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Microfinance as a Catalyst for Women's Empowerment and Human Capital: Insights from Middle East and North Africa

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Abstract

Unlocking the full potential of individuals, particularly women in developing regions, remains a significant challenge for achieving sustainable development. Although microfinance is widely acknowledged as an effective instrument for promoting economic empowerment and alleviating poverty, its impact on human capital enhancement through women's empowerment has not been sufficiently examined in the literature. This study addresses this gap by investigating the relationship between microfinance access, women's economic empowerment, and human capital development in the Middle East and North Africa (MENA) region. Using a Two-Stage Least Squares regression framework, the analysis provides empirical evidence that microfinance access positively influences women's empowerment, which subsequently contributes to the improvement of human capital indicators. The findings identify microfinance as a critical mechanism for fostering sustainable economic growth and promoting gender equality. This research offers valuable implications for policymakers and scholars interested in advancing development through financial inclusion in the MENA region.

Categories: Sustainable Economic Development, Political Economy
Keywords: human capital development, mena region, microfinance, sustainability, women empowerment
JEL Classifications: G21, I25, J16

Introduction

Poverty is a global issue that demonstrates in various forms depending on geographic and socio-economic contexts. In today's world, it has become a catalyst for interpersonal conflict and remains one of the most urgent economic and social challenges facing humanity. Its widespread negative effects impact individuals and societies alike, and it is often considered a fundamental driver of human rights violations. In the modern era, poverty continues to hinder both economic growth and human development. Broadly defined, it refers to a condition in which individuals suffer from a severe lack of well-being (Tasos et al., 2020).

One of the major obstacles to overcoming poverty is limited or nonexistent access to financial services. In many developing countries, both formal and informal financial institutions have failed to provide adequate financial support to the underprivileged. Low-income individuals are often excluded from the formal banking system due to stringent collateral requirements, a preference for wealthier clients, high minimum loan amounts, and cumbersome administrative procedures (Tasos et al., 2020). In response, the concept of microfinance has emerged, with Microfinance Institutions (MFIs) becoming a key component of development strategies and economic revitalization efforts worldwide. Microfinance services can empower low-income individuals by helping them combat poverty, improve business management, increase productivity, achieve higher returns on investments, and enhance their overall quality of life (Adnan and Kumar, 2021).

Access to microfinance in developing countries plays a significant role in supporting income-generating activities, promoting entrepreneurship, and reducing economic vulnerability. This access is widely regarded as an effective means of empowering disadvantaged populations, particularly women (Singh and Chudasma, 2020). According to Assaad et al., an expanding body of empirical literature demonstrates that microfinance serves as a powerful instrument for advancing women's empowerment (Assaad et al., 2020). This empowerment is increasingly recognized as a critical component of poverty reduction strategies. It is not only viewed as a development objective in its own right but also as a mechanism for stimulating economic growth, reducing poverty, and strengthening governance systems (Asim, 2009). Women around the world contribute to national economies by maintaining sustainable livelihoods for their families. Given that women constitute approximately 70 percent of the global poor and frequently lack access to credit and other financial services, empowering women has been shown to yield substantial benefits, including improved infant and child survival rates, increased school enrolment, and greater household expenditure on children's education and health (Khan and Noreen, 2012). Given the critical role of human capital in poverty reduction and the far-reaching effects of women's empowerment on household welfare

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and human capital development, this paper aims to explore whether microfinance can serve as an effective strategy for enhancing human capital by economically empowering women. Despite global advancements in financial inclusion, the Middle East and North Africa (MENA) region continues to face significant challenges. It ranks third among developing regions in terms of severe poverty and still lags behind in access to financial services (Emara and Mohieldin, 2020).

In light of these considerations, the study seeks to address the following research questions within the MENA context:

1. To what extent does women's economic empowerment influence children's human capital?

2. Can microfinance enhance human capital by promoting women's economic empowerment?

This study focuses on a sample of seven countries: Egypt, Morocco, Jordan, Sudan, Syria, Turkey, and Tunisia. The selection of these countries is driven by shared socioeconomic challenges, such as high youth unemployment, the prevalence of informal economic activity, and limited access to formal financial services (Adair et al., 2022). Moreover, the MENA region has undergone structural reform as part of broader economic strategies aimed at promoting sustainable development (Ghazy and Ghoneim, 2019) and (Helmy et al., 2019). Despite improvements in educational attainment across the region, women continue to rank among the lowest globally in terms of access to economic opportunities and participation in the labor market (Assaad et al., 2020).

Assessing the role of microfinance in this context is vital for understanding its potential in addressing these persistent socioeconomic issues and contributing to broader objectives such as economic revitalization and sustainable development. The period of analysis spans from 1999 to 2018. This study employs an unbalanced panel dataset, resulting in varying numbers of observations across countries and years.

Data sources include the Microfinance Information Exchange, Penn World Table version 10.01 (PWT), the World Bank, and Our World in Data. The empirical analysis employs fixed and random effects panel regression models, with the choice between them determined by the Hausman test. Following the initial estimations, the models are re-estimated using a two-stage least squares (2SLS) approach, with women's economic empowerment (WEE) serving as an instrumental variable to address potential omitted variable bias.

Given that women in the MENA region continue to face significant barriers to economic participation (Assaad et al., 2020), this paper contributes to the literature by examining the impact of microfinance on human capital through the channel of WEE. This relationship remains underexplored in existing research, particularly within the MENA context. The empirical findings of this study are expected to provide valuable insights into this nexus and to enrich the academic discourse on microfinance and development in the region.

The literature review is presented in the following section. The research hypotheses and the methods employed for data collection are outlined in the "Research Methodology" section. The subsequent sections present and discuss the empirical findings. Finally, the conclusion offers a discussion of the implications of the results and provides recommendations for future research.

