as the balancing score $P(X) = Pr(T = 1|X)$, enables a meaningful comparison between treated and untreated individuals.

Compared to other conventional regression techniques, PSM has the built-in advantage of using characteristics (X) that are not affected by the intervention but are correlated with both the outcome variable and the intervention (Rosenbaum and Rubin, 1983; Abadie and Imbens, 2006). Heckman et al. (1999) argues that matching estimators produce low-bias estimates of the effect of a treatment. Firstly, by conditioning on X (i.e., baseline characteristics) selection bias is addressed. Secondly, treatment and control individuals are drawn from the same dataset and are thus exposed to similar economic conditions.

Our dataset provides a sufficient set of control variables so that the two major assumptions underlying the PSM can be satisfied, and we can compute the matching estimate with minimum bias. We implement the PSM in three steps. First, we generate the propensity scores using an extensive set of variables such as age, level of education, religion, marital status, survey year dummies and region of residence, among others, for women having a financial account and for non account holders. Second, we match with a financial account women without a financial account. Third, we estimate the average treatment effect (ATT) of having a financial account on women economic empowerment.

As can be observed in Figs. 3 and Fig. 4, there exists a significant overlap in the spread of the propensity score in the treated and control groups. Furthermore, an example of results from the overall covariate balancing test in Table 3 shows that the standard mean difference for all covariates used reduces from 20.6 before matching to 4.5 after matching. Also, the likelihood ratio test indicates that before matching, the null hypothesis of joint significance of all covariates used was rejected at the 1% level. By contrast, after the matching, the joint significant test could not be rejected. Hence the specified model balances covariates across both groups and the common support or balancing assumption is satisfied.

We employ exact matching and the nearest neighbour as our baseline PSM estimator. However, to check the robustness of the results we also consider Kernel matching and Rosenbaum (2002) bounding approach based on the sensitivity parameter Γ - see the

⁶ An instrumental variable approach was also considered where ownership of an account was instrumented with the distance to the nearest financial institution at the community level. While the estimation results were qualitatively similar to the PSM results reported here, we disregarded this identification strategy because the instrument was not too powerful. Estimation results are, nevertheless, available from the authors upon request.

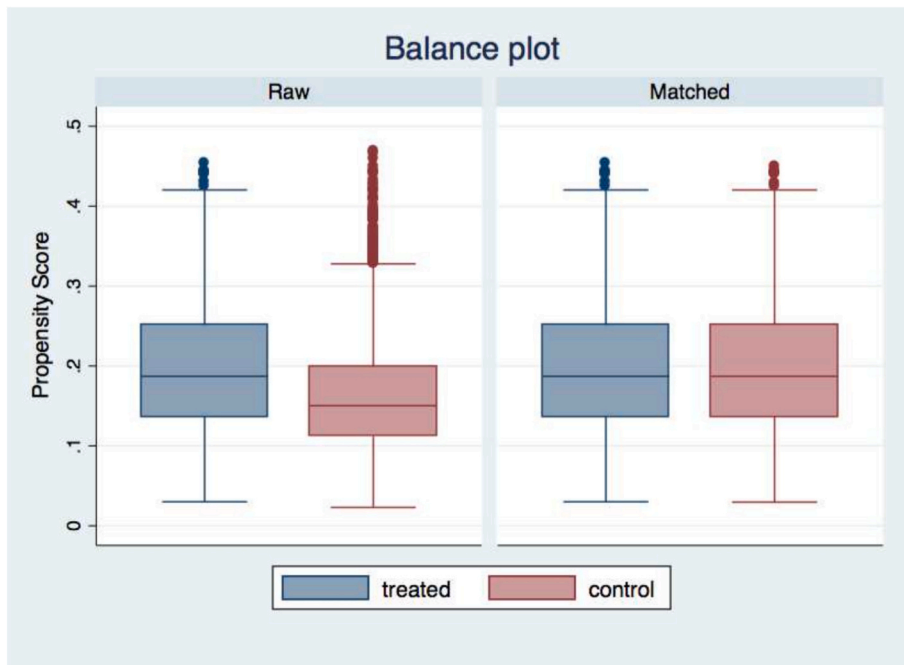


Fig. 3. Propensity Score Balancing Box Plot

Notes: This figure represents the balancing plot of the raw and matched data. It demonstrates the overlap in the distribution of propensity scores across all variables (such as age, level of education, religion, marital status, survey dummy, region of residence, etc.) between the treatment and control groups.

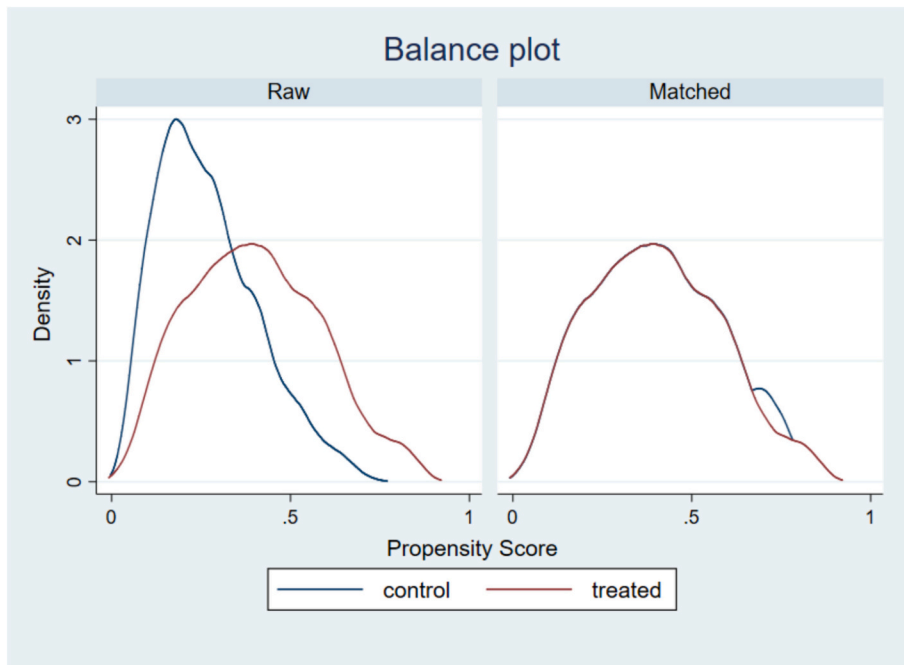


Fig. 4. Propensity Score Balancing Density Plot

Notes: The figure depicts the balancing plot of the raw and matched data. The figure illustrates an overlap in the spread of propensity score from all variables (age, level of education, religion, marital status, survey dummy, region of residence and others) for both the treatment and control groups, as the two density perfectly fit in the matched panel.

