

# Analysis of the impact of financial inclusion and FinTech on youth labour force participation in the MENA region

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## Abstract

This study examines the determinants of financial inclusion and FinTech, and then evaluates their effects on youth labour force participation in the MENA region. The World Bank's Global Findex 2021 database was used to perform probit estimations and propensity score matching. The results show that young people with higher education levels, higher incomes, mobile phones and Internet access are more likely to be included in the traditional and digital financial systems. In addition, barriers to financial inclusion encompass a lack of documentation, religious constraints and the costs associated with financial services. Furthermore, examining the effect of financial inclusion and FinTech reveals that having formal bank accounts and mobile money accounts, as well as savings, formal loans, and digital transactions, has a significant impact on young people's participation in the labour force.

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## Keywords

- financial inclusion
- FinTech
- labour force
- propensity score matching
- MENA

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## Introduction

Youth is a pivotal stage in an individual's life, where they begin shaping their future and establishing their role in society (Sykes et al., 2016). Particular attention must be given to young people, as they are the builders of tomorrow, an essential component of the global workforce, but also a natural resource that requires investment (Bessant & Cook, 1998). Youth participation in the labour market is not only critical for their personal growth but also for driving economic prosperity (Aslan, 2019). However, the persistent lack of decent job opportunities, exacerbated by rapid population growth in developing countries, creates an urgent need for sustainable economic solutions (ILO, 2024). This challenge is further intensified by the global nature of youth unemployment, which continues to be a widespread and entrenched crisis (Denny & Churchill, 2016). Addressing this issue is essential, as providing meaningful employment opportunities for young people is key to fostering both individual empowerment and broader economic development.

The GET for Youth 2024 report indicates that despite a decline in the youth unemployment rate to 13% in 2023, nearly 20.4% of young people worldwide are classified as NEET (neither in employment, education, nor training). Additionally, the report highlights that the Arab States and North Africa are among the most affected regions, with over one in three economically active young people being unemployed in 2023, illustrating the magnitude of the challenges, especially in low-income countries. This shows that despite efforts to promote a linear transition of young people into the labour market from school to work, the reality is that this transition is far from linear, due to challenges and barriers that make their trajectory less predictable and more complex than policies assume (Denny & Churchill, 2016).

Financial inclusion has attracted increasing attention from international organizations and policymakers in recent years. It has become a priority for achieving the Sustainable Development Goals (Shen et al., 2023) and a catalyst for inclusive growth and socioeconomic development, particularly in developing countries (Niaz, 2021). Several studies have highlighted financial inclusion as an effective mechanism for combating youth unemployment and vulnerability, primarily by fostering entrepreneurship and creating work opportunities for the young (Claessens & Perotti, 2007; Elouaourti & Ibourk, 2024a). Financial inclusion is thus seen as a critical tool for unlocking the potential of young people to drive sustainable transformation and inclusive development (Wilson, 2021).

In addition, the digitalisation of financial services has emerged as a powerful lever for extending access to financial services to hitherto underserved groups, such as women and youth (Elouaourti & Ibourk, 2024a). This digital shift facilitates the integration of the informal economy and contributes to

poverty reduction by creating new opportunities for economic empowerment (Elouaourt & Ibourk, 2024b; Xu et al., 2023).

The impact of financial inclusion and FinTech on youth participation in the labour market has, to our knowledge, not been sufficiently explored in the Middle East and North Africa (MENA)<sup>3</sup> region. This study aims to fill this gap by providing new empirical evidence on how access to financial services and digital financial technologies influences youth engagement in the labour market.

Interest in this subject arises from the fact that the MENA region, notably its lower-income countries, continues to experience high unemployment rates, with an overall rate of around 12% of the total labour force and 28% among those aged 15 to 24 (World Bank Database, 2021). This highlights the persistent barriers to youth participation in the labour market. Despite some progress in financial inclusion within the MENA region, marked by a 9% increase in formal account ownership, a 3% rise in formal savings, and a 15% growth in formal credit, alongside a 20% boost in digital transactions and a marginal 1% increase in mobile money accounts in 2021 compared to 2017 (World Bank Group, 2021), these levels remain relatively low compared to regions such as Latin America and the Caribbean, Emerging Asia, and Emerging Europe (Ndoye & Barajas, 2022). The situation for young people in the MENA region is particularly concerning, with only 33% of those aged 15–24 holding a bank account and just 7% owning a mobile money account (World Bank Group, 2021).

The contribution of this research lies in its focus on youth, a group largely underrepresented in previous studies on financial inclusion in the MENA region, and in its examination of the role of FinTech in facilitating economic participation. Thus, this study provides valuable insights that can inform policy interventions aimed at promoting youth employment and economic empowerment.

In this regard, to address our research question, Section 1 begins with a review of the literature. Section 2 then presents the data and methodology used in the study. Section 3 is devoted to the results, and the final section provides the conclusions.

