

Mobile Money and Female Youth Empowerment Evidence from a Cross-Cultural Panel Study

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Abstract:

Empowering the female younger generation is critical for fostering economic growth. Mobile money offers households and businesses convenient, affordable, and innovative ways to conduct financial transactions. However, the impact of this financial technology (Fin tech) on the prospects of the young generation remains ambiguous. To explore this issue, we utilize panel data from the International Monetary Fund and the World Bank covering 32 countries from 2015 to 2023. The results highlight a significant positive effect of mobile money on female participation in education and training. This study offers two key policy recommendations aligned with the United Nations Sustainable Development Goals (SDGs) 4 and 5. First, it advocates for enhancing educational and training opportunities to improve the prospects of young females. Second, it emphasizes the vital role of females' participation in economic and political spheres.

Keywords:

financial technology, female young generation, mobile money, developing countries, women in finance, households finance.

1. Introduction:

Financial technology (Fin tech) solutions have significantly transformed the financial services industry (Goldstein et al., 2019; Nourallah et al., 2024). These technologies provide both households and businesses with innovative, accessible, and cost-effective means to conduct financial transactions at any time and from any location (Ben Youssef et al., 2021; Nourallah et al., 2021). One particularly impactful development is mobile money, i.e., a novel payment system that enables users to transfer funds via mobile phones without the necessity of owning a traditional bank account (Konte & Tetteh, 2023). Unlike Bitcoin (Liu et al., 2023), mobile money can serve as a stable means of payment. This innovation has proven especially vital for unbanked populations, empowering them to manage daily financial activities and supporting entrepreneurial ventures in various economic sectors.

Asongu et al. (2024) argue that mobile money can help mitigate the negative consequences of inequality. Islam et al. (2022) conclude a remarkable role for these Fin tech solutions in fostering poverty reduction initiatives. They also raise questions regarding the effect of this technology on vulnerable communities. Moreover, Ahmad et al. (2023) report that Fin tech solutions can drive economic growth, both directly and indirectly, through financial inclusion. While the impact of mobile money on financial inclusion and economic growth has been studied extensively, its role in improving the quality of life for vulnerable groups, particularly the female young population, remains underexplored. Youth female represent a crucial demographic in developing countries, and their empowerment is likely to contribute positively to broader economic development (Lam, 2006). Nevertheless, unemployment among female youth is one of the most pressing development challenges facing countries around the world (Anyanwu, 2013). This overlooked dimension warrants further investigation.

When it comes to education and supporting young females, the role of women stands out as an essential and inseparable part of society. Women are not only vital members of the family, but they also play a significant role in the economic development and overall progress of communities. Their contributions extend well beyond the household, encompassing active participation in the labor market, civic engagement, leadership roles, and involvement in sustainable innovative initiatives (Asongu et al., 2022).

Women entering the labor force brings about a multitude of benefits, both direct and long-term. On one hand, it helps create a better balance in employment opportunities between genders and contributes significantly to raising household income (Cabeza-García et al., 2018; Hakan Oztunc et al., 2015). On the other hand, when women are economically active, they are more likely to invest in well-being and education (Behrman et al., 1999). This not only enhances the development of the next generation but also breaks cycles of poverty. Moreover, when women develop professionally, they often become role models for the younger generation. Their success stories inspire youth to pursue education, build aspirations, and believe in their ability to lead meaningful careers.

To address this gap, the present study employs panel data from 2015 to 2023, covering a sample of developing countries from different regions. The findings of the current study indicate that the number of mobile money agents is significantly associated with improving young female participation in education and training. This highlights the potential of Fin tech solutions to enhance the prospects of this demographic group. To validate the robustness of our results, we re-estimate the model using an alternative proxy for mobile money, i.e., mobile cellular subscriptions (per 100 people) and the instrumental variable test. The findings remain consistent, reinforcing the importance of mobile money in supporting financial inclusion in developing countries.