Table 3
Propensity Score Matching Quality Test.

Indicator Name	Before Matching	After Matching
Pseudo R2	0.193	0.020
LR χ^2	584.85	26.64
P-Value ($P > \chi^2$)	0.000	0.538
Mean Standard Bias	20.6	4.5

sensitivity analysis below.

5. Results

For comparison purposes, [Table 4](#) presents the Ordinary Least Squares (OLS) and probit estimation results of model (1) described above. The first three columns of [Table 4](#) depict the regression of log income of female-headed households, one of our measures of economic empowerment, on access to financial accounts while controlling for relevant individual and household characteristics. All regressions include survey year and region fixed effects, and standard errors are clustered at the region level. Due to space limitations, we report only the estimated coefficients on financial inclusion, our variable of interest. Full estimation results can be found in [Table A3](#) in the Appendix.

As shown in Column 1 of [Table 4](#), access to a financial account exhibits a positive and statistically significant impact on income, which confirms hypothesis 1 above. The point estimate (0.2527) indicates that, on average, female-headed households without a financial account experience a 29% increase in income when they transition to having an account.⁷

We further disaggregate account ownership into formal accounts and informal accounts. As observed in Column 2 of [Table 4](#), female household heads with a formal bank account exhibit higher income compared to those without a formal account. Specifically, female household heads transitioning from not having a formal account to having one experience a 40% increase in income. Similarly, the coefficient on informal account ownership is also positive (see Column 3 of [Table 4](#)) but not statistically different from zero at any conventional significance levels. Thus, these results come to confirm hypothesis 2, namely, that the impact on women empowerment of having a formal and an informal account are not the same.

[Fig. 5](#) illustrates the relationship between financial account ownership and the logarithm of income for rural and urban women across various age groups. As depicted in the figure, income is higher for urban female heads with a financial account compared to urban female heads without an account across all age groups. Qualitatively similar results are observed for rural household heads. [Fig. 6](#) also plots the effect on income for women across the 10 regions of Ghana. It is evident that, overall, women with an account have higher predicted income compared to women without an account.

Interestingly, our results also indicate that the level of education and the sector of employment- namely primary, secondary, tertiary, and postgraduate education- positively correlates with income, while being in the agriculture sector negatively correlates with income (see full OLS regression results in Appendix [Table A3](#)). A similar conclusion was reached by [Orso and Fabrizi \(2016\)](#), which found that education helps empower women in Bangladesh. Likewise, female household heads living in cities and urban areas tend to be more economically empowered than their counterparts residing in rural areas.

The last three columns of [Table 4](#) present the results of the marginal effects of a probit model of employment variable and financial inclusion (see [Table A4](#) in the Appendix for the complete regression results).⁸ As observed in Column 4, female household heads with a financial account are almost 10 percentage points more likely to be employed at the 1% significance level. Moreover, female household heads owning a formal account increase their probability of being employed by 16 percentage points (Column 5), while informal account ownership is again not significant (Column 6). This result is also echoed in studies by [Westeneng and d'Exelle \(2015\)](#) and [Anderson and Eswaran \(2009\)](#).

To shed more light on the relationship between financial account ownership and employment, [Table 5](#) reports the estimation results from a multinomial logit model where employment is further disaggregated into formally employed (or wage employment), self-employed and unemployed (the base category). Confirming our research hypothesis, the marginal effects shown in Column 1 of [Table 5](#) reveal that having a bank account increases the odds of being employed, and this relationship appears to be driven by ownership of a formal account. Moreover, Column 2 shows a negative relationship between formal account ownership and self-employed female household heads. That is, women in possession of a formal account are more likely to be employed by someone else than to be self-employed. A similar conclusion was reached in the study by [Croson and Gneezy \(2009\)](#) where they argued that women are more risk-averse than men and hence would prefer wage employment to starting a business. Another explanation for these results is offered by [Buvinić and Furst-Nichols \(2016\)](#) that suggests that access to a financial account alone is not sufficient to grow female-owned subsistence-level firms; instead, financial inclusion packages should be complemented with training. Finally, the

⁷ Since the model is a semi logarithmic model with a dummy variable as our independent variable of interest, the impact on the outcome variable is not the point estimate but must be computed. From Eq. 1 the impact of financial inclusion on income is computed as $\%WE = (exp(\beta_1) - 1) * 100$. Detailed explanation can be found in [Halvorsen et al. \(1980\)](#).

⁸ Note that the difference in sample size across the models with income and employment as dependent variables is due to missing values for such dependent variable.

Table 4
Impact of Financial Inclusion on income and Employment, OLS and Probit.