## **1. Literature review**

It is increasingly recognised that access to financial services can facilitate the transition to employment and greater economic security by facilitating entrepreneurship, savings, investment in education, training, and access to credit to

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<sup>3</sup> Middle East and North Africa (MENA) include: Algeria, Bahrain, Djibouti, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Malta, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, United Arab Emirates, Palestine, and Yemen.

start a business (Banerjee et al., 2015) or to finance income-generating activities (Lyons & Contreras, 2017). Thus, this literature review aims to examine previous work analysing the determinants of access to, and use of, traditional and digital financial services and their effects on youth labour market participation.

### **1.1. Determinants of youth financial inclusion and access to FinTech**

There is no universally agreed international definition of financial inclusion. However, it is generally accepted that financial inclusion is a multidimensional concept that encompasses access, use, availability and quality of financial products and services (Cámara & Tuesta, 2014). These services are essential for promoting economic development, reducing poverty, and improving resilience to financial shocks. Moreover, in light of technological evolution and innovation, the financial sector has responded to this dynamic by giving rise to digital financial services and Financial Technology (FinTech). Digital financial services encompass financial services, products and infrastructure accessed and delivered via digital platforms and mobile apps, and they are typically offered by FinTech companies and innovative financial service providers (Ozili, 2018).

Young people often encounter various barriers when seeking to access formal financial services. These obstacles include regulatory and policy constraints, such as age restrictions for opening accounts and stringent identification requirements, as well as minimum balance requirements imposed by banks (Babajić et al., 2018). Chowa et al. (2015) emphasise that a supportive regulatory environment is essential to ensure the widespread availability of youth products in formal financial institutions. Also, Ndungu and Moturi (2020) indicate that factors such as organisational size, resource availability, and the regulatory environment significantly influence the adoption of mobile FinTech. Furthermore, high service costs deter young people from engaging with financial institutions (Iyambo, 2020). The geographical distance of financial institutions, particularly in rural areas where banking infrastructure is limited or non-existent, exacerbates this issue (Mossie, 2022). Addressing these barriers is crucial for promoting broader financial inclusion and FinTech access among young people, thereby enhancing their economic empowerment and resilience (Asuming et al., 2018).

On the demand side, several sociodemographic, psychological, cultural and religious factors influence young people's access to formal and digital financial system. According to Zins and Weill (2016), older men with higher levels of education and income are more likely to benefit from financial inclusion. Koloma (2021) finds that financial inclusion of youth in Mali is facilitated by factors such as stable employment, higher education level and high-income

levels. Other findings also indicate that being in the labour market and having a high level of education in Tanzania increases youth's chances of holding a current account or savings account with a formal financial institution (Kazungu & Njau, 2023). In addition, inequality in access to FinTech is also explained by sociodemographic factors such as gender, age, education and income (Elouardighi & Oubejja, 2023; Zins & Weill, 2016). Psychological factors, including trust in financial institutions and risk perception, also play a significant role. Some young people may choose not to engage with formal financial services because a family member already holds an account or due to insufficient funds (Babajić et al., 2018). Additionally, perceptions of hidden fees and a lack of transparency contribute to self-exclusion. Cultural and religious norms can also influence access to the formal financial system. For example, 18% of those excluded from the financial system in Jordan cite religious reasons for not having a bank account, highlighting the need for Islamic banking solutions (MED Confederation, 2021).

Financial literacy is a crucial determinant of financial inclusion. Williams and Oumlil (2015) indicate that students are often excluded from the formal financial sector due to a lack of financial knowledge, highlighting the need for improved educational initiatives. Sakanko et al. (2023) advocate for the integration of financial literacy into school curricula to encourage broader use of financial services, especially digital ones. Berguiga and Adair (2023) demonstrate that educating young people about financial products and services is critical for their engagement with FinTech. Fanta and Mutsonziwa (2021) confirm that financial literacy is a powerful driver of inclusion, enabling young people to understand and use FinTech services better.

The availability of technology and internet infrastructure is, in turn, essential for promoting financial inclusion and access to FinTech (Ndungu & Moturi, 2020). Bekele (2022) highlights that access to mobile phones and internet services plays a significant role in expanding financial inclusion in countries such as Kenya and Ethiopia. Furthermore, Vangvaidi (2024) points out that digital infrastructure remains one of the most important factors for fostering financial inclusion. The proliferation of mobile phones in Africa has made financial services more accessible, reducing geographical and economic barriers to traditional financial inclusion and also to digital financial inclusion for young people (Elouaourti & Ibourk, 2024a).

## **1.2. Financial inclusion, FinTech access and youth participation in the labour market**

Young people are a valuable workforce for various occupational sectors, thanks to their mobility, mental agility and digital skills. However, the devel-

opment of this workforce depends not only on socio-demographic factors such as race, gender, place of residence and level of education, geographical characteristics, and infrastructural factors, but also on the financial system of a given territory. These factors influence youth decisions and labour market participation (Alikperova et al., 2019).