This study offers three key contributions. First, it reveals a previously unexplored effect of mobile money on the young female. The results suggest that access to mobile money services is likely to improve the well-being of young females, as evidenced by decreasing the percentage of young females who are not being in education and training. Second, to our knowledge, this is the first empirical, cross-cultural evidence showing that the empowerment of women in economic and political life interacts with Fin tech adoption to enhance young female outcomes. Third, the study reveals a new aspect by highlighting the role of technology in community development. It presents evidence that the use of Fin tech can contribute to supporting younger generations with education and job opportunities. Investing in the education and employment of young females directly influences economic growth, as these generations play a vital role in driving innovation, transferring knowledge, and improving existing organizational structures and management practices.

The remainder of this paper is organized as follows: Section 2 reviews the relevant literature; Section 3 outlines the methodology; Section 4 presents the empirical results; and Section 5 concludes with key policy implications.

2. Literature review :

Amartya Sen (The 1998 laureate of the Nobel Memorial Prize in Economics) argues that an individual's quality of life is determined by the capabilities they possess, which in turn shape the opportunities they can access. When it comes to Fin tech, there are possible positive consequences, such as financial inclusion. The capability approach emphasizes the role of individuals in improving their lives (Sen, 2005). Education, employment, and training are essential dimensions of individuals' lives, particularly for youth (Stampini & Verdier-Chouchane, 2011). Improved opportunities in these domains are strongly associated with a higher quality of life for young people (Gavrielides, 2025). It is important to highlight that previous studies have demonstrated the positive impact of Fin tech on individuals' capabilities (e.g., Nourallah et al., 2024). One possible explanation is that Fin tech promotes financial inclusion, enabling households to cover education-related expenses. Additionally, Fin tech enhances individuals' access to financial services, thereby expanding opportunities for households to manage and grow small businesses.

The adoption of Fin tech solutions in household financial management has garnered significant attention from a range of stakeholders (Nourallah & Öhman, 2021). Key innovations in this space include robo-advisors (Balakrishnan et al., 2024), mobile banking (Nourallah, 2022), and cryptocurrencies (Liu et al., 2023). The adoption of Fin tech solutions has been explored, and previous studies conclude that several key factors, including ease of use, security, accessibility, and user trust, can perform a significant role in influencing user acceptance and continued usage (Nourallah, 2023). These factors not only shape individual decisions but also affect broader market penetration and the overall success of Fin tech platforms.

In the context of developing countries (Malaquias & Hwang, 2016), particularly in regions where access to traditional banking infrastructure is limited, mobile money has emerged as an indispensable financial tool. Mobile money, which has become common among youth (Grzybowski et al., 2023), represents a vital Fin tech solution due to its benefits for households and businesses that face difficulties accessing financial services. It

also offers financial services at an affordable cost, requiring only a simple technological infrastructure, typically a phone (Shaikh & Karjaluo, 2019).

Empirical studies examining mobile money highlight its benefits, notably in advancing financial inclusion and fostering economic growth (Ahmad et al., 2023). Asongu et al. (2024) explore the impact of mobile money innovations on income inequality and gender inclusion in sub-Saharan Africa and conclude that mobile money can play a positive role in addressing income inequality and promoting gender inclusion. Nevertheless, the study emphasizes the need for policy improvements to effectively use the potential of this technology. Aiming to examine the impact of mobile money on savings and saving practices, Takyi et al. (2022) conduct a study in Ghana and report that the use of mobile money enhances savings behavior and promotes financial inclusion, with particularly significant effects in rural areas. In a similar vein, Seng (2021) find that mobile money usage among Cambodian households is associated with higher per capita income and an increased likelihood of receiving remittances. In their turn, Naito et al. (2021) conclude that mobile money can enhance financial resilience, as households using mobile money in Tanzania tend to borrow less due to the adoption of improved saving behaviors. Furthermore, empirical investigations report a positive effect of mobile money on tax revenue performance and firm innovation (Apeti & Edo, 2023).