Variable	OLS- Dep: Income			Probit-Dep: Employment		
	(I)	(II)	(III)	(IV)	(V)	(VI)
Financial Account	0.2527*** (0.0610)			0.0986*** (0.0153)		
Formal Account		0.3392*** (0.0480)			0.1619*** (0.0216)	
Informal Account			0.1097 (0.0822)			-0.0018 (0.0180)
Individual Characteristics	✓	✓	✓	✓	✓	✓
Household Characteristics	✓	✓	✓	✓	✓	✓
R-squared (Pseudo R-squared)	0.349	0.350	0.347	0.587	0.596	0.572
Observation	4184	4174	4174	4569	4569	4569

Notes: Column 1–3, captures the OLS estimation for the outcome variable income. Column 4–6 captures the marginal effects of financial inclusion on Employment status. Here the employment status is a dummy variable that takes 1 if the individual is employed and 0 otherwise. Individual characteristics include: Age, Marital Status, Educational Level, Religion, Location, Employment status (OLS). House-hold Characteristics: include income quintile, and Regional fixed effects include 9 dummies for region of residence. And time fixed effect dummy. Robust standard errors clustered at the regional level are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

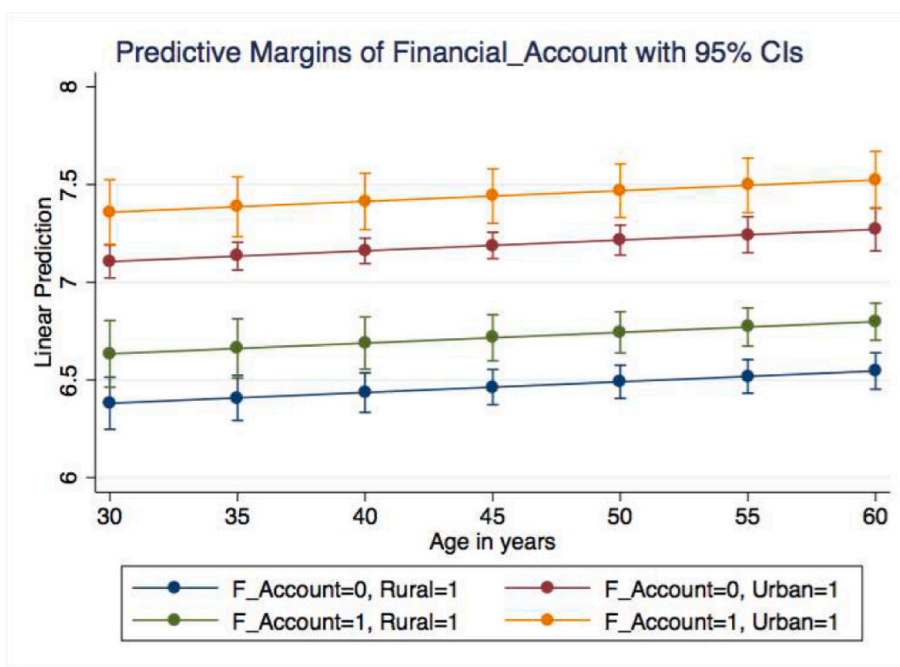


Fig. 5. Predictive margins for Rural and Urban Women

Notes: This figure presents the positive relationship between financial account ownership and income for urban and rural women across different age groups.

coefficients for informal accounts (see Column 3 in Table 5), although positive for employed and unemployed individuals, are not statistically significant.

As mentioned earlier, the presence of a potential endogeneity issue raises concerns regarding the reliability of the OLS and probit results of Tables 4 and 5. To address this concern, we employ Propensity Score Matching as an identification strategy. PSM results are presented in Table 6 which reports the average treatment effect (ATT) on the treated.

As observed in Column 1 of Table 6, ownership of a financial account has a positive and significant effect on the income of female household heads. Specifically, female household heads transitioning from not having an account to possessing one increase their income by 27.8%, and this effect is significant at the 1% level. Similarly, as becomes evident in Column 2, it is formal account ownership which establishes a positive causal relationship with income. Female household heads shifting from not having a formal account to acquiring one witness a notable 21.2% rise in income. Columns 4 to 6 of Table 6 report the average treatment effect of financial inclusion on the employment status of female household heads. As observed in Column 4, the point estimate of financial

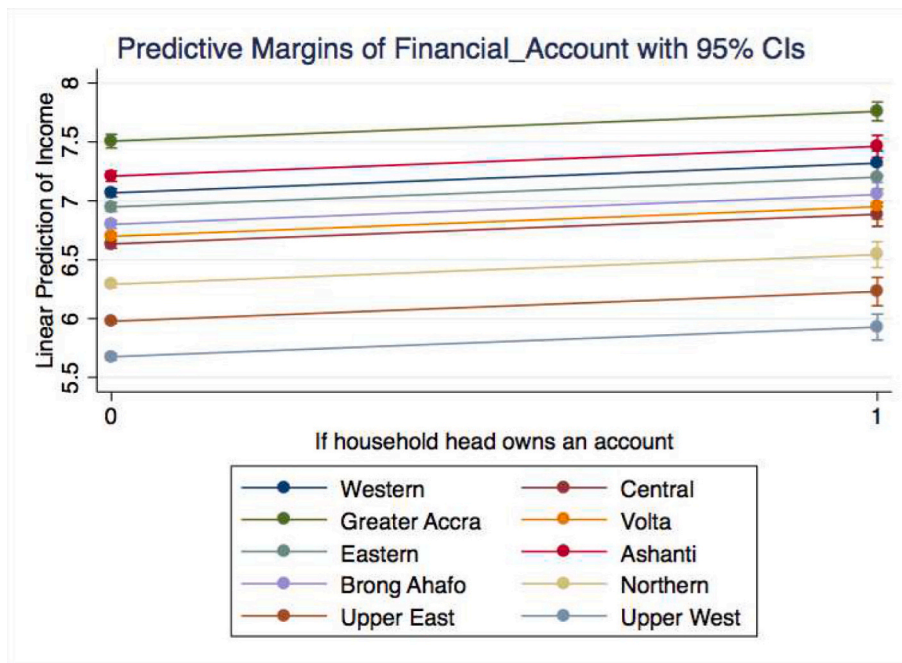


Fig. 6. Predictive Margins across regions

Notes: This figure presents the positive relationship between financial account ownership and income for women across the 10 regions of Ghana.