Financial inclusion allows young people to invest in their education, skills development, start businesses activities (Kazungu & Njau, 2023), and manage their finances effectively (OECD, 2020). As young people enter the labour market, their engagement with financial institutions can have a significant impact on their employment prospects (Sykes et al., 2016). They also help reduce the gender income gap (Kede Ndouna & Zogning, 2022) and strengthen the economic empowerment of individuals and businesses (Elouaouarti & Ibourk, 2024a). Additionally, employees typically need a bank account to receive wages, as employers prefer direct deposit as a way of ensuring transaction security and traceability (Leyshon & Thrift, 1995). Therefore, addressing financial exclusion has become increasingly essential in promoting economic participation and security.

Furthermore, according to Lyons and Contreras (2017), financial inclusion helps young people create their own jobs when they cannot find work through traditional means. Cho and Honorati (2014) conducted a meta-regression on youth entrepreneurship programmes in developing countries, highlighting credit constraints as a significant barrier preventing young people from starting income-generating activities. Similarly, a randomised evaluation of a group-lending microcredit programme in Hyderabad, India found that while microcredit uptake increased by 8.4 percentage points, the impact on household outcomes varied. Investments and profits from existing small businesses rose, but overall household consumption did not show significant change (Banerjee et al., 2015). Alongside these findings, others have suggested that financial exclusion, particularly among young people, restricts opportunities for successful entrepreneurship (Markel & Panetta, 2014).

Several studies have suggested that access to financial services via digital platforms can promote economic participation, entrepreneurship and investment. Izzo et al. (2022) indicate that the FinTech sector has benefited most from the digital revolution and that, if managed properly, it can provide significant advantages in terms of employment, particularly for the youth population, and foster greater financial inclusion worldwide. Other authors have revealed that young Nigerians have benefited from virtual currencies (Bitcoin) to create jobs and generate wealth (Onyekwere et al., 2023). Koomson et al. (2022) find that mobile money significantly enhances entrepreneurship, particularly among young people. Alongside these findings, Sesabo and Mkuna (2024) suggest that improving the well-being of this group requires strengthening capabilities related to mobile financial services, as well as training, awareness-raising, and access to financial resources.

However, other authors have reported findings indicating a negative impact of financial inclusion on employment. For instance, Arcand et al. (2013) revealed that MEDA's Youth Invest initiative in Morocco, aimed at enhancing youth skills, financial literacy, and facilitating the opening of formal savings accounts, negatively impacted employment outcomes. Similarly, Grimm and Paffhausen (2015) found that microcredits were not an effective tool for job creation across 54 countries, primarily in Latin America, because most micro-finance programmes focused more on stabilising incomes than on generating new employment opportunities.

Conversely, while financial inclusion influences youth participation in the labour market, it is important to acknowledge the potential for reverse causality (Lyons & Contreras, 2017). Indeed, while financial inclusion can promote youth labour market participation by providing the necessary resources for skills development, job search, or entrepreneurship, it is equally plausible that young individuals already active in the labour market may have better access to financial services due to their employment status (Berguiga & Adair, 2023). Young people in work are more likely to engage with formal financial systems. However, the analysis by Lyons and Contreras (2017) examining the relationship between entrepreneurship and financial inclusion among young people revealed that the direction of causality is more likely to flow from financial inclusion to entrepreneurial spirit, rather than the reverse. This bidirectional relationship underscores the importance of creating supportive financial ecosystems that enable youth to actively participate and facilitate their integration into the labour market. In the long term, this contributes to sustainable economic growth and poverty reduction (Demirgüç-Kunt & Singer, 2017).

Given these mixed results, this study aims to evaluate the impact of different dimensions of financial inclusion and FinTech access on youth labour force participation in the MENA region. The objective is to determine how these financial tools and services contribute to improving youth employability and economic integration within the region.

## **2. Data and methodology**

### **2.1. Data and variables**

This study aims to examine the determinants of youth inclusion in formal and digital financial systems and assess their causal effect on youth labour force participation in the MENA region. The youth category encompasses people aged between 15 and 35. The measurement of financial inclusion involves having a bank account, saving, and borrowing from a financial institu-

tion, while FinTech is measured by having a mobile account and receiving or making digital payments. Labour force participation is measured by the “workforce” denoting whether individuals are engaged in work-related activities.

The data used in this research is sourced from the World Bank’s Findex survey database for 2021. We focused our study on MENA countries (excluding high-income countries). The analysed countries include Algeria, Egypt, Iran, Iraq, Jordan, Lebanon, Morocco, Tunisia, and the West Bank and Gaza. The total sample comprises 9,052 individuals, of which 4,655 are young people.

## 2.2. Methodology

To test empirically the effect of financial inclusion and FinTech on youth labour force participation, we classified these people into two groups: the first (experimental group) included youth with access to the formal and digital financial systems, while the second (control group) included youth excluded from the formal and digital financial systems. Given that the randomization condition is not respected in our dataset, the results of the study can be influenced by selection bias. Therefore, like Koloma (2021), we applied the propensity score matching (PSM) method developed by Rosenbaum and Rubin (1983). This approach controls selection bias and provides a more relevant estimate of the average treatment effect (ATT) on individuals studied (Lecocq et al., 2016). However, while PSM is effective in mitigating biases stemming from observable variables, it does not fully address concerns related to omitted variable bias and reverse causality. The absence of instrumental variables remains a limitation, but PSM still significantly reduces biases associated with the selection of observables.