It can be argued that the role of Fin tech in helping, empowering, and improving the future of young females is not merely a technological advancement; it is a strategic element for achieving comprehensive economic and social development. Nevertheless, while mainstream research has focused on the effects of mobile money on economic growth and financial inclusion, the role of this technology in empowering the future of young females remains understudied.

It is important to note that previous studies highlight a remarkable role for women in enhancing the quality of life and education, which, in turn, can empower young females. Hessami & da Fonseca (2020) examine the existing literature on the impact of female political representation, highlighting its positive effects on the provision of public goods in developing countries and its role in enhancing institutional quality through the reduction of corruption. Also, the female political representation can improve the subjective well-being (Hortas-Rico & Rodríguez-Crespo, 2025).

Behrman et al. (1999) study how increases in women's schooling enhance child human capital and contribute to economic growth, and they emphasize investments in female education as it concludes that maternal literacy improves child education through home teaching productivity. Due to the positive effect of women's primary education and labor force participation on GDP per capita, Hakan Oztunc et al. (2015) conclude that women's education significantly affects long-term economic growth. Based on an extensive literature review, Hessami & da Fonseca (2020) emphasize the need to examine the impact of female political representation on areas beyond economic growth.

3. Methods :

3.1. Data, variables, and empirical strategy :

The data is drawn from panel data spanning the years 2015-2023, sourced from the Financial Access Survey (International Monetary Fund, 2024) and The World Bank data (The World Bank, 2024). The number of mobile money agents can play a critical role in facilitating the adoption of this technology (Johnen et al., 2023). Accordingly, the present study utilizes the number of active mobile money agents as a proxy to measure the impact of mobile banking [] (International Monetary Fund, 2024). While we utilize the share of young female not in education, employment or training, female as percentage of female youth population to assess the young female participation in education and training [EETTF]. The dataset encompasses Albania, Bangladesh, Benin, Botswana, Burkina Faso, Cambodia, Cameroon, Chad, Congo, Rep. of, Côte d'Ivoire, Fiji, Rep. of, Ghana, Guinea, Guinea-Bissau, Guyana, Kenya, Lesotho, Kingdom of, Liberia, Libya, Madagascar, Rep. of, Malawi, Maldives, Mali, Mauritius, Namibia, Niger, Pakistan, Philippines, Rwanda, Senegal, Togo, Zambia. We run fixed effect panel data model as shows in equation [1]

$$EETTF_it = \beta_1 \cdot LOG_MOBMON_it + \beta_2 \cdot GDPPER_it + \beta_3 \cdot GEET_it + \beta_4 \cdot LAFF_it + \beta_5 \cdot WONPAR_it + \beta_6 \cdot INFLAT_it + \alpha_i + \varepsilon_it$$

Eq. [1]

is the dependent variable for country i at time t and represents the share of the female youth population not in education, employment, or training, total (% of the youth population) (modeled ILO estimate) (The World Bank, 2024). The main independent variable is the log of Number of active mobile money agent for country i at time t (International Monetary Fund, 2024).

Control variables include gdp which represents the GDP per capita growth (annual %) for country i at time t . edu refers to the government expenditure on education, total (% of GDP) for country i at time t (The World Bank, 2024). We also use lfr which is the labor force, female (% of total labor force) for country i at time t and $women$ which denotes the proportion of seats held by women in national parliaments (%) for country i at time t (The World Bank, 2024). Another control variable is $inflation$ which signifies the inflation, consumer prices (annual %) (The World Bank, 2024). $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$, and β_6 are the coefficients to be estimated, while α_i represents the individual-specific fixed effect, which captures all time-invariant factors that differ across countries but remain constant over time and ϵ_{it} is the idiosyncratic error term. All variables used in the study, along with their definitions and sources, are presented in the appendix.