Literature review

Microfinance and Women Empowerment

There are numerous ways that microcredit is believed to help women. First, increasing income through microcredit may benefit women and girls in their households through enhancing their consumption and human capital (Sharif, 2020). Many studies, such as Dao (Dao, 2020) and Wright (Wright, 1999) have concluded that microcredit has a positive effect on the income of the impoverished in low- and middle-income countries. Second, microcredit helps women participate more actively in the economy (Badri, 2013). Adding to that, women tend to be motivated to establish their own businesses in an effort to become financially independent in which such businesses may not be registered and are usually run from homes. So the paper of Khan et al. (Khan et al., 2023) explains that women who have complete control over their loans through these enterprises feel economically empowered. Conversely, women who take loans to fuel household spending rather than starting their business or who exhibit little control or poor discipline over repayment responsibilities are likely to become deeper entrenched in poverty and disempowerment.

Al-Dajani and Marlow examined 43 Palestinian migrant women who managed home businesses (embroidered products) and revealed advancements in income, savings, and spending. None of the women had formed official, legally recognized businesses for ten years; instead, they were satisfied to operate home-based businesses that they believed to be acceptable from a cultural standpoint (Al-Dajani and

Marlow, 2013). Another study in rural India indicates that female entrepreneurs who have access to microcredit and mobilize their savings are involved in a range of micro-enterprises, which include producing basic items such as incense sticks, paper plates, broomsticks, and bangles, as well as food items like pickles, fritters, and snacks, in addition to agriculture. These micro-entrepreneurial activities have resulted in significant improvements in the economic conditions of women (Khan et al, 2023).

Hence, microfinance sector enables women to become more economically independent by providing working capital and helping them in securing more constant income for their families. Hence, microfinance services provision in terms of credit and training helps women in establishing new businesses and grow the current ones, which eventually leads those women to experience higher self-esteem, more confidence and become more engaged in household and community activities (Mengstie, 2022).

Moreover, the increasing financial self-sufficiency of women and their enhanced role in household decision-making are expected to positively influence children's well-being, as empirical evidence suggests that women tend to allocate resources with a stronger emphasis on their children's health, education, and overall welfare compared to men (Hill and King, 1995). Empirical evidence indicates that policies enhancing women's access to resources and strengthening their influence over household decision-making can yield significant benefits for children's well-being (Fantahun et al., 2007). While the magnitude of effects varies across studies, cash transfer programs directed to women rather than men consistently demonstrate greater positive impacts on children's health and education outcomes. Moreover, even in the absence of direct income transfers, an increase in women's bargaining power within the household is often associated with higher investments in their children's education, underscoring the pivotal role of women's agency in shaping human capital development (De Hoop et al., 2018).

In other words, women can have the freedom to use their earnings for various purposes, such as taking care of their children and celebrating religious festivals like Eid or Christmas. They use their income to purchase clothes for themselves and their children. Additionally, they often allocate their profits toward educating their children, purchasing medicine for their family, and providing assistance during emergencies (El Hadidi, 2016). Hence, microcredit projects have been attributed to boosting household educational investment and lowering gender disparity in education. The reasoning behind this association is that financial empowerment of women through microcredit strengthens their bargaining ability in their homes and empower them to make wiser family decisions about their children's education (Kandulu et al, 2020).

However, the motives behind targeting women are different. Some claim that among the disadvantaged, women are among the poorest and the most vulnerable, given the fact that women have been traditionally excluded from access to material resources such as credit and property; women have also been excluded from access to social resources such as education (El Hadidi, 2018). Just having access to material resources alone is not sufficient, as it does not result in empowerment and equality because women should be capable of using those resources to achieve their goals. In other words, women must be able to use resources for purposes they desire in order to feel empowered (El Hadidi, 2018).

Others believe that enhancing women's capabilities grants them the autonomy to make choices, which remains valuable and subsequently contributes to the growth and prosperity of the economy. Previous literature revealed that another motivating factor is that the more resources available for women, the greater they will contribute to their family's well-being, particularly their children. Finally, a growing number of MFIs favor women as members because they think they make better and more dependable borrowers, which helps ensure their financial viability. In other words, women are more likely to benefit from microfinance because they have a great track record of repayment; the bulk of their income is spent on family and especially their children's needs, in addition to the growing proportion of families headed by women (Bhatt and Bhatt, 2017).

Microfinance and Human Capital Nexus

Major struggles as basic as suffering while paying your children's school fees or transferring money from the capital city to your family living in a rural area or purchasing inventory to start your own business are common in the developing world since access to formal financial services is not commonly smooth-running. Most of the people living in developing countries find it hard to access their needed financial services, which hinders their ability to make their daily life decisions (Helms, 2006).

It is now widely acknowledged that access to high-quality education and a healthy environment are crucial for development within the context of the Sustainable Development Goals (SDGs), particularly for the next generation to ensure their best possible future contribution to society (Megally and Ghoneim, 2020). A person's knowledge, experience, and social skills combine to perform work that generates economic value. Education and health are the key components that strengthen human capital and also contribute directly to economic growth. Investments in human capital, particularly in education, have been identified by development economists since the 1960s as one of the main catalysts behind combating

poverty, development, and sustainable economic growth (Sobel, 1978). There has been a rising interest in researching whether microfinance, and specifically microcredit, can lead to increased educational investment in addition to reducing poverty, gender inequality and improving overall quality of life (Kandulu et al., 2020).

Financial inclusion promotes economic opportunities, which can be used to finance health and education costs (Okoye et al., 2017). Literature suggests that microfinance programs do not only help the poor with their financial needs but also impact social development among their beneficiaries (Abrar ul Haq et al., 2021). Microfinance interventions raise the standards of living and give impoverished women more influence as well as having a significant impact on the sum of money allocated to their households' education and health (Chirkos, 2014). According to Islam and Choe (Islam and Choe, 2013), if microcredit programs are effective in reducing poverty, it is reasonable to assume that they could also contribute to an improvement in investment in children's education; this is due to the fact that poor access to credit in low-income households is the primary cause of why children are receiving insufficient schooling. Through a variety of channels, access to credit can positively boost children's educational outcomes. First, access to credit may have a favorable impact on the demand for children's education through raising the borrower's income (Holvoet, 2004). Second, rural households are often vulnerable to negative external events that could make it challenging for them to keep their kids enrolled in school over the long term (Looker and Naylor, 2009). Hence, microcredit programs can provide loans that help these households smooth their consumption, reducing the likelihood of their children to dropping out of school in response to adverse shocks. Finally, while microcredit programs may not have a direct impact on children's education, they may still influence schooling choices by requiring adults to participate in training programs. These programs often educate beneficiaries about the benefits of sending their children to school. For example, one of the 16 decisions that members of Grameen Bank are required to memorize is "We shall educate our children" (Rouf, 2011).