To perform the analysis, we followed three steps. The first is to use a probit model to estimate conditional probability, i.e. the propensity score denoted  $P(x_i)$ , so that each individual is exposed to the  $D_i$  treatment (in this case, holding a bank account, saving with a financial institution, borrowing from a financial institution, holding a mobile money account, and making or receiving digital payments). This estimation is based on the observable characteristics  $x_i$  of individuals, including age, age squared, gender, education level, income quintile, barriers to financial inclusion, and access to technology. Therefore:

$$P(x_i) = P(D_i = 1 \mid x_i)$$

$P(x_i)$  – propensity score,

$D_i$  – treatment status (1 – the youth is included in the formal and digital financial systems, 0 otherwise),

$x_i$  – the vector of observable characteristics of youth  $i$ .



Secondly, this study applies a combination of propensity score matching techniques, including nearest neighbour matching, kernel matching and radius matching, to ensure that individuals in the treatment and control groups are appropriately paired based on similar propensity scores. Nearest neighbour matching assigns each treated observation to the closest control observation based on propensity scores, minimising bias. However, this approach can result in suboptimal matches if there are significant differences between covariates in the two groups (Abadie & Imbens, 2006). Kernel matching, on the other hand, assigns weights to control observations using a kernel function, improving data utilisation and reducing variance by considering all available control units (Heckman et al., 1998; Jann, 2017). Radius matching limits the selection of control units to those within a specific distance from treated observations, thereby avoiding overly distant matches, although the risk of improper matching remains if the radius is too wide or too narrow (Dehejia & Wahba, 2002).

The third step estimates the causal effect of financial inclusion and FinTech on youth participation in the labour force by calculating the average treatment effect on members of the experimental group. The treatment effect for individual  $i$  is  $Y_{1i} - Y_{0i}$  and the average treatment effect is expressed as:

$$\begin{aligned} \tau &\equiv E\{Y_{1i} - Y_{0i} \mid D_i = 1\} = E\left[E\{Y_{1i} - Y_{0i} \mid D_i = 1, P(x_i)\}\right] = \\ &= E\left[E\{Y_{1i} \mid D_i = 1, P(x_i)\} - E\{Y_{0i} \mid D_i = 1, P(x_i)\} \mid D_i = 1\right] \end{aligned}$$

### 3. Results and discussion

#### 3.1. Descriptive analysis

Table 1 presents the main descriptive statistics for the MENA region data. The average age of the youth population was approximately 26 years, with an almost equal distribution between men (52%) and women (48%). In terms of education level and income level, 58% had attained a secondary level of education, while 24% reported having a high income. Additionally, there is a marked predominance of individuals residing in urban areas (93%), reflecting the global trend towards urbanisation. Access to technology is also noteworthy, with 94% owning a mobile phone and 87% having internet access.

Despite the presence in urban areas and their commitment to technology, young people in MENA still face challenges of financial inclusion. 38% of respondents reported having a formal bank account, while access to formal savings accounts was limited to 10%. Borrowing from financial institutions was

Table 1. Descriptive statistics

Variables	Observations	Minimum	Maximum	Mean	Standard deviation
<b>Labour force participation</b>					
Workforce	4,655	0	1	0.59	0.491
<b>Socio-demographic characteristics</b>					
Female	4,655	0	1	0.48	0.500
Male	4,655	0	1	0.52	0.500
Age	4,655	15	35	25.58	5.767
Urbanicity	4,655	0	1	0.93	0.250
Education_Primary	4,655	0	1	0.21	0.407
Education_Secondary	4,655	0	1	0.58	0.493
Education_Tertiary	4,655	0	1	0.21	0.407
Income quintile_Poor 20%	4,655	0	1	0.15	0.361
Income quintile_Second 20%	4,655	0	1	0.19	0.390
Income quintile_Middle 20%	4,655	0	1	0.20	0.401
Income quintile_Fourth 20%	4,655	0	1	0.22	0.411
Income quintile_Richest 20%	4,655	0	1	0.24	0.428
<b>Financial inclusion</b>					
Formal account	4,655	0	1	0.38	0.484
Formal savings	4,655	0	1	0.10	0.298
Formal credit	4,655	0	1	0.05	0.224
<b>FinTech</b>					
Mobile money account	4,655	0	1	0.07	0.250
Made or received a digital payment	4,655	0	1	0.31	0.462
<b>Barriers to financial inclusion</b>					
Too far	4,655	0	1	0.08	0.271
Too expensive	4,655	0	1	0.18	0.386
Lack documentation	4,655	0	1	0.10	0.296
Lack trust	4,655	0	1	0.16	0.365
Religious	4,655	0	1	0.09	0.283
Lack money	4,655	0	1	0.85	0.362
Family member	4,655	0	1	0.13	0.340
No need	4,655	0	1	0.27	0.445
<b>Technology access</b>					
Mobile owner	4,655	0	1	0.94	0.237
Internet access	4,655	0	1	0.87	0.341

Source: authors' calculations, based on Findex 2021 data.

even less common, with just 5% of young people utilising these services. A lack of money is cited by 85% of the financially excluded as the main reason for not having a bank account, highlighting tangible barriers to accessing traditional financial services.

