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Beyond the Digital Dividends: Fintect and Extreme Poverty in the Middle East and Africa

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Beyond the Digital Dividends:

Fintech and Extreme Poverty in the Middle East and Africa

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ABSTRACT

This study analyzes the impact of the proliferation of Financial Technology (FinTech) on the achievability of the Sustainable Development Goals (SDGs) with respect to extreme poverty by 2030. The study uses system General Method of Moments (GMM) dynamic panel estimation methodology on annual data for 12 MENA and 45 SSA countries in addition to 70 emerging markets and developing economies from outside the two regions over the period from 2004 until the latest available data in 2018. Three different measures characterize FinTech adoption: the number of mobile cellular subscriptions per 100 people, the number of fixed broadband subscriptions per 100 people, the percentage of people in the population who use the internet. The preliminary results of the study indicate that FinTech measures have a positive statistically significant impact on reducing extreme poverty for the full sample as well as the MENA and the SSA regions. The second part of the study employs a gap analysis against four poverty targets — United Nations' 0%, World Bank's 5%, and two intermediaries of 1.5% and 3% to capture all possibilities. The results of the gap analysis suggest that the situation in the MENA region is more promising than the SSA region where improvements in FinTech along will bring extreme poverty below 5% in all MENA countries with the exception of Yemen and Djibouti. For the SSA region, only 4 out of the 45 countries; Gabon, Cabo Verde, Seychelles, and Mauritius are able to close the extreme poverty target of 5%. The paper concludes that poverty alleviation goes beyond digital dividends and identifies human capital accumulation and improvement in governance as the prerequisites for realizing the potential of FinTech and its contribution to the efforts of eradicating extreme poverty within a policy framework to achieve the SDGs in both the MENA and SSA regions.

JEL Classification Numbers: C23; G21; O43
***Keywords*:** Financial Technology; Extreme Poverty; Middle East and North Africa, Africa; SDGs; Gap Approach

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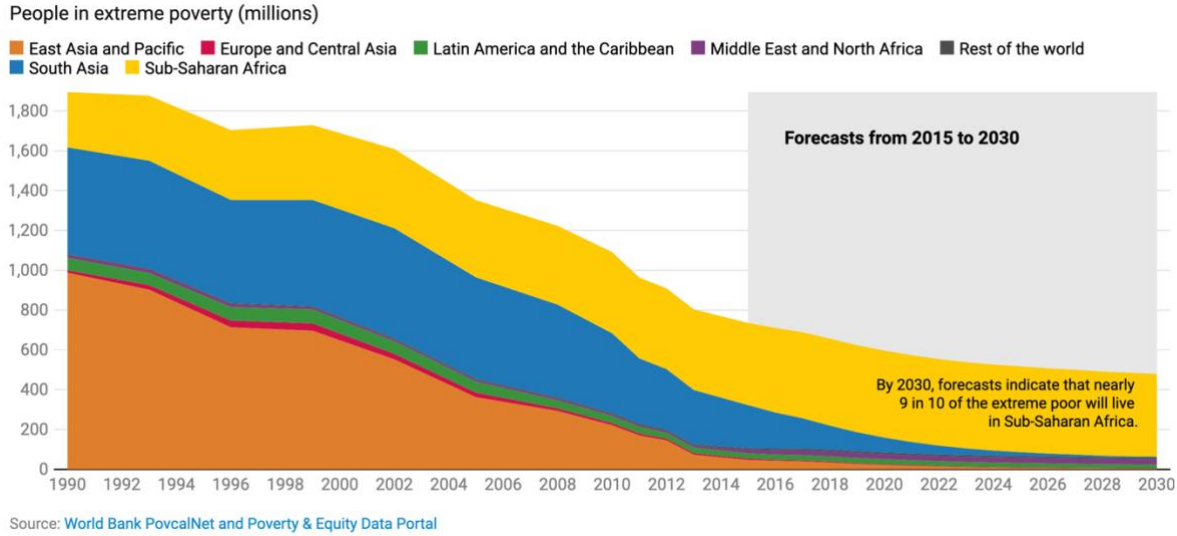
1. Introduction

Over the past few decades, global poverty rates have reduced by more than 50%. While nearly 36% of the world population suffered from extreme poverty in 1990, the population who lived on less than the poverty line of $1.90 per day has decreased to 10% in 2015, which indicates a great improvement in poverty alleviation.