3.2. Descriptive statistics and correlation :

Table 1 presents the descriptive statistics for the main variables used in the analysis. The table includes the number of observations (Obs), the mean, standard deviation (Std. Dev.), minimum (Min), and maximum (Max) values, as well as the 1st and 99th percentiles (p1 and p99, respectively). Additionally, it reports measures of distributional shape, including skewness (Skew.) and kurtosis (Kurt.). These statistics provide a comprehensive overview of the central tendency, variability, and distributional properties of the data.

Table 1: Descriptive Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max	p1	p99	Skew.	.Kurt
Year	252	2019	2.587	2015	2023	2015	2023	0	1.77
MOBMON	229		132000	52		112		2.539	10.439
GDPPER	251	2.45	7.044		62.111		33.769	3.119	32.116
GEET	223	4.048	1.828	1.656		1.687	9.851	1.507	5.233
EETIF	252	32.628	10.986	12.662	57.222		56.445	243.	2.292
LAFF	252	43.088	6.839	20.738			49.73	-1.735	5.656
WONPAR	250	21.804	12.505	4.598	63.75	4.598	61.25	1.315	4.869
INFLAT	251	5.625	6.043	-3.233		-1.8	30.768	2.177	9.296

Table 1 presents the descriptive statistics for the main variables used in the analysis. The table includes the number of observations (Obs), the mean, standard deviation (Std. Dev.), minimum (Min), and maximum (Max) values, as well as the 1st and 99th percentiles (p1 and p99, respectively). It reports measures of distributional shape, including skewness (Skew.) and kurtosis (Kurt.). The data is drawn from three waves of panel data spanning the years 2015-2023, sourced from the Financial Access Survey (International Monetary Fund, 2024) and The World Bank data (The World Bank, 2024). The dataset encompasses Albania, Bangladesh, Benin, Botswana, Burkina Faso, Cambodia, Cameroon, Chad, Congo, Rep. of, Côte d'Ivoire, Fiji, Rep. of, Ghana, Guinea, Guinea-Bissau, Guyana, Kenya, Lesotho, Kingdom of, Liberia, Libya, Madagascar, Rep. of, Malawi, Maldives, Mali, Mauritius, Namibia, Niger, Pakistan, Philippines, Rwanda, Senegal, Togo, Zambia. Note: missing values have been imputed using the average. In the statistical analysis, the log value of the variable 'mobmon' is used.

Table 2 presents the correlation coefficients between the key variables used in the analysis. The results indicate relatively low levels of multicollinearity across most variables. For example, the correlation between mobile money variable [LOG_MOBMON] and educational and training engagement [EETTF] is weak (0.027), suggesting a minimal direct relationship, while the correlation between [LOG_MOBMON] and government expenditure on education and training [GEET] is moderately negative (-0.413), potentially reflecting differences in resource allocation or policy focus. Overall, the matrix supports the inclusion of these variables in regression analysis without major concern for multicollinearity.

Table 2: The correlation matrix

	EETTF	LOG_MOBMON	GDP-PER	GEET	LAFF	WON-PAR	INFLAT
EETTF	1						
LOG_MOBMON	0.027	1					
GDPPER	0.1284	-0.0842	1				
GEET	0.1545	-0.413	-0.1105	1			
LAFF	-0.4784	0.036	-0.1218	0.1545	1		
WONPAR	0.1586	0.0469	0.1462	0.2012	0.0796	1	
INFLAT	0.0085	0.3125	-0.0665	-0.1741	0.1058	0.0083	1

Table 2 illustrates the estimation results of the correlation matrix. The data is drawn from three waves of panel data spanning the years 2015-2023, sourced from the Financial Access Survey (International Monetary Fund, 2024) and The World Bank data (The World Bank, 2024). The dataset encompasses Albania, Bangladesh, Benin, Botswana, Burkina Faso, Cambodia, Cameroon, Chad, Congo, Rep. of, Côte d'Ivoire, Fiji, Rep. of, Ghana, Guinea, Guinea-Bissau, Guyana, Kenya, Lesotho, Kingdom of, Liberia, Libya, Madagascar, Rep. of, Malawi, Maldives, Mali, Mauritius, Namibia, Niger, Pakistan, Philippines, Rwanda, Senegal, Togo, Zambia