Almost 59% of participants were either employed or actively seeking employment, with a majority being men (69%). Among young people active in the labour market, 48% held a bank account, though access to formal savings remained low at only 13%. Nearly 40% were involved in digital financial transactions.

### **3.2. Determinants of financial inclusion and FinTech use**

Given that we had five treatments (formal current account, formal savings, formal borrowing, mobile money account, and digital transactions), we estimated five probit models to obtain the propensity scores. The results (Table 2) show that all the estimated models are significant. Financial inclusion largely depends on sociodemographic variables, which is consistent with other researchers' findings (Ezzahid & Elouaourti, 2021). As young people grow older, they tend to hold current accounts, rely on formal credit, but are less likely to utilize formal savings. Moreover, the findings also reveal that younger individuals are more likely to access FinTech by owning mobile money accounts and using digital transactions.

Young people with higher education are more likely to access financial services (both traditional and digital) than their peers. This can be explained by the fact that educated individuals are capable of assessing the benefits and opportunity costs associated with the use of financial services (Stănescu & Gikay, 2020). Young people living in urban areas are more likely to have a bank and mobile money account, but are less likely to use formal savings services than those living in rural areas.

Young women were found to be less likely to be financially included and to access FinTech. These findings are consistent with other studies that have demonstrated significant gender gaps in financial inclusion in the MENA region (Özşuca, 2019). Similarly, other studies show that borrowing conditions vary by gender, which has consequently excluded women from accessing bank loans (Antonijević et al., 2022). Other authors explain the differences between men and women by pointing out that women are more likely to favour informal financial services (Hasler & Lusardi, 2017). Moreover, the findings related to FinTech access through holding a mobile money account and executing or receiving digital payments are consistent with previous studies showing that men are more likely to use digital banking services (Lee et al., 2022), but these are contrary to the conclusions of Ameme (2015), who as-

**Table 2. Estimating propensity scores for financial inclusion and FinTech use among young people**

Variables	Formal account	Formal savings	Formal credit	Mobile money account	Made or received a digital payment
<b>Sociodemographic characteristics</b>					
Female	-0.261*** (0.0445)	-0.193*** (0.056)	-0.150** (0.064)	-0.345*** (0.061)	-0.275*** (0.043)
Age	0.073** (0.0395)	-0.142*** (0.049)	0.034 (0.062)	-0.119** (0.048)	-0.024 (0.037)
Age squared	-0.001 (0.000)	0.002*** (0.000)	0.000 (0.001)	0.002** (0.000)	0.000 (0.000)
Urbanicity	-0.182** (0.103)	0.203* (0.111)	-0.121 (0.142)	-0.299** (0.144)	-0.147 (0.093)
Education_Secondary	0.221*** (0.062)	0.247*** (0.089)	0.067 (0.087)	0.095 (0.084)	0.235*** (0.061)
Education_Tertiary	0.693*** (0.073)	0.583*** (0.097)	0.327*** (0.098)	0.319*** (0.098)	0.673*** (0.071)
Income quintile_ Second 20%	0.023 (0.078)	0.054 (0.119)	-0.066 (0.110)	0.014 (0.114)	0.059 (0.077)
Income quintile_ Middle 20%	0.058 (0.077)	0.199* (0.111)	-0.039 (0.105)	-0.011 (0.113)	0.098 (0.075)
Income quintile_ Fourth 20%	0.143** (0.076)	0.126 (0.111)	-0.150 (0.109)	0.108 (0.108)	0.091 (0.075)
Income quintile_ Richest 20%	0.446*** (0.073)	0.634*** (0.105)	-0.071 (0.105)	0.321*** (0.105)	0.433*** (0.072)
<b>Barriers to financial inclusion</b>					
Too far	-0.343** (0.145)	-0.029 (0.162)	-0.069 (0.152)	0.166 (0.127)	-0.086 (0.112)
Too expensive	-1.313*** (0.093)	-0.879*** (0.125)	-0.205** (0.098)	-0.336 (0.104)	-0.884*** (0.078)
Lack documentation	-0.881*** (0.145)	-0.662*** (0.193)	-0.188 (0.144)	-0.092 (0.121)	-0.481*** (0.107)
Religious	-0.713*** (0.146)	-0.538*** (0.198)	-0.258* (0.156)	0.118 (0.115)	-0.270** (0.105)
Lack money	1.652*** (0.112)	0.986*** (0.133)	0.643*** (0.142)	0.430*** (0.098)	1.140*** (0.085)
<b>Technology access</b>					
Mobile owner	0.275** (0.121)	-0.080 (0.166)	0.086 (0.181)	0.678** (0.271)	0.366*** (0.126)

Table 2 cont.