However, not all countries have experienced this remarkable progress. According to the United Nations, countries with the characteristics of small, fragile, and conflict-affected tend to associate with higher poverty rates. Among all such regions, the Middle East and North Africa (MENA) and Sub-Saharan Africa (SSA) are two representative examples. Between 2011 and 2015, the MENA region is the only region that has a rising extreme poverty rate, from 2.7% to 5%, which almost doubled the population in extreme poverty. Specifically, Syria's extreme poverty rate increases by over 20%, and the poverty rate in Yemen reaches 41% in 2015 (Atamanov and Tandon, 2018). For countries in the Sub-Saharan Africa region, nearly 42% of the population still struggles to meet the poverty line. While most regions demonstrate a falling trend in the population of extreme poor, figure 1 shows that the extreme poverty rate in the SSA region is likely to stagnate to an extent that nearly 9 in 10 of the extreme poor will be living in the SSA region by 2030 (Wadhwa, 2018). Clearly, if this pattern turns into reality, the first goal of the United Nations Sustainable Development Goals (SDGs), "End poverty in all its forms everywhere" by 2030, is unlikely to achieve.

Figure 1. World Population of Extreme Poverty by Region



Source: World Bank PovcalNet and Poverty & Equity Data Portal

Current research generally centers on financial development and explores its role in poverty reduction. Although financial inclusion is an indispensable element impacting the rate of extreme poverty, its contributing factor – financial technology (FinTech) – should receive equal attention. FinTech, referring to the technology used in enabling banking and financial services, has become quite popular in recent years. The new technologies, such as mobile money, reduce the transaction and services costs for both the consumers and the providers, boosts the overall market efficiency, and improves financial access and inclusion as people who once had no access to financial services now are able to gain access remotely. Having these benefits, FinTech helps support growth and prevent growth volatility (Heng et al., 2016) while

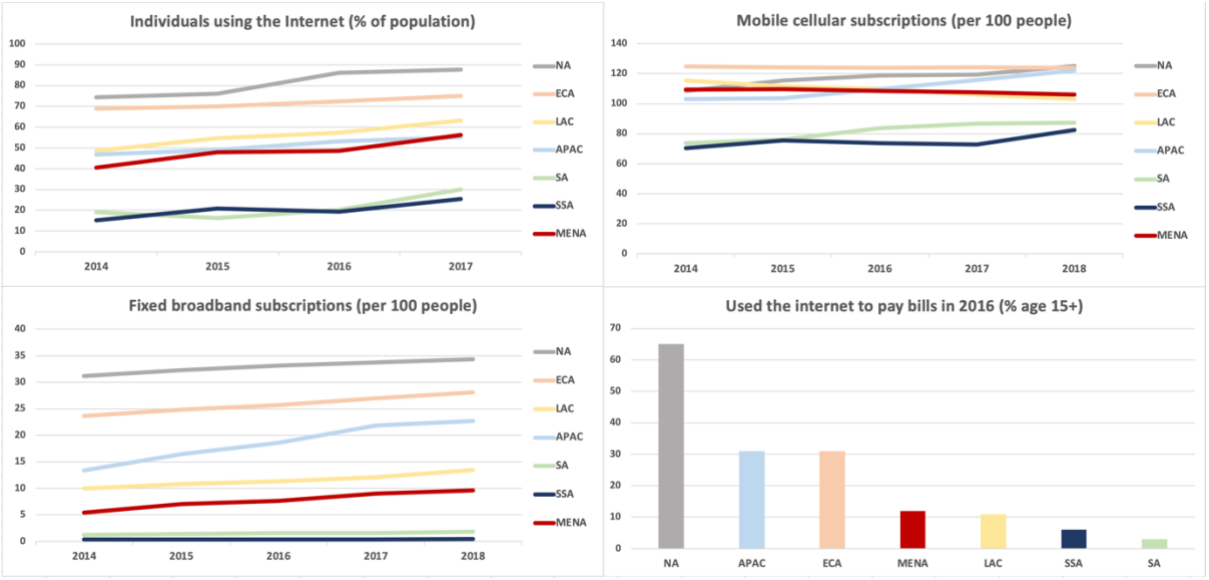
reducing poverty by enhancing financial development and inclusion (Berkmen et al., 2019). Hence, theoretically, the proliferation of FinTech makes SDG 1 more realizable.

What's more, greater access to financial services due to FinTech accelerates the achievement of other SDGs that are associated with poverty. Savings and loan products advance health and well-being (SDG 3) by helping individuals manage medical expenses and recover from health crises. They foster education (SDG 4) by giving families the ability to invest in learning opportunities. They promote gender equality (SDG 5) by allowing women greater control over their finances, strengthening their bargaining power in the household, with proven benefits for family welfare. They reduce hunger and food insecurity (SDG 2) by helping farmers boost production to meet the needs of growing populations. And they promote more equitable and peaceful societies (SDGs 10 and 16) by better positioning people to meaningfully engage in economic and social progress. Financial tools alleviate poverty *directly* and *indirectly*, through pathways that have been investigated in various countries around the world (see Section II).