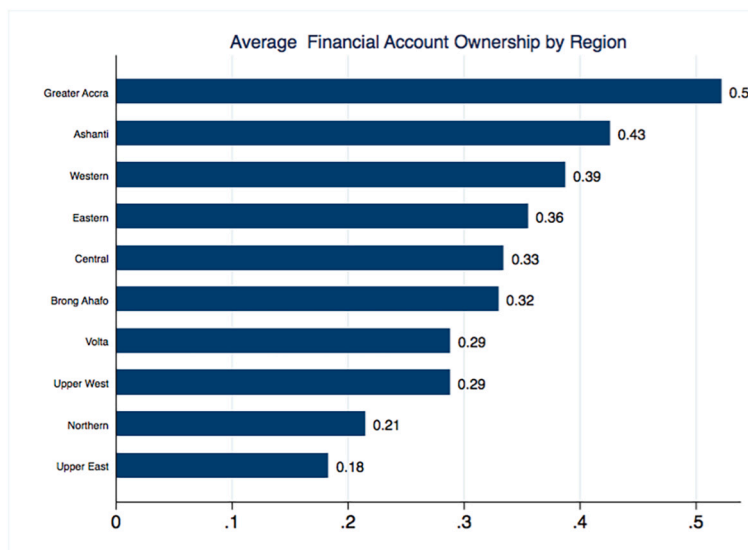


Fig. 7. Financial Accounts Ownership by Regions in Ghana

Notes: This figure shows the average financial account ownership in Ghana by regions.

account ownership is positive and significant at the 1% significance level, indicating that household heads with a financial account have an 11.8 percentage point higher probability of being formally employed. Once again, this effect appears to be driven by formal account ownership, as the point estimate of informal account ownership is negative, and this time significant.

Notably, the propensity score matching results closely align with and reinforce the findings from the OLS and probit analysis, and are consistent with our earlier research hypothesis. That is, they underscore the empowering effect of access to a financial account by female household heads, with formal account ownership playing a differential and significant role.

Table 5
Average Marginal Effects of Financial Inclusion on Three Categories of Employment, Multinomial logit.

	Employed	Self Employed	Unemployed
	(I)	(II)	(III)
Financial Account	0.0932*** (0.0182)	-0.0722*** (0.0150)	-0.0210 (0.0155)
Formal Account	0.1440*** (0.0220)	-0.1408*** (0.0266)	-0.0033 (0.0289)
Informal Account	0.0020 (0.0198)	0.0024 (0.0112)	-0.0044 (0.0177)
Individual Characteristics	✓	✓	✓
Household Characteristics	✓	✓	✓
No of Observation	4569	4569	4569

Column 1 captures the marginal effect of financial inclusion on employed female HH, column 2 on self employed female HH and column 3 on Unemployed female HH outcome variable of interest. Here the employment status is a three categorical variable that takes 1 if the female HH is employed, 2 if the female HH is self employed and 0 if unemployed (base Category). Individual characteristics include: Age, Marital Status, Educational Level, Religion, Location, Employment status(OLS). Household Characteristics: include income quintile, and Regional fixed effects include 9 dummies for region of residence. And time fixed effect dummy. Robust standard errors clustered at the regional level are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 6
Impact of Financial Inclusion on income and Employment, PSM- Exact Matching.

Variable	ATT- Dep: Per capita Income			ATT-Dep: Employment		
	(I)	(II)	(III)	(IV)	(V)	(VI)
Financial Account	0.2454*** (0.0820)			0.1176*** (0.0302)		
Formal Account		0.1919* (0.1068)			0.1741*** (0.0308)	
Informal Account			-0.0320 (0.0957)			-0.0682*** (0.0259)
Individual Characteristics	✓	✓	✓	✓	✓	✓
Household Characteristics	✓	✓	✓	✓	✓	✓
Observation	4184	4174	4174	4569	4569	4569

Notes: Column 1–3, captures the ATT with the outcome variable income. Column 4–6 captures the ATT with Employment as the outcome variable of interest. Here the employment status is a dummy variable that takes 1 if the individual is employed and 0 otherwise. Individual characteristics include: Age, Marital Status, Educational Level, Religion, Location, Employment Sector. Household Characteristics: include income quintile, and Regional fixed effects include 9 dummies for region of residence. And time fixed effect dummy. Robust standard errors clustered at the regional level are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

5.1. Robustness checks and sensitivity analysis

We check the robustness of our results in different ways. First, we use different matching estimators like the Kernel matching and the nearest neighbour matching techniques to ascertain that the PSM results are not dependent on the estimator. With the nearest neighbour matching, we used both nearest neighbour 1 and neighbour 3. As can be seen in [Table A5](#) in the Appendix (kernel matching) and [Table A6](#) (nearest neighbour matching), the results from the different matching techniques are consistent with the exact matching method used as benchmark.

Second, we check to what extent the results could be driven by the observations in the capital, Accra, which hosts the headquarters of many financial institutions and has numerous branches of major banks and financial institutions. In essence, the concentration of financial institutions in the region could facilitate easy access to financial services while economic activity (and thus female economic outcomes) could also be higher.⁹ To ensure that the results are robust and not solely driven by these observations, we eliminate the households from the Greater Accra (GA) region. As [Table A7](#) in the Appendix shows, the only qualitatively different result is that now ownership of informal account is also positively associated with income. All other qualitative results remain the same.