Variables	Formal account	Formal savings	Formal credit	Mobile money account	Made or received a digital payment
Internet access	0.447*** (0.080)	0.579*** (0.132)	-0.003 (0.106)	0.402*** (0.129)	0.451*** (0.081)
Constant	-3.802*** (0.524)	-1.280** (0.642)	-3.127*** (0.812)	-1.457** (0.644)	-2.401*** (0.485)
Number of observations	4,655	4,655	4,655	4,655	4,655
Wald chi <sup>2</sup>	693.15	297.74	100.06	132.89	656.80
Prob > chi <sup>2</sup>	0.000	0.000	0.000	0.000	0.0000
Pseudo R <sup>2</sup>	0.304	0.166	0.071	0.072	0.1964

Note: Standard errors in parentheses, statistical significance: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Source: authors' estimates, based on FINDEX data (2021).

serts that gender does not have a significant influence on the adoption of digital banking services.

In addition, belonging to the highest income bracket increases the likelihood of holding a traditional and digital bank account, as well as saving and conducting digital transactions, although this category is excluded from formal credit. This aligns with the findings of Triki and Faye (2013), who found that, on average, adults in the highest income quartile were nearly four times more likely to have a formal bank account than those in the lowest income quartile. Similarly, as Akileng et al. (2018) suggest, individuals without a stable and substantial income have little incentive to open a savings account and are unlikely to qualify for loans, making them the most vulnerable to financial exclusion. It is also demonstrated by Lyons and Kass-Hanna (2019) that young people, women, individuals with lower levels of education, and the poor continue to face significant barriers to financial inclusion in the MENA region.

Furthermore, the main determinants of financial exclusion among young people are lack of documentation, religious considerations, and the costs associated with financial services. However, the lack of money among young people is associated with a greater likelihood of holding a traditional and digital bank account. In addition, these individuals also tend to make greater use of formal savings and credit than their counterparts.

Access to technology plays a determining role in the likelihood of having a bank account and accessing technological financial services. This is consistent with the findings of Evans (2018), which indicate that the increase in internet and mobile phone usage is associated with greater financial inclusion.

Similarly, Lyons and Kass-Hanna (2019) show that people living in MENA countries with high levels of financial education and better financial and technological infrastructure are associated with better financial inclusion outcomes.

### 3.3. Bias reduction test

After obtaining the propensity scores using the probit model, we examined the overlap between the distributions of the propensity scores of the experimental and control groups. An adequate overlap is required to ensure that the matching method is applicable and that the two groups are comparable. In fact, the visualisation of the Figures 1 and 2 reveals slight differences (particularly in the treatment of formal savings). However, they generally confirm the achievement of a good balance. Therefore, to ensure that the matching reduces the biases initially observed and to examine the reliability of our analysis, we carried out a bias reduction test, using the kernel matching technique to match the young people included in the traditional and digital financial systems to the excluded who had the closest propensity score. This approach is equivalent to comparing the means (or percentages) between the experimental and control groups.

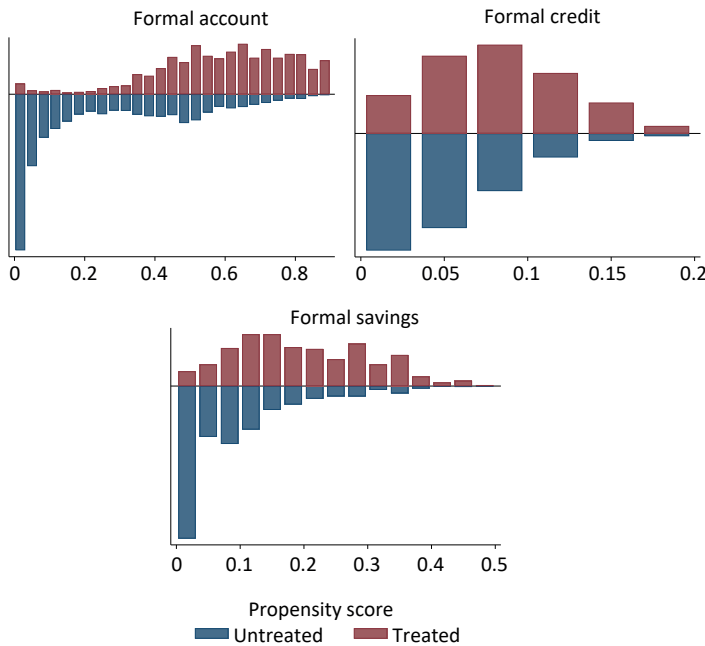
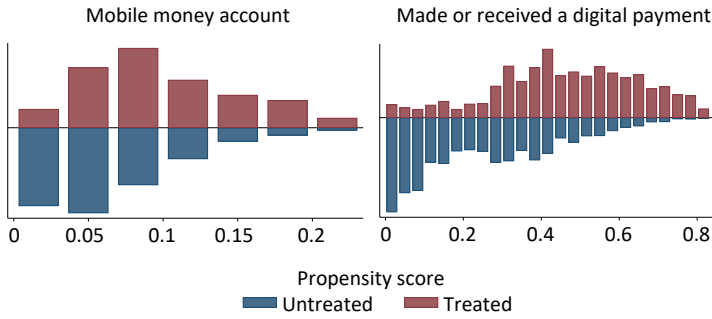


Figure 1. Propensity score distributions for the “financial inclusion” treatment

Source: authors’ elaboration, based on Findex 2021 data.