. 4. Results :

4.1. Baseline model :

Table 3 presents the estimation results from a baseline panel fixed effects model – which controls for unobserved, time-invariant differences across countries, examining the relationship between the number of active mobile money agents [LOG_MOBMON] on the share of young females not in education, employment, or training, total as a percentage of the young female population while considering the female political representation and various macroeconomic indicators across countries. Across all models (1)–(7), the coefficient on [LOG_MOBMON] is consistently negative and statistically significant. This suggests that an increase in the number of mobile money agents is associated with a decrease in young females who are not in education, employment, or training. It is worth pointing out that the effect size remains stable across models, ranging from -0.313 to -0.426. Remarkably, the proportion of women in the total labor force [LAFF] and the percentage of parliamentary seats occupied by women [WONPAR] show a large and highly significant negative effect on youth who are not in education, employment, or training.

Table No. (3): The Basic Model

	(6)	(5)	(4)	(3)	(2)	(1)
* log_mobmon	-0.417** (0.168)	-0.414** (0.369)	-0.425** (0.170)	-0.426** (0.165)	-0.313* (0.177)	-0.317* (0.179)
gdpper	-0.00247 (0.0255)	-0.00249 (0.0256)	-0.00623 (0.0254)	-0.0192 (0.0261)	-0.0204 (0.0259)	
geet	-0.543 (0.393)	0.0556 (0.392)	-0.00578 (0.392)	0.200 (0.403)		
laff	-0.838 (0.200)	-0.834*** (0.200)	-0.812*** (0.201)			
wonpar	-0.0884 (0.201)	-0.0873* (0.507)				

Follow: Table No. (3): The Basic Model

	(6)	(5)	(4)	(3)	(2)	(1)
inflat	0.00648					
	(0.0382)					
cons	73.94	71.82***	73.74***	36.02***	36.73***	36.70***
	(1.655)	(1.657)	(2.185)	(9.070)	(9.098)	(9.192)
N	252	252	252	252	252	252
R-sq	0.110	0.110	0.098	0.030	0.029	0.027

Table 3: The baseline model

Table 3 illustrates the estimation results of the baseline model, where the number of active mobile money agents for a country is the main independent variable. Models (1)-(7) present the results of estimating the model using the panel fixed effects, including one variable at a time. The data is drawn from three waves of panel data spanning the years 2015-2023, sourced from the Financial Access Survey (International Monetary Fund, 2024) and The World Bank data (The World Bank, 2024). The dataset encompasses Albania, Bangladesh, Benin, Botswana, Burkina Faso, Cambodia, Cameroon, Chad, Congo, Rep. of, Côte d'Ivoire, Fiji, Rep. of, Ghana, Guinea, Guinea-Bissau, Guyana, Kenya, Lesotho, Kingdom of, Liberia, Libya, Madagascar, Rep. of, Malawi, Maldives, Mali, Mauritius, Namibia, Niger, Pakistan, Philippines, Rwanda, Senegal, Togo, Zambia. Note: ***, **, and * denote the 1%, 5%, and 10% significance levels, respectively. Standard errors are within parenthesis.

4.2. Robustness check:

While the number of mobile money agents can serve as a reasonable proxy for mobile money usage at the national level, it does carry the potential for measurement error. To assess the robustness of our empirical strategy, we employed another proxy. Our initial proxy (the number of mobile money agents) captures supply-side aspects of mobile money, hence, we adopt an alternative approach by using a proxy more directly linked to actual usage, i.e., mobile cellular subscriptions per 100 people. This allows us to evaluate the consistency and validity of our findings from different perspectives. Table 4 presents the result from a robustness check where the main independent variable is mobile cellular subscriptions per 100 people [MOBCEL] instead of the number of mobile money agents used in the baseline model. The models (1)-(7) confirm the conclusion of the baseline model of the role of mobile money in youth empowerment. It is worth pointing out that the role of women has been also confirmed.