A final concern may arise from the potential unobserved heterogeneity between the women in possession of a bank account (treatment) and the women without an account (control group). That is, there might be unobserved characteristics (e.g. attitude or unobserved skills) that can affect the decision to have a bank account, which also simultaneously affects income and employment

⁹ Indeed, as [Figure 7](#) reports, the Greater Accra (GA) region has the highest proportion of people with a bank account about 52% in comparison to other regions.

decisions, thus potentially resulting in a biased estimate. We address this last concern by employing the bounding approach proposed by Rosenbaum (2002). An application of this procedure can also be found in Becker and Caliendo (2007).¹⁰ We use the Mantel and Haenzel (MH) test statistic under the assumption of no hidden bias with gamma equal one ($\Gamma = 1$). Results for this last check are provided in the Appendix in Tables A8 and A9. The Q_{mh}^+ and Q_{mh}^- at $\Gamma = 1$ are identical, showing that there is a positive treatment effect and no hidden bias at the 1% significance level. We require Γ to be between 1.3 and 1.35 for the income model and between 1.2 and 1.25 for the employment model to render our results spurious. However, these represent worst-case scenarios. For instance, $\Gamma = 1.25$ does not indicate the absence of a true positive effect of financial inclusion on income. It simply implies that if an unobserved variable was to cause the odds ratio of treatment assignment to differ by 1.25 between the treatment and control groups, and significantly influence the outcome, then the confidence interval for the effect of financial inclusion on income would encompass zero. Conversely, if a confounding variable had an equally influential effect on assignment (i.e., having a bank account) but only a mild impact on income, the confidence interval would exclude zero (see DiPrete and Gangl, 2004 for further details).

6. Conclusions

Due to social and cultural norms, as well as legal barriers and other factors, in many developing countries financial inclusion tends to be lower for women. Yet, financial inclusion can be an important aspect of economic development. Using household level data for Ghana, we add to the (still inconclusive) literature on the link between financial inclusion and outcomes of women empowerment. We focus on a relatively less studied measure of financial inclusion: having a financial account. Moreover, as in Sakyi-Nyarko et al. (2022), we distinguish between formal (commercial and investment banks) and informal financial accounts. The latter include financial services subject to less or no regulation such as saving and credit accounts, Susu (Merry go round contributions) or mobile money, which are especially important in less developed countries. Methodologically, we use an identification strategy based on propensity score matching as a way to cope with the potential endogeneity problem, which constitutes an improvement with respect to previous studies looking at the link between financial inclusion and women empowerment in Ghana such as Ganle et al. (2015) or Salia et al. (2018).

Consistent with our reserach hypotheis, we find that women who have a bank account are more likely to be employed (particularly being wage workers) and tend to have higher income. These results are in line with the findings of Suri and Jack (2016), Bruhn and Love (2014) and Croson and Gneezy (2009). We also obtain that the positive effect between financial inclusion and women's employment and income is mainly driven by formal account ownership whereas the impact of informal account ownership is not statistically significant. However, we can not rule out the statistical insignificance to be due to the relatively small sample size. In this sense, further studies with larger sample size would be helpful.

Our results call for higher promotion of formal banking as it is this type of financial assets that seem to be driving the results. Policies aimed at expanding access to formal financial services for women, potentially coupled with initiatives to enhance financial literacy and skills training, can contribute significantly to improving the livelihoods of women in Ghana and similar contexts, ultimately driving broader socio-economic progress. Moreover, as financial inclusion is lower in rural areas and poorer regions, other policy implications resulting from our study would suggest that government programs aiming to economically empower women should prioritize women living in those areas.

Code availability

Attached to the file.

CRedit authorship contribution statement

Barbara Ama Zelu: Data curation, Conceptualization, Methodology, Writing – original draft, Writing – review & editing. **Susana Iranzo:** Conceptualization, Methodology, Supervision, Writing – original draft, Writing – review & editing. **Alejandro Perez-Laborda:** Conceptualization, Methodology, Supervision, Writing – original draft, Writing – review & editing.

Declaration of competing interest

None.

Data availability

The data is available for download at Ghana Statistical Services. (statsghana.gov.gh).

¹⁰ We use formal accounts for this analysis. Results from the other models are available under request.

Acknowledgement

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Appendix A. Appendix

Table A1
Variable Definition.

Variables	Description
Panel A: Socio Economics Characteristics	
Log of Income Per capita	Log of income per capita in the last 12 months in Ghana cedis
Financial Account	=1 If has a bank account (formal or informal), =0 otherwise
Formal Account	=1 If has a formal bank account, =0 otherwise
Informal Account	=1 If has a informal bank account, =0 otherwise
Age in years	Age of woman
Married	=1 If woman is married or has a partner, =0 otherwise
Divorce	=1 If woman is divorced or separated, =0 otherwise
Widowed	=1 If woman is widowed, =0 otherwise
Single	=1 If woman is single, =0 otherwise
Self Employed	=1 If is self employed, =0 otherwise
Employed	=1 If woman has a salaried work, =0 otherwise
Unemployed	=1 If woman is not working, =0 otherwise
First Quintile	=1 If household belong to income quintile one, =0 otherwise
Second Quintile	=1 If household belong to income quintile two, =0 otherwise
Third Quintile	=1 If household belongs to income quintile three, =0 otherwise
Fourth Quintile	=1 If household belong to income quintile four, =0 otherwise
Fifth Quintile	=1 If household belong to income quintile five, =0 otherwise
Primary	=1 If completed primary school (9 years of school), =0 otherwise
Secondary	=1 If completed high school (12 years of school), =0 otherwise
Tertiary	=1 If completed tertiary education (16–15 years of school), =0 otherwise
Post Graduate	=1 If completed a post graduate course, =0 otherwise
No Education	=1 If has no education, =0 otherwise
Islam	=1 If woman belongs to islamic region, =0 otherwise
Christian	=1 If woman belongs to christian religion, =0 otherwise
Traditional	=1 If woman belongs traditional religion, =0 otherwise
No religion	=1 If woman does not belong to any religion, =0 otherwise
Agric sector	= 1 If woman works in the Agriculture sector, =0 otherwise
Non Agric sector	=1 If woman works in other sectors other than the Agric, =0 otherwise
Panel B: Other Characteristics	
Rural	=1 If lives in rural area, =0 otherwise
Urban	=1 If lives in urban area, =0 otherwise
Wave 4	1 If survey year was from 1998 to 1999, =0 otherwise
Wave 5	1 If survey year was from 2005 to 2006, =0 otherwise
Wave 6	=1 If survey year was from 2012 to 2013, =0 otherwise
Wave 7,2016 to 2017	=1 If survey year was from 2016 to 2017, =0 otherwise
Western Region	=1 If lives in the western region, =0 otherwise
Central Region	=1 If lives in the Central region, =0 otherwise
Greater Accra Region	=1 If lives in the Greater Accra region, =0 otherwise
Volta Region	=1 If lives in the Volta region, =0 otherwise
Eastern Region	=1 If lives in the Eastern region, =0 otherwise
Ashanti Region	=1 If lives in the Ashanti region, =0 otherwise
Brong Ahafo Region	=1 If lives in the Brong Ahafo region, =0 otherwise
Northern Region	=1 If lives in the Northern region, =0 otherwise
Upper East Region	=1 If lives in the Upper East region, =0 otherwise
Upper West Region	=1 If lives in the Upper West region, =0 otherwise