**Figure 2. Propensity score distributions for the “FinTech” treatment**

Source: authors’ elaboration, based on Findex 2021 data.

The matching procedure has reduced bias in terms of propensity scores between young people studied who have a traditional bank account, who use formal savings, who use formal borrowing, who hold a mobile money account and who conduct digital transactions, and their counterparts (nearly 99%, 94%, 100%, 100% and 98% respectively), with a  $p$ -value greater than 5%<sup>4</sup> in the matched sample. However, we found that before matching, there were significant biases between groups. Nevertheless, after matching, the biases were reduced, but some variables, such as exclusion due to remoteness and religion in the first model, seemed to exhibit significant bias after matching. However, the majority of the variables reveal non-significant differences between groups. Therefore, we can accept the equilibrium of covariates, since no covariate has a bias value greater than 20 (Rosenbaum & Rubin, 1985).

### 3.4. Average treatment effects on the treated group

Table 3 shows the average effect of the treatment (access to traditional and digital financial systems) on members of the experimental group. We first applied the Stata command `psmatch2` using kernel matching, nearest neighbour matching and radius matching. This command enabled us to perform both propensity score calculations and subsequent verification of balancing properties (Alam & Mamun, 2017) and to apply `rbounds` to estimate Rosenbaum (2002) bounds.

Then, to check the robustness of the ATT estimate, we tested the effect (ATT) by the nearest neighbour matching technique and by the propensity score matching technique. We applied these techniques because they are likely to provide more consistent estimates of the standard errors of the estimated

<sup>4</sup> The detailed results are available from the authors upon request.

**Table 3. Average treatment effects on the treated group**

	ATT estimation results (based on psmatch2 command)			ATT estimation results (based on teffects psmatch command)	
	Kernel matching	Radius matching	Nearest neighbour matching	Propensity- score matching	k-nearest neighbour matching
Formal account	0.12** (0.02)	0.253** (0.012)	0.141** (0.034)	0.125*** (0.229)	0.0906*** (0.0189)
Formal savings	0.09** (0.022)	0.194** (0.028)	0.094** (0.041)	0.094*** (0.023)	0.0481** (0.0145)
Formal credit	0.10** (0.03)	0.216** (0.02)	0.020 (0.043)	0.0601** (0.025)	0.026 ** (0.01)
Mobile money account	0.12** (0.025)	0.213** (0.024)	0.096** (0.041)	0.088** (0.026)	0.0315** (0.0135)
Made or received a digital payment	0.098** (0.019)	0.247** (0.013)	0.105** (0.032)	0.099*** (0.0169)	0.098*** (0.0194)

Note: statistical significance: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Source: authors' calculations.

effects (Abadie & Imbens, 2012). In addition, the latter adjusts for biases that arise when matching is based on more than one covariate.

The results obtained from these five techniques support the hypothesis that traditional and digital financial systems exert a significantly positive effect on youth labour force participation. Consequently, compared with the counterfactual group, the mean labour force participation is significantly greater for those included in the traditional and digital financial sectors who have access to a formal current account (ATT = 0.12), who use formal savings (ATT = 0.09), who borrow from a financial institution<sup>5</sup> (ATT = 0.10), who have a mobile money account (ATT = 0.12), and who conduct digital transactions (ATT = 0.098).

These effects could be explained by the fact that the "possession of a formal current account" facilitates commercial transactions and financial management for young people. "Formal savings" strengthen the ability of young people to plan financially and to stabilise their income. "Formal borrowing" is a crucial instrument for encouraging young people to invest in education, training or entrepreneurship, which could improve employment and entrepreneurship opportunities. These results confirm those obtained by other research (Kazungu & Njau, 2023; Koloma, 2021) indicating the positive effect of financial inclusion on the willingness to engage in entrepreneurial activities. According to Gangani and Raval (2021), access to formal financial services can

<sup>5</sup> Except for ATT nearest neighbour, access to credit has no significant effect.



serve as a catalyst for young people, contributing to their empowerment and enhancing their overall well-being.

Furthermore, the results of this study reveal that digital transformation within the financial system plays a crucial role in facilitating the integration of young people into the labour market. Owning a mobile money account and making or receiving digital payments enables young people to conduct financial transactions with ease and immediacy, such as salary payments and access to banking services. This can help reduce employment barriers and stimulate economic activity by fostering greater inclusion and participation in the labour force. These findings are consistent with previous research, which highlights that by facilitating access to essential financial services allows businesses and individuals to improve their economic opportunities, creating a fertile environment for entrepreneurship and labour market engagement, and thus improving regional competitiveness (Pearce, 2011). Capasso et al. (2023) also point to the positive influence of financial technology on entrepreneurship, demonstrating that knowledge, the availability and access to crowdfunding and blockchain technologies greatly improve entrepreneurial intentions. In addition, digital savings and access to digital credit are key channels through which FinTech adoption influences entrepreneurial activities.