Table No. (4): Durability Test

	(6)	(5)	(4)	(3)	(2)	(1)
** log_ mobmon	-0.0324 ***	-0.0324**	-0.0352**	-0.0439***	-0.0437***	-0.0442***
	(0.0147)	(0.0147)	(0.148)	(0.149)	(0.0149)	(0.0149)
dgpper	-0.00152	-0.00152	-0.00694	-0.0179	-0.0187	
	(0.0258)	(0.0260)	(0.0255)	(0.0253)	(0.0254)	
geet	-0.100	-0.100	-0.0767	0.120		
	(0.397)	(0.391)	(0.387)	(0.388)		
laff	-0.766 ***	-0.766	-0.732***			
	(0.203)	(0.202)	(0.203)			
*wonpar	-0.112 ***	-0.112**				
	(0.0479)	(0.0470)				
inflat	-0.000153					
	(0.0377)					
***cons	71.68 ***	71.69 ***	67.96 ***	36.51 ***	36.97 ***	36.97 ***
	(9.098)	(9.022)	(8.980)	(2.143)	(1.472)	(1.471)
N	252	252	252	252	252	252
R-sq	0.117	0.117	0.094	0.041	0.040	0.038

Table 4: The robustness check :

Table 4 illustrates the estimation results of the robustness check model where the mobile cellular subscriptions (per 100 people) are the main independent variable. Models (1)-(7) present the results of estimating the model using the panel fixed effects, including one variable at a time. The data is drawn from three waves of panel data spanning the years 2015-2023, sourced from the Financial Access Survey (International Monetary Fund, 2024) and The World Bank data (The World Bank, 2024). The dataset encompasses Albania, Bangladesh, Benin, Botswana, Burkina Faso, Cambodia, Cameroon, Chad, Congo, Rep. of, Côte d'Ivoire, Fiji, Rep. of, Ghana, Guinea, Guinea-Bissau, Guyana, Kenya, Lesotho, Kingdom of, Liberia, Libya, Madagascar, Rep. of, Malawi, Maldives, Mali, Mau-

ritius, Namibia, Niger, Pakistan, Philippines, Rwanda, Senegal, Togo, Zambia. Note: ***, **, and * denote the 1%, 5%, and 10% significance levels, respectively. Standard errors are within parenthesis.

4.3. Additional robustness check :

Table 5 presents results from an additional robustness check where [LOG_BANKS], i.e., the natural logarithm of the variable commercial bank branches (per 100,000 adults), is added to the test to assess the effect of the main independent variable, i.e., the number of active mobile money agents for a country. The models (1)-(7) confirm the conclusion of the baseline model of the role of mobile money in young female empowerment. The significance of women's roles has likewise been also concluded, as reported in previous tests.

Table No. (5): Additional Durability Test

	(7)	(6)	(5)	(4)	(3)	(2)	(1)
** log_mobmon	-0.313 *** (0.180)	-0.317 *** (0.179)	-0.313 ** (0.177)	-0.426 ** (0.165)	-0.425 *** (0.170)	-0.414 *** (0.169)	-0.417 *** (0.168)
gdpper	-0.00229 (0.0254)	-0.00247 (0.0255)	-0.00249 (0.0254)	-0.00623 (0.0254)	-0.0192 261	-0.0204 (0.0259)	
geet	-0.589 (0.394)	-0.0543 (0.393)	-0.0556 (0.392)	-0.00278 393	0.200 (0.394)		
***laff	-0.812 *** (0.200)	-0.834 *** (0.200)	-0.868 *** (0.201)	-0.833 *** (0.203)			
wonpar	-0.873 (0.0507)	-0.884* (0.0521)	-0.629* (0.0521)				
inflat	0.00648 (0.0382)	0.00792 (0.0387)					
***cons	73.07 *** (9.779.)	73.94 *** (9.192)	73.74 *** (9.098)	71.82 *** (9.070.)	36.02 *** (2.185)	36.73 *** (1.657)	36.70 *** (1.655)
N	252	252	252	252	252	252	252
R-sq	0.110	0.110	0.110	0.098	0.030	0.29	0.027