Research Method

The previous literature has primarily investigated the relationship between the variables of interest separately, such as the impact of microfinance on women's empowerment or human capital, or the impact of women's empowerment on human capital. Adding to that, the microfinance industry in the MENA region is still gradually expanding (Bassem, 2014) as according to Abdelkader (Abdelkader, 2023), microfinance is a relatively new and promising sector in the region. To our knowledge, no previous studies have explored whether access to microfinance enhances human capital by economically empowering women in the MENA region. Assaad et al. point out that women continue to rank lowest globally in terms of access to economic opportunities and economic participation (Assaad et al., 2020).

Given the preceding, a panel dataset is used where our analysis is run for seven countries in the MENA region [Egypt, Morocco, Tunisia, Sudan, Turkey, Jordan and Syria] with a total of 113 observations for all countries for the years 1999 to 2018. The time periods for which data are available vary across these countries, with Egypt, Tunisia, and Jordan having data available from 1999 until 2018, Morocco from 1999 until 2017, Sudan from 2007 until 2014, Turkey from 2005 until 2015, and Syria from 2004 until 2018. Moreover, Iraq was to be included in our analysis but given the availability of its microfinance data for only 1 year, it was excluded.

Data for microfinance were collected from the Center for Financial Inclusion website by utilizing the Microfinance Information Exchange (MIX) which was established in 2002 and is acknowledged as the most prominent worldwide data source for inclusive finance. Moreover, the World Bank Data Bank has been employed for data on Female Labor Force Participation (FLFP) to act as a proxy for this paper's second variable, which is WEE. As demonstrated in a number of published papers (Saqib, 2016) (Afridi et al., 2016), the usage of FLFP as a proxy for WEE is a commonly recognized approach in the literature.

Lastly, human capital was measured through the Human Capital Index (HCI). It was observed that there were two HCIs. This index measures the productivity of the future generations' workforce compared to a benchmark of complete education and perfect health, as established by the Human Capital Development Project implemented by the World Bank in 2018 (Kharkheli, 2022). In other words, it indicates an estimate of the quality of human capital that a child born today can expect to have when they are 18 years old, considering the health and educational conditions in a given area. This index has values from 0 to 1 with higher values indicating higher levels of human capital. In parallel, the other HCI is derived from the PWT 10.01 (Penn World Table, 2022), which reports the index on a scale from 0 to 10 and measures the human capital per person, based on the schooling years (Guan et al., 2025) and returns to education (Psacharopoulos, 1994). However, given that the World Bank has missed observations for the majority of the years included in this study, it was decided to move forward with the HCI derived from the PWT 10.01.

To enhance the reliability and robustness of the econometric models and to account for potential factors that may influence our variables of interest, five control variables were included in the analysis, including GDP per capita (Gdppc), Women Business and The Law Index, self-employment, urbanization and women's political empowerment (WPE). In order to address the potential influence of a country's

economic growth on the variables of interest in the analysis, Gdppc is considered in the model as a control variable, which was obtained from the World Bank. Gdppc has been used by Hornset and De Soysa (Hornset and De Soysa, 2022), Memon et al. (Memon et al., 2022), and Bel Hadj Miled (Bel Hadj Miled, 2022). Table *1* below represents a summary of all the variables used.

Variable and Proxy	Definition	Data Source	Model
Microfinance [LnFemBor]	Number of females that have an outstanding loan balance with the financial institutions	(Microfinance Information Exchange, 2022)	2SLS econometric model – Independent Variable in first-stage equation
Women Economic Empowerment [LnFLFP]	Proportion of the female population that is economically active, ages [15-64]	(World Bank, 2022)	Panel Regression Model – Independent Variable 2SLS econometric model – Independent Variable in second-stage equation
Human Capital [LnHCI]	Years of schooling and returns to education	(Penn World Table, 2022)	Panel Regression Model – Dependent Variable 2SLS econometric model – Dependent Variable in second-stage equation
GDPPC [Lngdppc]	Gross Domestic Product divided by midyear population	(World Bank, 2022)	Panel Regression Model – Control Variable 2SLS econometric model – Control Variable
Self-Employment [Lnselfemp]	Proportion of females who work for their account or with a small number of partners. They have control over their own working conditions but still bear the risks and uncertainties associated with running their own business.	(World Bank, 2022)	Panel Regression Model – Control Variable 2SLS econometric model – Control Variable
Women Business and The Law [LnWBL]	An index that assess how laws and regulations impact women's economic opportunities across several dimensions. It is a 0-100 index with 100 representing the highest possible level of gender equality in each dimension.	(World Bank, 2022)	Panel Regression Model – Control Variable 2SLS econometric model – Control Variable
Women Political Empowerment [LnWPE]	The best estimate of the extent to which women enjoy civil liberties, can participate in civil society, and are represented in politics.	(Our World in Data, 2022)	Panel Regression Model – Control Variable 2SLS econometric model – Control Variable

TABLE 1: Variables, measures and definitions, data sources, and model specification

2SLS, Two-Stage Least Squares

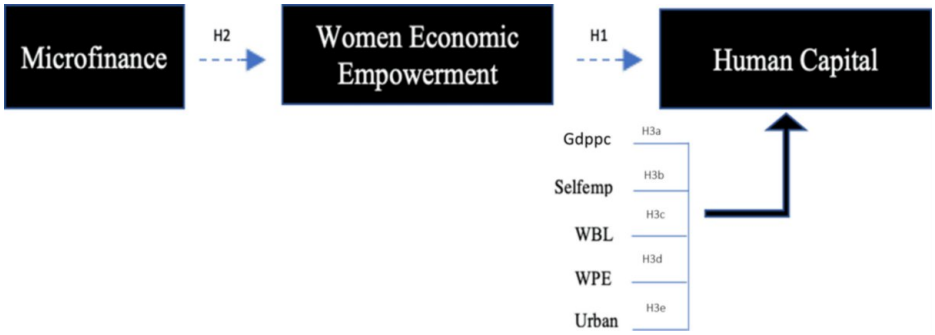

FIGURE 1: Conceptual framework

Figure 1 presents a a conceptual framework which is designed to answer the research questions by formulating the following hypotheses:

H1: Women economic empowerment contributes to human capital

H2: Microfinance contributes to women economic empowerment

H3a: Gdppc contributes to human capital

H3b: Self-employment contributes to human capital

H3c: WBL contributes to human capital

H3d: WPE contributes to human capital

H3e: Urbanization contributes to human capital

Model specification

Model use	Equation	Eq. #
Panel Regression: Fixed & Random effect	$\ln(\mathrm{HCI}_{it}) = \alpha + \beta_1 \ln(\mathrm{FLFP}_{it}) + \beta_2 \ln(\mathrm{GDPPC}_{it}) + \beta_3 \ln(\mathrm{SelfEmp}_{it}) + \varepsilon_i$	1a
	$\ln(\mathrm{HCI}_{it}) = \alpha+\beta_1 \ln(\mathrm{FLFP}_{it})+\beta_2 \ln(\mathrm{GDPPC}_{it})+\beta_3 \ln(\mathrm{SelfEmp}_{it})+\beta_4 \ln(\mathrm{WBL}_{it})+\beta_5 \ln(\mathrm{Urban}_{it})+\varepsilon_i$	1b
	$\ln(\mathrm{HCI}_{it}) = \alpha+\beta_1 \ln(\mathrm{FLFP}_{it})+\beta_2 \ln(\mathrm{GDPPC}_{it})+\beta_3 \ln(\mathrm{SelfEmp}_{it})+\beta_4 \ln(\mathrm{WPE})+\varepsilon_i$	1c
2SLS Econometric Models: Stage I	$\ln(\mathrm{FLFP}_{it}) = \alpha+\beta_1 \ln(\mathrm{FemBor}_{it})+\beta_2 \ln(\mathrm{GDPPC}_{it})+\beta_3 \ln(\mathrm{SelfEmp}_{it})+\varepsilon_i+u_i$	2a
	$\ln(\mathrm{FLFP}_{it}) = \alpha+\beta_1 \ln(\mathrm{FemBor}_{it})+\beta_2 \ln(\mathrm{GDPPC}_{it})+\beta_3 \ln(\mathrm{SelfEmp}_{it})+\beta_4 \ln(\mathrm{WBL})+\beta_5 \ln(\mathrm{Urban})+\varepsilon_i+u_i$	2b
	$\ln(\mathrm{FLFP}_{it}) = \alpha+\beta_1 \ln(\mathrm{FemBor}_{it})+\beta_2 \ln(\mathrm{GDPPC}_{it})+\beta_3 \ln(\mathrm{SelfEmp}_{it})+\beta_4 \ln(\mathrm{WPE})+\varepsilon_i+u_i$	2c
2SLS Econometric Models: Stage II	$\ln(\mathrm{HCI}_{it}) = \alpha+\beta_1 \ln(\hat{\mathrm{FLFP}}_{it})+\beta_2 \ln(\mathrm{GDPPC}_{it})+\beta_3 \ln(\mathrm{SelfEmp}_{it})+\varepsilon_i+u_i$	3a
	$\ln(\mathrm{HCI}_{it}) = \alpha+\beta_1 \ln(\hat{\mathrm{FLFP}}_{it})+\beta_2 \ln(\mathrm{GDPPC}_{it})+\beta_3 \ln(\mathrm{SelfEmp}_{it})+\beta_4 \ln(\mathrm{WBL})+\beta_5 \ln(\mathrm{Urban})+\varepsilon_i+u_i$	3b
	$\ln(\mathrm{HCI}_{it}) = \alpha+\beta_1 \ln(\hat{\mathrm{FLFP}}_{it})+\beta_2 \ln(\mathrm{GDPPC}_{it})+\beta_3 \ln(\mathrm{SelfEmp}_{it})+\beta_4 \ln(\mathrm{WPE})+\varepsilon_i+u_i$	3c

TABLE 2: Equation employed by model

2SLS, Two-Stage Least Squares

The empirical analysis for this paper is conducted using a fixed-effects model, a random-effects Generalized Least Squares (GLS) regression model, and a two-stage GLS regression model (G2SLS) with women empowerment as an instrument. Ln values for all the variables are calculated and included in the preceding econometric models to capture the percentage changes instead of the unit change (Wooldridge et al., 2016).

First, we wanted to examine the direct impact of women's empowerment on human capital by running a panel regression model for the three equations as presented in Table 2 answering both Hypotheses 1 and 3. The three equations included HCI as the dependent variable and FLFP as the independent variable; control variables varied in the equations.

Afterwards, in accordance with the research aim to determine whether microfinance contributes to the development of human capital through economically empowering women, as presented in Table 2, *2GSLS* is employed with WEE as the instrument variable. Where FLFP is the dependent variable, which is the proxy for WEE. FemBor is the independent variable, which indicates the number of female microfinance borrowers, and different control variables are employed, as presented in Table 2, Equations 2a, 2b, and 2c.

The second stage in 2GSLS analysis was the testing of the second hypothesis (H2) regarding the role of women empowerment forwarding the impact of microfinance on human capital. The obtained FLFP in the

first stage is employed. HCI is the dependent variable and FLFP is the estimated Female Labor Force Participation Rate, obtained from the first equation, which measures WEE. (FemBor) is an independent variable which indicates the percentage of female microfinance borrowers, and a number of control variables are employed in equations 3a, 3b and 3c as presented in Table 2.