### 3.5. Sensitivity of results to unobservable selection

We utilised Rosenbaum’s bounds test to examine how the results would be affected in the presence of hidden bias stemming from an unobserved

**Table 4. Sensitivity of the results to unobservable selection**

Gamma	Formal account		Formal savings		Formal credit		Mobile money account		Made or received a digital payment	
	<i>p</i> <sup>+</sup>	<i>p</i> <sup>-</sup>	<i>p</i> <sup>+</sup>	<i>p</i> <sup>-</sup>	<i>p</i> <sup>+</sup>	<i>p</i> <sup>-</sup>	<i>p</i> <sup>+</sup>	<i>p</i> <sup>-</sup>	<i>p</i> <sup>+</sup>	<i>p</i> <sup>-</sup>
$\Gamma = 1$	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000
$\Gamma = 1.1$	0.000	0.000	0.000	0.000	0.009	0.000	0.000	0.000	0.000	0.000
$\Gamma = 1.2$	0.000	0.000	0.002	0.000	0.036	0.000	0.003	0.000	0.000	0.000
$\Gamma = 1.3$	0.017	0.000	0.017	0.000	0.103	0.000	0.017	0.000	0.001	0.000
$\Gamma = 1.4$	0.208	0.000	0.074	0.000	0.221	0.000	0.057	0.000	0.033	0.000
$\Gamma = 1.5$	0.661	0.000	0.204	0.000	0.378	0.000	0.143	0.000	0.230	0.000

$\Gamma$  – log odds of differential assignment due to unobserved factors. *p*<sup>+</sup> denotes the upper bound significance level and *p*<sup>-</sup> denotes the lower bound significance level.

Source: own elaboration.

confounding variable. Gamma ( $\Gamma$ ) equal to 1 corresponds to the random assignment of treatments (no selection bias due to unobserved factors). In contrast, Gamma ( $\Gamma$ ) equal to 1.1 measures the effect of a 10% change in the log-odds of selection into the treatment (Zupi & Cerulli, 2020). In our study, we set the gamma values from 1 to 1.5, representing up to a 50% change in the odds ratio between the propensity score with and without the presence of a potential unobserved confounder.

Table 4 reveals that our results are robust up to  $\Gamma = 1.3$  in the case of formal current accounts, mobile money accounts, and formal savings. As for the case of the effect of engaging in digital transactions, its effect is robust up to  $\Gamma = 1.4$ . The effect of credit on youth labour force participation becomes sensitive to a difference in unobserved covariates beyond the threshold of  $\Gamma = 1.2$ .

## Conclusions

The aim of this paper was to investigate the determinants of youth access to traditional and digital financial services, and then to examine their effects on labour force participation in the MENA region. The World Bank's Global Findex 2021 database was used to perform probit estimations and propensity score matching. The results highlight greater financial exclusion among young women. As also demonstrated by Demirgüç-Kunt et al. (2015), the MENA region has the largest gender and youth gaps in financial inclusion. On the other hand, young people with a higher level of education, high income, mobile phones and internet access are more likely to be included in the formal financial system. Barriers to inclusion include lack of documentation, religious constraints, and costs associated with financial services.

By analysing the effects of financial inclusion and financial technology, we deduce that ownership of a formal current account and mobile money account, savings, formal loans and digital payments have significant impacts on youth labour force participation. In particular, holding a formal current account and making or receiving digital payments have particularly strong effects. These findings underline the importance of socioeconomic and technological factors in developing policies and initiatives to encourage financial and digital inclusion, especially for young women. These factors must be taken into account by decision makers when implementing awareness and training programmes to minimize economic disparities and encourage the financial empowerment of young people, contributing to the region's inclusive and sustainable development.

This study has some limitations. While the propensity score matching (PSM) method helps to reduce selection bias by balancing the observed character-

istics between the groups studied, it remains sensitive to unobserved covariates. Furthermore, the potential for reverse causality between financial inclusion and youth labour participation is a significant concern. As a result, the estimation of causal effects may not be fully captured in this study. Future research could benefit from incorporating instrumental variable techniques to more effectively address an endogeneity issue and to provide a clearer understanding of the causal relationships at play (DiPrete & Gangl, 2004).

Nevertheless, this study makes a contribution to the literature on financial inclusion and youth labour market participation. The use of rigorous methodologies and robustness analyses strengthens the validity of our results. In addition, we included various dimensions of financial inclusion in our study to provide an in-depth understanding of their impacts. Despite methodological limitations, this research offers valuable policy insights for improving the economic and financial integration of young people. The results of this study suggest that it is essential to promote young women's access to the formal and digital financial systems and to improve access to education for young people, which could be achieved through the implementation of targeted educational programmes. Furthermore, investing in digital infrastructure is also necessary to ensure that all young people, especially those living in rural or disadvantaged areas, have access to technology, a determinant factor for financial inclusion and, consequently, their economic empowerment.

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