Table A2
Descriptive Statistics.

Variables	Obs	Mean	SD	Min	Max
	(I)	(II)	(III)	(IV)	(V)
Log of Income Percapita	4034	6.93	1.56	0.69	13.14
Financial Acct - Dummy	4569	0.27	0.44	0	1

(continued on next page)

Table A2 (continued)

Variables	Obs	Mean	SD	Min	Max
	(I)	(II)	(III)	(IV)	(V)
Formal_Account - Dummy	4558	0.12	0.32	0	1
Informal_Account - Dummy	4558	0.13	0.34	0	1
Age in years	4569	48.59	16.84	15	99
Married - Dummy	4569	0.32	0.47	0	1
Divorce - Dummy	4569	0.18	0.38	0	1
Widowed - Dummy	4569	0.35	0.47	0	1
Single - Dummy	4569	0.15	0.35	0	1
Self Employed - Dummy	4569	0.30	0.46	0	1
Employed - Dummy	4569	0.47	0.50	0	1
Unemployed - Dummy	4569	0.23	0.42	0	1
First Quintile - Dummy	4569	0.14	0.34	0	1
Second Quintile - Dummy	4569	0.17	0.37	0	1
Third Quintile - Dummy	4569	0.18	0.38	0	1
Fourth Quintile - Dummy	4569	0.20	0.40	0	1
Fifth Quintile - Dummy	4569	0.31	0.46	0	1
Primary - Dummy	4569	0.16	0.37	0	1
Secondary - Dummy	4569	0.04	0.21	0	1
Tertiary - Dummy	4569	0.02	0.15	0	1
PostGrad - Dummy	4569	0.00	0.07	0	1
No Education - Dummy	4569	0.003	0.06	0	1
Islam - Dummy	4569	0.08	0.39	0	1
Christian - Dummy	4569	0.85	0.47	0	1
Traditional - Dummy	4569	0.03	0.26	0	1
No religion - Dummy	4569	0.04	0.19	0	1
Agricsector - Dummy	4569	0.24	0.13	0	1
NonAgricsector - Dummy	4569	0.76	0.42	0	1
Rural - Dummy	4569	0.51	0.50	0	1
Urban - Dummy	4569	0.49	0.50	0	1
Wave 6 from 2012 to 2013	4569	0.53	0.50	0	1
Wave 7 from 2016 to 2017	4569	0.47	0.50	0	1
Western Region	4569	0.10	0.29	0	1
Central Region	4569	0.13	0.34	0	1
Greater Accra Region	4569	0.11	0.31	0	1
Volta Region	4569	0.13	0.33	0	1
Eastern Region	4569	0.12	0.33	0	1
Ashanti Region	4569	0.16	0.36	0	1
Brong Ahafo Region	4569	0.12	0.32	0	1
Northern Region	4569	0.028	0.17	0	1
Upper East Region	4569	0.07	0.25	0	1
Upper West Region	4569	0.04	0.19	0	1

Table A3

OLS Regressions - Dependent Variable: Income per Capita.

Variables	(I)	(II)	(III)
F_Account	0.253*** (0.061)		
Formal_Account		0.339*** (0.048)	
Informal_Account			0.110 (0.082)
Age	0.005** (0.002)	0.005** (0.002)	0.005** (0.002)
Married	-0.199** (0.067)	-0.215*** (0.066)	-0.221*** (0.067)
Divorce	-0.311** (0.101)	-0.326*** (0.100)	-0.343*** (0.103)
Widowed	-0.244** (0.103)	-0.259** (0.101)	-0.275** (0.104)
Unemployed	-0.692*** (0.080)	-0.700*** (0.077)	-0.698*** (0.077)
Primary	-0.079 (0.067)	-0.077 (0.065)	-0.070 (0.065)
Secondary	0.330*** (0.099)	0.316*** (0.093)	0.407*** (0.097)
Tertiary	0.724*** (0.089)	0.713*** (0.093)	0.685*** (0.087)

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Table A3 (continued)