Nevertheless, if not planned and managed well, FinTech also bears certain risks and issues. One main concern is cyber risks, including the possibilities of cyber-attacks and data breach. In fact, safety and privacy issues play a role as early as in the adoption of FinTech and digital financial services (Rana et al., 2019), since consumer trust and engagement tend to decrease if such risks are believed to be high. Another challenge for FinTech is technology and networking issues. The general unavailability of the network (Rana et al., 2019) may greatly discourage the use of financial services. Moreover, for certain underdeveloped countries, a lack of agents and inadequate training of mobile network operators further slows down the progress of FinTech (Nesse et al., 2018), increasing the difficulty of achieving SDG 1.

Among all, the MENA and SSA regions exhibit interesting patterns that make them suitable research subjects for our study. While the MENA usually represents the average global FinTech performance, the SSA region reveals serious problems in its lack of technological readiness (figure 2). As mentioned, the improvement of FinTech relies heavily on the Internet; the MENA has 56% of the population using the Internet and 9 in every 100 people subscribing to fixed broadband, which is incomparable to North America that has 88% of the population enjoying the Internet and a fixed broadband subscription rate of 34%. However, the statistics of the SSA is far more surprising, as the Internet usage rate is merely 25%, and the fixed broadband subscription rate is even less than 1%, both being the lowest in all regions. A similar trend is also observed in the mobile cellular subscription rate. In particular, in the year of 2016, 11% of the MENA population used the Internet to complete at least one bill while that figure was halved in the SSA region, underscoring how the improvement of FinTech facilitates economic activities.

Figure 2. FinTech Measurements by Region



Sources: ICT Development Report and database, Global Findex Database

In response to the issues of extreme poverty and FinTech development, this study aims to examine the impact of FinTech on the extreme poverty rate as well as the realizability of the SDGs by 2030, the target year set by the United Nations. More specifically, we employ gap analysis to analyze the effect of FinTech against four poverty targets — 0%, 1.5%, 3%, and 5%. The study seeks to answer the following questions: Do different types of fintech indicators affect poverty alleviation directly? Is this effect the same across the different regions? What is the impact of the proliferation of fintech on the achievability of the Sustainable Development Goals (SDGs) with respect to extreme poverty by 2030? The rest of this paper is divided as follows: Section 2 reviews the literature; Section 3 describes the data used; Section 4 highlights the

methodology employed and the model specification; Section 5 presents our results; Section 6 concludes; and Section 7 lists the references. An appendix appears at the end of the paper.

2. Literature Review

Extreme poverty has been a heated topic and concern especially after the United Nations and the World Bank Group announced their overarching goal of eliminating extreme poverty by 2030. Not only do more papers focus on the determinants of poverty and the solutions to end it, but the world has shown significant progress such that the number of poor has diminished by 68 million since 2016 (World Bank, 2018). Still, the overall reducing rate is not large enough as there is only a 0.6 percentage point of decline in extreme poverty per year from 2013 to 2015 (World Bank, 2018).

To alleviate poverty, its determinants should first be clarified. The determinants of poverty tend to vary across regions, bounded by specific culture and their political, socio-economic environments. For instance, social capital, ethnic and income inequality, local political competition, federal grants, and foreign-born population are some of the crucial determinants of extreme poverty in the US (Rupasingha and Goetz, 2007), while for the EU countries, the agricultural size of holdings, resources productivity, social protection, and domestic material consumption are the main factors impacting poverty (Ulman and Căutișanu, 2020). Nevertheless, most existing studies either focus on upper- and middle-income economies or discuss the topic on a general country-level that lacks in sub-regional heterogeneity. The few studies that analyze low-income economies like MENA and SSA regions find that income inequality, attainment of only primary education,

urbanization, infrastructure development, and mineral/oil rent are significantly associated with poverty (Ncube et al., 2014).