Results And Discussion

Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
FLFP	113	22.66628	6.057689	11.551	34.409
HCI	113	2.210149	0.3938521	1.496281	2.888361
FemBor	113	149651	179242.2	863	780966
Gdppc	113	3718.126	2907.405	664.3417	12507.59
WBL	113	47.34513	18.06284	26.25	82.5
Selfemp	113	35.46303	22.88419	3.42974	71.96
Urban	113	60.18091	15.48684	32.866	90.979
WPE	113	0.5475664	0.1589948	0.263	0.871

TABLE 3: Sample descriptive statistics

FLFP, Female Labor Force Participation; HCI, Human Capital Index; WPE, women's political empowerment

Table 3 above shows a summary of the descriptive statistics for eight variables across 113 annual observations from the period 1999 to 2018. It is remarkable to highlight that FLFP scored 22.66, indicating that an average of 22.6% of the sample are employed, with Turkey (2015) having the highest rate of 34.4%. The mean of the HCI is 2.21, with the minimum value of 1.491 and the maximum value of 2.88. The average number of female borrowers is 149,651 borrowers, the lowest number of borrowers is found in Syria in 2004 at 863 borrowers, while the highest is 780,966 scored in Morocco 2008. Gdppc has a mean of 3718.126, indicating that the average GDP per capita in the sample is $3718, with the minimum value of $664.34 and the maximum value of $12507.59 found in Turkey 2013. WBL shows an average of 47.34 indicating that marginally, half of the sample have about the same legal and business rights as men, which promotes their economic opportunities. The highest value for WBL is found in Turkey 2015, while the lowest is found in Sudan 2007. Moreover, Selfemp has a mean of 35.46, which reflects that on average, about 35% of women employment in the sample is self-employed. The average for urbanization is 60.1, which indicates that on average, 60% of the population that resides in urban regions. Lastly, WPE has a minimum value at 0.26 found in Egypt 2013, while it enjoys the highest value in Tunisia 2018 at 0.87.

FIGURE 2: Map map of female borrowers in MENA region

Source: Constructed by authors based on MIX dataset. MENA, Middle East and North Africa

Given the total number of female borrowers obtained from MIX website, Figure *2* demonstrates the calculated average number of female microfinance borrowers across seven countries in the MENA region. The countries in the legend are listed in descending order based on the highest average number of female borrowers to the lowest, with Morocco having the highest number of female microfinance borrowers at 329,908, followed by Egypt at 309,478. This aligns with the literature, as according to Ben Abdelkader and Mansouri (Ben Abdelkader and Mansouri, 2019), the microfinance markets in the MENA region are at varying stages of development, with Morocco and Egypt exhibiting higher levels of outreach and scale compared to newer markets. Sudan has the lowest number of female microfinance borrowers at 5,575. The dataset suggests that there are significant differences in the number of female microfinance borrowers across the MENA region, with Morocco and Egypt having the highest numbers.

Model results

First: Panel Regression Model: Women Empowerment and Human Capital

Dependent variable: LnHCI	(1a)	(1b)	(1c)
LnWLFP	0.208** (0.02)	0.181*** (0.00)	0.208*** (0.00)
Lngdppc	0.112*** (0.00)	0.104*** (0.00)	0.111*** (0.00)
Lnselfemp	-0.266*** (0.00)	-0.241*** (0.00)	-0.267*** (0.00)
LnWBL		0.131*** (0.00)	
LnFertilityrate		-0.087 (0.24)	
LnWPE			0.015 (0.71)
Constant	0.081 (0.60)	-0.251 (0.34)	0.106 (0.53)
Model	Random	Random	Random
Hausman- Test chi2 [prob>chi2] – FE vs RE	3.60 0.3075	1.31 0.9335	2.42 0.6586
Wald chi3 Prob > chi2	257.19 0.0000	339.48 0.0000	257.30 0.0000
R-squared	0.70	0.76	0.71
Rho	0.90	0.94	0.92
Breusch & Pagan Lagrangian multiplier test	442.35 0.0000	413.22 0.0000	198 0.0000
Number of observations	113	113	113
Number of groups	7	7	7

TABLE 4: Results for panel regression models using random/fixed effects models

Table *4* illustrates the results of the direct impact of WEE on HCI through the three equations 1a, 1b and 1c. First, multicollinearity was tested using Variance Inflation Factor (VIF) and mean VIF for the three equations scored 2.27, 5.88, and 2.67, respectively (presented in Table *5*). According to Stine (Stine, 1995), a VIF value of 10 greater than 10 is considered a sufficiently large value to indicate the presence of a multicollinearity problem. Hence, the models still fall within an acceptable range.

Then, the models are tested to select for fixed effects or random effects using the Hausman test, which resulted in chi2 that is greater than 0.05 for models 1a and 1c. Hence, random effects model is considered for the aforementioned two models. Then, for models 1a and 1c we ran the Breusch and Pagan Lagrangian multiplier test to check if the random effects model was the best choice for our models or whether a pooling model would work more effectively. The two models are found to be significant at 1% level where Prob > chi2 is found to be less than 0.05%.

Model 1a shows that WEE, measured through female labor force participation (LnWLFP), has a positive and statistically significant effect on human capital at the 5% level. Specifically, a 1% increase in the female labor force participation rate is associated with a 0.21% increase in the HCI. The model also controls for GDP per capita (Lngdppc) and female self-employment (Lnselfemp), both of which are statistically significant. The positive coefficient for GDP per capita (0.112) indicates that a 1% increase in GDP per capita is associated with a 0.11% increase in human capital. Conversely, the negative coefficient for self-employment (-0.266) suggests that a 1% increase in female self-employment is associated with a 0.27% decrease in human capital. The R-squared value of 0.70 implies that the variables in Model 1a collectively explain 70% of the variation in the HCI, indicating a strong model fit. Finally, the Hausman test results across all three models show p-values greater than 0.05 (e.g., 0.3075 for Model 1a), indicating that random effects models are appropriate. Therefore, Model 1a, along with Models 1b and 1c, is correctly estimated using a random effects specification rather than fixed effects.

In addition to GDP per capita and self-employment, Model 1b adds more control variables to the analysis of human capital, including WBL and fertility. The findings show no significant relationship between WEE and human capital. Moreover, given an R-squared value of 0.70, it indicates that the female microfinance borrowers explain 70% of the variations in HCI. The coefficients of GDP per capita and self-employment are found to be similar to those in Model 1a, with a 1% rise in GDP per capita resulting in a 0.104% increase in human capital, while a 1% increase in self-employment leads to a drop of 0.24% in human capital. WBL is statistically significant with a coefficient of 0.131, while fertility is not significant.