Table 5: The additional robustness check :

Table 5 illustrates the estimation results of the additional robustness test where [Log_Banks], i.e., log of the variable commercial bank branches (per 100,000 adults), is added to the test to assess the effect of the main independent variable, i.e., the number of active mobile money agents for a country. Models (1)-(7) present the results of estimating the model using the panel fixed effects, including one variable at a time. The data is drawn from three waves of panel data spanning the years 2015-2023, sourced from the Financial Access Survey (International Monetary Fund, 2024) and The World Bank data (The World Bank, 2024). The dataset encompasses Albania, Bangladesh, Benin, Botswana, Burkina Faso, Cambodia, Cameroon, Chad, Congo, Rep. of, Côte d'Ivoire, Fiji, Rep. of, Ghana, Guinea, Guinea-Bissau, Guyana, Kenya, Lesotho, Kingdom of, Liberia, Libya, Madagascar, Rep. of, Malawi, Maldives, Mali, Mauritius, Namibia, Niger, Pakistan, Philippines, Rwanda, Senegal, Togo, Zambia. Note: ***, **, and * denote the 1%, 5%, and 10% significance levels, respectively. Standard errors are within parenthesis.

4.4. Endogeneity test:

Reverse causality or omitted variable errors are major concerns that may affect the estimation of [LOG_MOBMON] on [EETF]. To address this issue, we use the IV test of the one-period lag of log_mobmon [LAG_LOG_MOBMON] as an instrument. Table 6 shows that IV regression reveals that the coefficient on [LOG_MOBMON] remains statistically significant and negative, suggesting a robust causal effect. Also, the table shows that the first-stage F-statistic is $60.26 > 10$, which indicates that the IV is strong and unlikely to suffer from weak instrument bias.

Table No. (6): Results of the First Stage and Regression Using the Tool (IV)

	(6)	(5)
	First Stage	IV (FE)
lag_log_mobmon	0.465 *** (0.0570)	-0.913*** (0.411)
** log_mobmon	-0.00455 *** (0.00794)	-0.0063** (0.0266)
dgpper	-0.00455* (0.00794)	-0.00663 (0.0266)
geet	0.219* (0.131)	0.0139 (0.455)
laff	-0.0384 *** (0.0727)	-0.879 (0.244)
*wonpar	-0.0525 *** (0.0160)	-0.0428** (0.0628)
inflat	-0.0101 (0.0121)	0.0300 (0.0416)
***cons	0.296 (3.450)	80.21 *** (11.36)
Observations	224	224
F (33, 190)	60.26	
Prob > F	0.000	
R-squared	0.9128	
Adj R-squared	0.8976	

Table 6: The First-Stage and IV Regression Results:

Table 6 presents results from a two-stage instrumental variables (IV) regression with fixed effects. The first stage, Model (1), estimates the relationship between the endogenous regressor `log_mobmon` and its instrument, the one-period lag of `log_mobmon` [`LAG_LOG_MOBMON`]), along with control variables. The second stage reports the causal effect of [`LOG_MOBMON`] on [`EETTF`] using the predicted values from the first stage as an instrument to correct for endogeneity. Standard errors are robust and clustered at the country level. Note: ***, **, and * denote the 1%, 5%, and 10% significance levels, respectively. Standard errors are within parenthesis.

5. Conclusion and policy recommendations:

Based on panel data from the International Monetary Fund and the World Bank covering 32 countries from 2015 to 2023, we explore the impact of mobile money on the empowerment of young females and find a significant positive effect of mobile money on young female participation in education and training. That is, higher usage of mobile money is associated with a reduced likelihood of young female who are not being in education, employment, or training, thereby enhancing their participation in these key domains. Our conclusion remains consistent even after applying various additional robustness checks, which suggests the strength of this effect.