Despite the regional variation of factors causing extreme poverty, there are certain fundamental determinants that many works of literature believe in having a profound impact on poverty alleviation. To begin with, Viadero (2011) finds that the lag of poverty contributes to extreme poverty as people living in chronically poor areas tend to have lower educational levels that prevent them from getting high-paid jobs in the labor market. He also finds that this disadvantage lasts for generations, which further traps the poor in extreme poverty. Economic growth is another major factor influencing poverty reduction. Past research has suggested that economic growth helps in poverty alleviation in many regions, such as India (Sehrawat and Giri, 2017), Vietnam (World Bank et al., 2004), Africa (Fanta and Upadhyay, 2009), and Latin America (Cruces et al., 2017). The Department for International Development (2008) even claims that "economic growth is the most powerful instrument for reducing poverty and improving the quality of life in developing countries," especially due to its ability to create employment opportunities and drive household earnings.

Moreover, economic growth is related to another determinant of poverty – inflation. Erbaykal and Okuyan (2008) have found a negative and statistically significant short-term relationship between inflation and economic growth. They also find a causality relationship from economic growth to inflation, whereas the opposite relationship (inflation to growth) is absent. This claim of one-way causality also appears in Gokal and Hanif's study (2004) which they use Fiji as the specific case to illustrate this relationship. Thus, higher economic growth may play a role in reducing the level of inflation. In terms of inflation, Talukdar (2012) observes that while many developing countries show a positive effect of inflation on poverty, in the cases of low-income countries, such correlation can be negative and occasionally statistically insignificant. The main impact of inflation on poverty is through adjusting real wages (Cardoso, 1992) and purchasing power (Neaime and Gaysset, 2018); thus, the poor households tend to be more vulnerable to inflation than the non-poor households (Sugema et al., 2010).

Trade openness also plays a crucial role in determining the level of extreme poverty. Currently, there is no consensus regarding whether trade openness exerts a positive or negative effect on poverty. Studies from Figini and Santarelli (2006) and Pradhan and Mahesh (2014) show that trade openness has a negative and significant relationship with poverty. Agusalim (2017) examines the topic further and believes that trade openness only has a long-run significant impact in reducing poverty, which starts to show an effect from the seventh year. Nevertheless, more recently, Neaime and Gaysset (2018) reveal very different findings as they investigate the MENA region. In contrast, their study finds that trade openness seems to have contributed positively to poverty. They think that institutional weaknesses and widespread corruption are potential

explanations for this finding, as these governance problems lower the efficiency of resource allocation and investment.

Furthermore, the impact of population growth on extreme poverty shall not be neglected. Similar to the previous determinant of "trade openness," past literature has different views of the effect of population growth on poverty. The first type of thought believes that rapid population growth leads to a reduced per capita income growth and a more uneven income distribution that increases poverty (L. and Birdsall, 1980; Ahlburg, 1996). Population Action International (2012) offers a second view that population growth alone has no inherent effect on economic development and poverty reduction, and what matters is the age structure of the population. Additionally, the neoclassical economists thought asserts that higher population means higher demand, expanding markets, increase in per capita income, and a reduction in poverty rates (Lutz, 1993; Jolly, 1994; Thampapillai et al., 2000).

Researchers have long sought out tools for improving the lives of the poor. Historically, economic growth and income redistribution have been seen as key channels for lifting populations out of poverty, either through domestic policies or foreign aid (Page and Pande 2018). A rich body of literature investigates the ways in which various factors, including access to credit for the poor (often with an emphasis on microcredit), infrastructure investment, the inclusiveness of institutions, availability of information,

governance, and others, contribute to prosperity and poverty (Banerjee and Newman 1994; Beck et al. 2007; Banerjee and Duflo 2011; and Acemoglu and Robinson, 2012). Our paper focuses on a less-cited variable: financial inclusion. More specifically, our study will center on FinTech, an element improving financial inclusion.

The link between financial inclusion and economic growth has been well documented. While numerous studies show that countries with greater levels of financial access tend to enjoy higher levels of income (Honohan, 2004; Demirguc-Kunt and Klapper, 2013; Cumming et al., 2014; Klapper, El-Zoghbi, Hess, 2016; and Emara and El Said, 2019), evidence that financial inclusion spurs economic growth has been more recent to emerge. In particular, FinTech is believed to play a crucial role in promoting financial inclusion. The Bali Fintech Agenda paper, launched by the World Bank and IMF, even suggests the member countries foster FinTech to boost financial inclusion in the region (IMF and World Bank, 2018). The past literature also acknowledges the connection of FinTech with financial inclusion and economic growth.