Model 1c keeps GDP per capita and self-employment as control variables and WPE is added. The results reveal that WEE continues to have a statistically significant impact on the HCI at the 1% level of significance. Similarly, as observed in Model 1a, a 1% increase in the females' labor force participation rate is associated with a 0.20% increase in human capital. Similarly, the control variables of GDP per capita and self-employment also have the same significant impact on the HCI as in Model 1a. However, the coefficient estimate for WPE is found to be statistically insignificant. This suggests that the inclusion of WPE in the analysis does not appear to have a significant impact on the development of human capital.

In conclusion, the impact of WEE on the development of human capital has been investigated through running two random effects models. Results generally suggest a positive and statistically significant relationship between women's labor force participation rate and the improvement of human capital in models 1a and 1c. However, 1b showed that WEE does not seem to have a significant impact on human capital.

The three models also demonstrate the positive impact of GDP per capita on the development of human capital, which is found to be a statistically significant control variable. In contrast, the results indicate a negative impact of self-employment as a control variable on the improvement of human capital. Therefore, the findings of the aforementioned models suggest that promoting WEE, particularly through increasing their labor force participation rate, can have a positive impact on the development of human capital. Additionally, policies and interventions that promote economic growth and gender equality, as captured by GDP per capita can also contribute positively to the development of human capital. The negative impact of self-employment on human capital may warrant further investigation and the development of appropriate policy measures to address the issue.

Second: 2SLS Regression: Microfinance, Women Empowerment and Human Capital

Dependent variable: LnFLFP	(2a)	(2b)	(2c)
LnFemBor	0.039*** (0.00)	0.044*** (0.00)	0.039*** (0.00)
Lngdppc	-0.001 (0.92)	-0.000 (0.99)	0.013 (0.52)
Lnselfemp		0.074 (0.16)	0.077* (0.09)
LnWBL		-0.099* (0.09)	
Lnfertilityrate		0.07 (0.68)	
LnWPE			-0.109* (0.05)
Constant	2.415 (0.00)	2.693 (0.01)	2.265 (0.00)
Sanderson-Windmeijer Prob > F	7.05 (0.03)	8.34 (0.02)	6.66 (0.04)
Model	Random	Random	Random
Number of observations	113	113	113
Number of groups	7	7	7

TABLE 5: Results for first-stage G2SLS regression

G2SLS, two-stage GLS regression

The presented Table *5* displays the outcomes of a first-stage G2SLS model that examines the relationship between the dependent variable LnFLFP and the independent variable LnFemBor, as well as several control variables, including Lngdppc, Lnselfemp, LnWBL, Lnurban, and LnWPE. The findings indicate that LnFemBor has a statistically significant and positive effect on LnFLFP, with consistent coefficient estimates of 0.039, 0.044, and 0.039 across all three models ($p < 0.001$). Specifically, an increase of 1% in the number of female microfinance borrowers is associated with a significant increase in their labor force participation.

In our analysis using 2SLS regression to assess the robustness of our results, we conducted a Stock & Yogo test to further assess the robustness of our findings. This test is commonly used to check for the presence of weak instruments in 2SLS regression models (Stock and Yogo, 2002). We found that the p-value was less than 0.05, which indicates that we can reject the null hypothesis of weak instruments and conclude that our results are robust. This test provides additional support for the validity of our analysis and enhances

our confidence in the results obtained using 2SLS regression.

Dependent variable: LnHCI	(3a)	(3b)	(3c)
Ln□□□□	0.752* (0.07)	0.648* (0.08)	0.753* (0.08)
Lngdppc	0.078** (0.02)	0.077*** (0.00)	0.068* (0.02)
Lnselfemp	-0.252*** (0.00)	-0.221*** (0.00)	-0.241 (0.00)
LnWBL		0.184 (0.28)	
Lnurban		-0.20 (0.80)	
LnWPE			0.069*** (0.01)
Constant	-1.388 (0.22)	-1.016 (0.62)	-1.293 (0.29)
Model	Random	Random	Random
Hausman- Test chi2 [prob > chi2] – FE vs RE	0.22 0.9740	0.01 1.0000	0.05 0.9997
R-squared (within)	0.54	0.62	0.54
Rho	0.97	0.99	0.99
Number of observations	113	113	113
Number of groups	7	7	7

TABLE 6: Results for second-stage G2SLS regression

G2SLS, two-stage GLS regression

Table 6 displays second-stage 2SLS regression results for the three models which reflect equations [3a, 3b and 3c] respectively. Both fixed effects and random effects models were estimated to examine how microfinance impacts human capital by economically empowering women. The FE/RE choice for the three models was determined by employing the Hausman test, which resulted in p-values > 0.05 implying that the random effect model is more suitable for all three of them.

Firstly, model 3a is significant at the 1% level as Prob > chi2 is found to be less than 0.05. The estimated FLFP has a significant positive impact on the HCI. In other words, when the estimated rate of labor force participation rises by 1%, HCI improves by 0.75%. Furthermore, the findings reveal that GDP per capita and self-employment rate are statistically significant at the 5% and 1% significance levels, respectively. Specifically, GDP per capita has a positive effect on HCI, with a 1% increase in GDP per capita leading to a 0.08% improvement in HCI. In contrast, self-employment rate has a negative effect on HCI, with a 1% increase in self-employment rate resulting in a 0.25% decrease in HCI. The model's R-squared value is 0.54, indicating that the independent variables explain 54% of the variation in the outcome variable.

The results of Model 3b indicate that the inclusion of WBL and urbanization as control variables did not alter the positive and significant relationship between the estimated women's participation in the labor force and the HCI. The coefficient for FLFP remains positive and statistically significant at 10% level, indicating that a 1% increase in FLFP is associated with a 0.64% increase in HCI. Similar to the previous model, the coefficient estimates for gdppc and self-employment show that they both impact HCI, with a 1% rise in gdppc causing a 0.07% increase in HCI and a 1% increase in self-employment causing a 0.22% drop in HCI. Model 2b is statistically significant at 1% level as Prob > chi2 is less than 0.05.