Variables	(I)	(II)	(III)
Post_Graduate	1.141*** (0.048)	1.156*** (0.046)	1.124*** (0.057)
Islam	-0.018 (0.142)	-0.031 (0.148)	-0.016 (0.148)
Christian	0.148 (0.114)	0.159 (0.117)	0.177 (0.118)
Traditional	-0.054 (0.137)	-0.065 (0.146)	-0.057 (0.144)
Urban	0.204** (0.080)	0.204** (0.084)	0.227** (0.083)
Agricsector	-0.867*** (0.191)	-0.879*** (0.194)	-0.886*** (0.196)
s2nd Quintile	0.413*** (0.090)	0.425*** (0.088)	0.425*** (0.088)
t3rd Quintile	0.764*** (0.101)	0.783*** (0.097)	0.786*** (0.100)
f4th Quintile	1.073*** (0.110)	1.088*** (0.107)	1.097*** (0.108)
f5th Quintile	1.674*** (0.098)	1.695*** (0.095)	1.725*** (0.095)
Wave7	0.416*** (0.100)	0.420*** (0.105)	0.374*** (0.107)
WesternR	0.573*** (0.089)	0.543*** (0.087)	0.562*** (0.090)
CentralR	0.094 (0.084)	0.072 (0.082)	0.084 (0.085)
GreaterAccraR	0.521*** (0.103)	0.475*** (0.106)	0.531*** (0.107)
VoltaR	0.321*** (0.077)	0.303*** (0.077)	0.327*** (0.078)
EasternR	0.460*** (0.086)	0.437*** (0.085)	0.455*** (0.086)
AshantiR	0.473*** (0.089)	0.463*** (0.089)	0.465*** (0.088)
BrongAhr	0.325*** (0.073)	0.302*** (0.073)	0.313*** (0.073)
NorthernR	0.308*** (0.044)	0.347*** (0.046)	0.358*** (0.046)
UpperEastR	0.022 (0.050)	0.003 (0.046)	0.005 (0.049)
N	4184	4174	4174
R-Squared	0.349	0.350	0.347

Table A4

Probit Regressions - Dependent Variable: Employment.

Variables	(I)	(II)	(III)
F_Account	0.661*** (0.117)		
Formal_Account		1.073*** (0.155)	
Informal_Account			-0.011 (0.112)
Age	-0.007*** (0.002)	-0.008*** (0.002)	-0.009*** (0.002)
Married	-0.004 (0.093)	-0.010 (0.087)	-0.039 (0.092)
Divorce	0.114 (0.070)	0.159** (0.077)	0.062 (0.070)
Widowed	-0.076 (0.088)	-0.052 (0.081)	-0.122 (0.089)
Primary	0.161** (0.067)	0.171** (0.076)	0.184** (0.072)
Secondary	0.920*** (0.137)	0.801*** (0.137)	1.112*** (0.152)
Tertiary	-0.364** (0.150)	-0.341** (0.156)	-0.448*** (0.156)

(continued on next page)

Table A4 (continued)

Variables	(I)	(II)	(III)
Post_Graduate	-0.143 (0.240)	-0.074 (0.273)	-0.100 (0.224)
Islam	0.007 (0.172)	-0.011 (0.197)	0.052 (0.193)
Christian	0.103 (0.156)	0.058 (0.176)	0.172 (0.175)
Traditional	-0.292 (0.221)	-0.315 (0.247)	-0.253 (0.211)
Urban	0.091 (0.087)	0.080 (0.097)	0.175* (0.090)
s2nd_quintile	0.177 (0.137)	0.207 (0.135)	0.206* (0.123)
t3rd_quintile	0.195** (0.094)	0.249*** (0.095)	0.258*** (0.089)
f4th_quintile	0.380*** (0.107)	0.406*** (0.104)	0.447*** (0.103)
f5th_quintile	0.664*** (0.098)	0.656*** (0.105)	0.779*** (0.089)
Wave7	2.726*** (0.082)	2.768*** (0.085)	2.499*** (0.064)
WesternR	-0.149** (0.070)	-0.256*** (0.069)	-0.170** (0.067)
CentralR	-0.178*** (0.065)	-0.252*** (0.063)	-0.189*** (0.062)
GreaterAccraR	-0.422*** (0.089)	-0.585*** (0.087)	-0.415*** (0.084)
VoltaR	0.220*** (0.065)	0.100 (0.064)	0.189*** (0.061)
EasternR	-0.194** (0.076)	-0.278*** (0.071)	-0.200*** (0.068)
AshantiR	-0.214*** (0.074)	-0.260*** (0.071)	-0.229*** (0.070)
BrongAhr	-0.090 (0.068)	-0.179*** (0.066)	-0.131** (0.065)
NorthernR	0.159*** (0.031)	0.028 (0.029)	0.071** (0.031)
UpperEastR	-0.421*** (0.037)	-0.547*** (0.056)	-0.522*** (0.051)
N	4569	4569	4569
Pseudo R-Squared	0.587	0.596	0.572

Table A5
Impact of Financial Inclusion on income and Employment, Kernel Matching.

Variable	Dep: Income			Dep: Employment		
	(I)	(II)	(III)	(VI)	(V)	(VI)
Financial Account	0.2874*** (0.0627)			0.0992*** (0.0196)		
Formal Account		0.3112*** (0.0854)			0.2081*** (0.0275)	
Informal Account			0.0951 (0.0742)			-0.0238 (0.02560)
Individual Characteristics	✓	✓	✓	✓	✓	✓
Household Characteristics	✓	✓	✓	✓	✓	✓
Observation	4184	4174	4174	4569	4569	4569

Notes: Column 1–3, captures the Kernel matching for the outcome variable income. Column 4–6 captures the Kernel Matching of financial inclusion on Employment status. Here the employment status is a dummy variable that takes 1 if the individual is employed and 0 otherwise. Individual characteristics include: Age, Marital Status, Educational Level, Religion, Location, Employment sector. House-hold Characteristics: include income quintile, and Regional fixed effects include 9 dummies for region of residence. And time fixed effect dummy. Robust standard errors clustered at the regional level are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A6
Impact of Financial Inclusion on income and Employment, Nearest Neighbour Matching.