The results indicate a robust inverse relationship between the number of active mobile money agents and the proportion of young females not engaged in education, employment, or training. This relationship and the additional robustness checks underscore the potential of mobile money as a catalyst for youth empowerment in developing countries.

The findings of this study are particularly relevant for countries with a high proportion of unbanked individuals and limited access to financial services, especially where young females face significant challenges related to disempowerment. The results suggest two key directions. First, legislation should be introduced to enhance the legal and business environment for the expansion of mobile money services. Additionally, policymakers are encouraged to take action to support the expansion of mobile money, particularly in areas where bank branches are scarce. This includes investing in mobile

network infrastructure and providing tax incentives to companies that extend coverage to these underserved regions. It is worth noting that mobile money providers can collaborate with social actors to promote the responsible use of their services among youth. Presentations and workshops on how to use mobile money effectively can help equip young people with essential financial knowledge.

Second, it underscores the importance of women's empowerment in both economic and political spheres. Thus, policymakers should enhance the facilitation and accessibility of mobile money services, as this technology has the potential to support young female by improving their education. This is an essential component in advancing Sustainable Development Goal (SDG) 4 on quality education. Furthermore, the cross-cultural evidence shows that the empowerment of women in economic and political life interacts with Fin tech adoption to enhance young female outcomes. Therefore, policymakers must promote women's participation in both the labor market and political spheres, as their engagement can contribute significantly to empowering young people. This aligns with the objectives of SDG 5, which emphasizes the importance of achieving gender equality and empowering all women and girls. Taken together, the conclusion emphasizes the importance of gender equality by highlighting women's ability to improve future opportunities for young females through their empowerment in education and training. This is particularly important for developing countries, where a significant percentage of the population is young. Women play a significant role in enhancing individuals' quality of life. To better understand the interaction effects between mobile money usage and women's participation in politics or the labor market, we suggest this as a promising area for future research.

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Appendix: Definitions of variables

Variable and the abbreviation	Definition	Database
Share of youth not in education, employment, or training, female (% of the female youth population) – EETTF	Share of youth not in education, employment or” training (NEET) is the proportion of young people who are not in education, employment, or training to the population of the corresponding age group: youth (ages 15 to 24); persons ages 15 to 29; or both (age groups..” (The World Bank, 2025f	World Bank – World Development Indicators
Gross Domestic Product (GDP) per capita growth – GDPGER	Annual percentage growth rate of GDP per capita” based on constant local currency. GDP per capita is gross domestic product divided by midyear population.” (The World Bank, 2025b	
The labor force, female (% of total labor force) – LAFF	Female labor force as a percentage of the total” shows the extent to which women are active in the labor force. The labor force comprises people ages 15 and older who supply labor for the production of goods and services during a specified period.” (The World Bank, 2025d	
The proportion of seats held by women in national parliaments (%) – WONPAR	Women in parliaments are the percentage of parliamentary seats in a single or lower chamber held by (women.” (The World Bank, 2025e	
Inflation, consumer prices (annual %) – INFLAT	Inflation, as measured by the consumer price index,” reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly.”(The World Bank, 2025c	
Commercial bank branches (per 100,000 adults) – BANKS	Commercial bank branches are retail locations” of resident commercial banks and other resident banks that function as commercial banks that provide financial services to customers and are physically separated from the main office but not organized as legally separated subsidiaries.” (The World Bank, 2025a	

Follow: Appendix: Definitions of variables

Variable and the abbreviation	Definition	Database
Number of active mobile money agents for the country – MOBCEL	Geographical Outreach, Mobile Money, Number of “active mobile money agent outlets” (International Monetary Fund, 2024)	International Monetary Fund – Financial Access Survey