Similar to the previous models, 3b is found to be also statistically significant at 1% level. FLFP has a positive and statistically significant relationship with HCI. The coefficient for FLFP suggests that a 1% increase in WEE is associated with a 0.75% increase in HCI. Moreover, the coefficients for gdppc and self-employment remain significant and maintain their relationship direction, where gdppc is positively related to HCI, while self-employment is negatively associated with it. The study also reveals that WPE is positively and significantly correlated with HCI at 1% level, with a coefficient estimate indicating that a 1% rise in WPE leads to a 0.06% increase in HCI.

Lastly, to ensure the robustness of the models used in this paper, the study opted to use and report robust standard error models to account for any potential biases or errors that may arise (Baltagi, 2011). Additionally, the research aimed to enhance the reliability of the findings by constructing several

econometric models with varied control variables, which could confirm that the relationship between the variables of interest generates consistent results and moves in the same direction. This approach was intended to strengthen the validity of the results obtained. Overall, the study employed various methods to ensure that the results were robust, reliable, and valid. By employing multiple econometric models and control variables, the study provided a more comprehensive understanding of the impact of microfinance on women's empowerment and human capital in the MENA region.

Discussion of findings: microfinance, women's empowerment, and human capital development

Utilizing the generalized two-stage least-squares regression analysis, this study's findings support Hypothesis 1 by demonstrating that microfinance can serve as an effective approach to enhancing human capital through economically empowering women. The findings of the three models employed in this study provide strong evidence for the validity of the microfinance intervention used in the first stage of the analysis. The results show a significant and robust relationship between the number of female active microfinance borrowers and women's labor force participation rate, which indicates that when the number of female active borrowers rises by 1%, the female labor force participation rate rises in parallel. This in fact validates the utilization of microfinance as a tool to foster WEE.

Subsequently, the predicted WEE, derived from the first stage, is employed as an independent variable in the second stage to quantify how WEE determined by microfinance impacts the human capital. In simpler terms, it improves years of schooling and returns to education. The results of the second stage indicate that WEE, determined by microfinance, has a statistically significant and positive impact on the HCI. It is noteworthy that the direct impact of WEE on human capital was examined to validate the congruence of the findings from both panel regression and 2SLS methods. The results confirm that WEE has a positive effect on improving human capital, which is consistent with the findings of both regression models.

To pertain the findings of the first-stage equation with previous literature, our results are aligned with Bhatt et al. (Bhatt et al., 2017), who found that WEE is significantly influenced by the intensity of loans and the duration of their membership in MFIs. This is due to the encouragement borrowers receive to invest in assets instead of using the loans for consumption.

Another study in which the relation between microfinance and women's empowerment was found to be significant is that of Datta and Sahu (Datta and Sahu, 2022), which demonstrated that the amount of microcredit given to women has traditionally been utilized for income-generating activities, such as establishing small businesses, which supports the economic, social, and psychological empowerment of women. Because of this, women's financial awareness, independence, and self-confidence in terms of having their own opinions and viewpoints are increasing. Moreover, women have been able to improve their financial situation and develop their entrepreneurial abilities through utilization of microcredit for income-generating reasons, which has increased their level of independence and control over their lives.

Additionally, consistent with our findings, Tariq and Sangmi examine the impact of microfinance on women's empowerment by comparing the outcomes of new and established female microfinance borrowers (Tariq and Sangmi, 2020). Results demonstrate that women's participation in microfinance programs leads to improvements in income, savings, and asset generation. Another study (Mengstie, 2022) that supports our findings proves that WEE is boosted by the credit amount received after joining microfinance programs; also, their asset ownership grows after joining microfinance programs compared to before joining those programs.

The research conducted by El Hadidi is relevant to this study (El Hadidi, 2018), as it investigates the effects of microfinance on various dimensions of women's empowerment in Egypt, which is one of the countries analyzed in this study. The paper found that microfinance has a significant positive effect on all dimensions of empowerment studied. However, the paper suggests that despite this positive relationship between microfinance and economic empowerment, the impact remains limited. The study explains that this limitation may be due to the nature of the projects and their mechanisms, which may not provide sufficient market expansion opportunities for localized women's projects, resulting in lower loan amounts for women compared to men. Additionally, women involved in such projects may lack the knowledge and skills to capitalize on broader market opportunities. Therefore, the study suggests that the Egyptian government should consider strategies to provide more opportunities for women to boost their economic multipliers through microfinance programs. Such initiatives may involve providing mentoring and training to aid in the growth and development of enterprises with potential for broader market reach. In contrast, the paper (Asim, 2009) provided significant and robust evidence that the microcredit intervention in Pakistan had no impact on decisions related to child-rearing, health, economics, and social mobility; the paper argued that women in Pakistan have reached a threshold of independence within societal structural norms, meaning that microcredit will only have a minor effect on these metrics.

In relation to the second-stage equation, our findings indicate that WEE significantly positively impacts

human capital. In other words, the higher the rate of women's participation in the labor force, the higher the years of schooling and returns to education. Our study's results are consistent with those of De Hoop et al. (De Hoop et al., 2018), which examined the impact of WEE on the accumulation of their children's human capital. The study found that rural women's participation in productive cash programs led to increased decision-making power, particularly in educational matters related to their children, in which children were more likely to attend school and less likely to engage in work or domestic chores. Hence, the study suggests that the positive impact of the program on children's human capital is due to the combined effect of women's increased decision-making power and the income generated from the productive transfer.

A study (Afridi et al., 2016) is also in line with the findings of this paper, showing that female labor force participation through microfinance programs has a positive and significant impact on their children's grade progression and time spent in school. The study provides evidence that a woman's preferences and decision-making power can be an important factor in improving her children's educational outcomes when her involvement in such programs is expanded. The positive impact of women's empowerment on children's education has been found to be linked to their improved position in household decision-making processes. These results are also aligned with the findings of De Hoop et al. (De Hoop et al., 2018), which suggest that women's improved position in household decision-making processes is the reason behind the positive impact of WEE on children's education and overall human capital development. Another study (Durrant and Sathat, 2000) is consistent with our findings, which also confirms that improvements in women's status at the individual and community levels, particularly in terms of their enhanced position within the household, can have positive effects on their children's well-being. Such effects can include improvements in child survival rates and increased school attendance.