Panel A Variable	ATT- Income, nn(1)			ATT- Employment, nn(1)		
	(I)	(II)	(III)	(VI)	(V)	(VI)

(continued on next page)

Table A6 (continued)

Panel A	ATT- Income, nn(1)			ATT- Employment, nn(1)		
	(I)	(II)	(III)	(VI)	(V)	(VI)
Financial Account	0.2615*** (0.0722)			0.0788*** (0.0189)		
Formal Account		0.3893*** (0.1150)			0.1284*** (0.0283)	
Informal Account			0.1047 (0.0830)			-0.012 (0.0209)
Individual Characteristics	✓	✓	✓	✓	✓	✓
Household Characteristics	✓	✓	✓	✓	✓	✓
Observation	4184	4174	4174	4739	4728	4728

Panel B	ATT- Income, nn(3)			ATT- Employment, nn(3)		
	(I)	(II)	(III)	(VI)	(V)	(VI)
Financial Account	0.226*** (0.0604)			0.0507*** (0.0155)		
Formal Account		0.3150*** (0.0896)			0.1070*** (0.0230)	
Informal Account			0.0746 (0.0693)			-0.0212 (0.0178)
Individual Characteristics	✓	✓	✓	✓	✓	✓
Household Characteristics	✓	✓	✓	✓	✓	✓
Observation	4184	4174	4174	4739	4728	4728

Notes: Column 1–3, captures the nearest neighbour matching for the outcome variable income. Column 4–6 captures the nearest neighbour matching of financial inclusion on Employment status. Here the employment status is a dummy variable that takes 1 if the individual is employed and 0 otherwise. Individual characteristics include: Age, Marital Status, Educational Level, Religion, Location. Household Characteristics: income quintile, and Regional include fixed effects include 9 dummies for region of residence. And time fixed effect dummy. Robust standard errors clustered at the regional level are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A7

Impact of Financial Inclusion on income and Employment, Sample without Greater Accra Region.

Panel A	OLS- Income			Probit- Employment		
	(I)	(II)	(III)	(VI)	(V)	(VI)
Financial Account	0.2372*** (0.0703)			0.1058*** (0.0162)		
Formal Account		0.3407*** (0.0652)			0.1860*** (0.0115)	
Informal Account			0.1190 (0.0889)			0.0048 (0.0182)
Individual Characteristics	✓	✓	✓	✓	✓	✓✓
Household Characteristics	✓	✓	✓	✓	✓	✓
R-squared (Pseudo R-squared)	0.330	0.331	0.328	0.598	0.609	0.580
Observation	3745	3738	3738	4073	4066	4221

Panel B	ATT- Income			ATT- Employment		
	(I)	(II)	(III)	(VI)	(V)	(VI)
Financial Account	0.2320*** (0.0781)			0.0652*** (0.0220)		
Formal Account		0.3760*** (0.1229)			0.2005*** (0.0366)	
Informal Account			0.1577* (0.0944)			-0.0183 (0.0247)
Individual Characteristics	✓	✓	✓	✓	✓	✓
Household Characteristics	✓	✓	✓	✓	✓	✓
Observation	3745	3738	3738	4073	4066	4221

Notes: Column 1–3, captures the OLS results for the outcome variable income. Column 4–6 captures the probit results of financial inclusion on Employment status. Here the employment status is a dummy variable that takes 1 if the individual is employed and 0 otherwise. Individual characteristics include: Age, Marital Status, Educational Level, Religion, Location, Employment sector. Household Characteristics: income quintile, and Regional include fixed effects include 9 dummies for region of residence. And time fixed effect dummy. Robust standard errors clustered at the regional level are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A8
Mantel-Haenszel (1959) bounds for the Employed-Formal Account Model.

Gamma	Q_{mh}^+	Q_{mh}^-	P_{mh}^+	P_{mh}^-
1	4.30442	4.30442	8.4e-06	8.4e-06
1.05	3.93327	4.68074	0.000042	1.4e-06
1.1	3.57784	5.0381	0.000173	2.4e-07
1.15	3.23869	5.38026	0.0006	3.7e-08
1.2	2.91438	5.70852	0.001782	5.7e-09
1.25	2.60364	6.02403	0.004612	8.5e-10
1.3	2.30537	6.3278	0.010573	1.2e-10
1.35	2.01857	6.62072	0.021766	1.8e-11
1.4	1.74239	6.90359	0.04072	2.5e-12
1.45	1.47605	7.17711	0.069965	3.6e-13
1.5	1.21886	7.44193	0.111449	5.0e-14
1.55	0.970188	7.69861	0.165976	6.9e-15
1.6	0.729479	7.94767	0.232854	1.0e-15
1.65	0.496225	8.18959	0.309868	1.1e-16
1.7	0.269966	8.42479	0.393593	0
1.75	0.05028	8.65365	0.479949	0
1.8	0.031154	8.87655	0.487573	0
1.85	0.238665	9.09379	0.405683	0
1.9	0.440653	9.30569	0.329732	0
1.95	0.637415	9.51252	0.261927	0
2	0.829222	9.71454	0.203489	0

Table A9
Mantel-Haenszel (1959) bounds for the Income - Formal Account Model.

Gamma	Q_{mh}^+	Q_{mh}^-	P_{mh}^+	P_{mh}^-
1	3.90668	3.90668	0.000047	0.000047
1.05	3.35849	4.45737	0.000392	4.1e-06
1.1	2.83545	4.98225	0.002288	3.1e-07
1.15	2.33606	5.4845	0.009744	2.1e-08
1.2	1.85824	5.96609	0.031568	1.2e-09
1.25	1.40015	6.42873	0.080735	6.4e-11
1.3	0.96018	6.87394	0.168482	3.1e-12
1.35	0.536918	7.30305	0.295662	1.4e-13
1.4	0.129102	7.71724	0.448639	6.0e-15
1.45	0.175161	8.11759	0.430477	2.2e-16
1.5	0.555255	8.50504	0.28936	0
1.55	0.922927	8.88044	0.178023	0
1.6	1.27899	9.24458	0.10045	0
1.65	1.62419	9.59814	0.052168	0
1.7	1.95918	9.94178	0.025046	0
1.75	2.28457	10.2761	0.011169	0
1.8	2.60094	10.6015	0.004649	0
1.85	2.90877	10.9186	0.001814	0
1.9	3.20854	11.2279	0.000667	0
1.95	3.50068	11.5296	0.000232	0
2	3.78558	11.8243	0.000077	0

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