Theoretically, microfinance aims to assist women in breaking the cycle of poverty and gaining access to enhanced economic opportunities. However, evidence suggests that its outcomes are not always uniformly positive. A study (Salia et al., 2018) indicates that economic empowerment for women may often lead to or exacerbate issues such as polygyny, family conflicts, and negative impacts on the education and well-being of young girls. These issues effectively cancel the benefits of microfinance, rendering it ineffective in improving the lives of women and their families.

Therefore, the findings from the first stage of this study are consistent with various empirical studies that demonstrate the positive impact of microfinance on WEE, such as increasing access to assets and savings and establishing new businesses. However, some studies show negative relationships between the variables of interest, which may be due to women reaching a certain level of empowerment that is limited by cultural norms and societal structures. In such cases, microfinance may not be able to further enhance WEE. In addition, the findings from the second stage of this study are consistent with several papers that suggest the positive impact of WEE through microfinance on their decision-making abilities at the household level, which can further improve the well-being of their children, particularly in terms of their educational attainment. However, one study argues that microfinance's aim to empower women may have unintended consequences that can harm them rather than benefit them at the household level, ultimately leading to negative outcomes for their children, particularly in terms of education.

It is important to note that the existing literature predominantly investigates the relationship between microfinance and women's empowerment, women's empowerment and human capital, or microfinance and human capital in isolation. In contrast, our research makes a valuable contribution by exploring the interconnections between these three variables. Specifically, our study establishes a significant positive relationship between microfinance and women's empowerment, which, in turn, has a positive influence on human capital. This finding is a novel contribution to the literature, as the relationship between microfinance, women's empowerment, and human capital has been scarcely examined in previous research. Therefore, our research provides a unique and valuable insight into the complex interplay between these variables in the MENA region and highlights the importance of considering all three variables together in future research and policy development.

Regarding the direction for future research, this paper stresses the significance of further examining the effect of microfinance on children's education, with a focus on gender disaggregation. This is crucial for determining whether one gender is impacted by WEE through microfinance more than the other. Such studies can shed important light on the potential of microfinance to reduce gender differences in educational results and support outcomes that are more equal for both boys and girls. We recommend conducting further research in this area to gain a deeper understanding of the complex relationships between microfinance, women's empowerment, and children's education.

In addition, this paper proposes that future research and further analysis can be conducted on the variables of interest by examining the effects of various microfinance products and services, such as microcredit, savings accounts, and financial literacy programs, on the economic empowerment of women. This will enable researchers and policymakers to identify the magnitude of the influence that different microfinance interventions have on economically empowering women and children's education.

It is also important to analyze the impact of microfinance on the achievement of decent work for women, particularly within the framework of Sustainable Development Goal 8 (SDG8): Decent Work and Economic Growth. SDG 8 emphasizes the need for inclusive and sustainable economic growth that generates productive employment and decent work for all. The concept of Decent Work, as outlined by the International Labour Organization, encompasses a range of indicators, including safe and secure working conditions, fair wages, reasonable working hours with sufficient rest, access to health insurance, and respect for family and cultural values (Ghoneim, 2021). The extent to which microfinance leads to decent work conditions is still under researched debate and requires deeper empirical examination. Moreover, it would be interesting to evaluate the role of microfinance under crises. A number of literature evaluated the role of microfinance during COVID (Ashari et al., 2024), (Sharma et al., 2021), and (Zheng and Zhang, 2021). Still, literature is needed to evaluate the role of microfinance in mitigating the pandemic effect, especially in developing countries where employment and inclusiveness were affected (Ghoneim, 2023).

Conclusions

In conclusion, this paper investigates how microfinance enhances WEE, which in turn strengthens human capital, particularly through improvements in children's education and skills. Conducting the analysis in the context of the MENA region, the study provides evidence of microfinance as a catalyst for inclusive and sustainable growth, as it establishes a clear link between financial access, empowerment, and developmental outcomes. Using panel regression, the findings show that empowered women significantly improve their children's human capital, while the 2SLS analysis confirms that microfinance positively and significantly increases women's empowerment and, in turn, human capital outcomes. These results demonstrate the value of financial inclusion as a pathway to socio-economic development. To the best of our knowledge, this paper is among the first to examine the interaction of microfinance, women's empowerment, and human capital in the MENA context, adding new insights to the literature on microfinance and development.

Respectively, microfinance can serve as a sustainable instrument with the potential to advance several of the United Nations' SDG, including poverty reduction, economic growth, and the promotion of decent work. In parallel, policymakers should prioritize initiatives that enhance women's participation in the labor force by improving access to education, vocational training, and employment opportunities, irrespective of financial status or geographic location. Governments play a crucial role in fostering equal access to these opportunities and may consider targeted measures, such as financial incentives or scholarship programs, to equip women with the skills and knowledge required to meet labor market demands. By advancing policies that strengthen WEE, governments can contribute to more inclusive, equitable, and sustainable societies.

Moreover, it is also urged that MFIs operating in the MENA region engage closely with local communities and educational institutions to offer extensive training programs and initiatives that go beyond providing credit. These initiatives ought to educate women on the significance of supporting their children's education. These efforts, which teach women how to prioritize their children's education and access educational resources, can take various forms, including workshops, seminars, and training sessions. MFIs may be crucial in advancing education and empowering women in the area by giving such projects first priority.

One of the primary limitations of this study is the availability of data for the MENA region, as some countries were missing from the beginning and others lacked certain observations during the examined time period. The study was only able to access data from seven MENA countries. As a result, the findings of this study may not be generalizable to the region as a whole. However, it is possible that examining the same topic for a single country in the region could offer greater clarity regarding the relationship between microfinance, WEE, and human capital.

Moreover, due to the limited availability of data, the researcher was unable to capture time-lagged results in the study. These time-lagged results would have been valuable in establishing a stronger causal relationship between the variables of interest. Specifically, since the increase in the number of female borrowers at a macro level is not expected to have an immediate impact on human capital within the same year, analyzing the effects over a longer time would have provided a more comprehensive understanding of the long-term implications.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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