FinTech, in its various forms, allows a greater percentage of individuals to access diverse financial services, exerting favorable effects on poverty alleviation and making the impact of financial inclusion more substantial (Ward and Zheng, 2015; Ghosh, 2016; N'dri and Kakinaka, 2020). Mushtaq and Bruneau (2019) find that the diffusion of FinTech is positively correlated with financial inclusion and negatively correlated with poverty and inequality. Although the magnitude of the effect depends on the specific qualities of the region, such as the Internet penetration rates and technological readiness, the overall positive impact of FinTech on growth and financial inclusion is proven to be statistically significant (Ghosh, 2016; Emara and Mohieldin, 2020). To be specific, the advent of FinTech spurs the growth in mobile payment, which has a positive relationship with factors such as formal account ownership, the number of ATMs and new bank branches (Emara and El Said, 2019; Coffie et al., 2020). The increase in these factors, in turn, augments financial accessibility, an essential element of financial inclusion defined by the World Bank (Aguera, 2015). Over the past several years, economists have generally reached a consensus that financial inclusion exerts a poverty-reducing effect and stimulates economic growth (Schubert, 2019; Mushtaq and Bruneau, 2019; Siddik et al., 2019; Fauzan et al., 2020; Emara and Mohieldin, 2020; N'dri and Kakinaka, 2020). Therefore, by improving the accessibility of financial services, FinTech serves as a tool in promoting financial inclusion and, hence, alleviating extreme poverty.

Yet, whether financial services improve the lives of the poor remains a subject of empirical debate. While some studies find no significant effects of financial inclusion on poverty reduction (Seven and Coskun, 2016; Neaime and Gaysset, 2017), others produce sharp results (Burgess and Pande, 2005; Kim, Yu, and Hassan, 2018). Evidence from various field experiments indicates that financial services have direct and indirect effects on poverty, particularly through pathways related to the SDGs (Klapper, El-Zoghbi, and Hess, 2016). Financial services like agricultural insurance, savings accounts, and digital financial products help farmers manage expenses and risks, bolstering SDG 2 – achieving food security and ending hunger – through greater crop yields (Karlan et al., 2014; Brune et al., 2015; Kirk et al. 2011). Financial inclusion has also been shown to improve health and well-being (SDG 3) by helping people manage medical expenses,

rebound from illness, and resume working. Importantly, out-of-pocket payments for health care remain a major reason people in developing countries remain in, or are pushed into, poverty (Priyanka et al. 2011).

Education – the focus of SDG 4 – is another channel through which financial inclusion impacts those living in poverty. Studies in various countries point to the power of savings products to enable family investment in learning opportunities that lead to meaningful employment (Klapper, El-Zoghbi, and Hess, 2016). What's more, Duflo (2012) found an increased likelihood that finances will be directed towards education and other prerequisites of poverty reduction – like health, food, and clean water – if women control them.

Indeed, when women are able to assert economic power, entire countries benefit. In MENA alone, it is estimated that gender gaps cause an income loss of about 38% (Cuberes and Teignier, 2015). By improving women's household bargaining power, studies confirm (El-Zoghbi et al., 2019), financial inclusion promotes gender equality (SDG 5), with spillover effects for other development objectives – not least, shared economic

growth (SDG 8) and equitable, peaceful societies (SDGs 10 and 16). What's more, exclusion from financial services slows economic growth and generates so-called poverty traps (Greenwood and Jovanic, 1990; Banerjee and Newman, 1994; World Bank, 2014).

But not all research shows a wide-reaching effect. In 2015, Park and Mercado demonstrated a strong link between financial access and poverty reduction in 37 developing Asian economies, until subsequent studies determined that this outcome was held only for high- and upper-middle-income economies (Park and and Mercado, 2018). Page and Pande (2018) give additional reasons to be wary of financial inclusion, citing the risk of elite capture and low repayment rates for state-led programs, and of finance-based solutions to global poverty more broadly.

Thus, for the MENA and SSA regions, which are considered mostly as middle- and low-income economies, the relationship between FinTech, financial inclusion, and poverty alleviation requires more empirical evidence. Schubert (2019) focuses primarily on the effect of financial inclusion on poverty in low- and lower middle-income countries, and under different robustness checks, the negative effect of financial inclusion on poverty still holds true. Haftu (2019) examines the mobile phone and Internet penetration in the SSA region and concludes that the improvement of access to mobile phones is critical to extreme poverty reduction as it increases per capita income. Donou-Adonsou, Lim, and Mathey (2016) even calculate that in the SSA region, a one percentage point increase on the Internet and mobile phone usage will lead to an increase of economic growth by 0.12 and 0.03 percentage points respectively. Moreover, mobile phone penetration is also positively correlated with education, domestic savings, regulation quality, and bank density (Asongu, 2015). Hence, the rise of mobile phone penetration in the MENA and SSA region not only fosters SDG 1 but also helps to fulfill SDG 4, 10, and 16.

Our study will build upon the existing empirical literature, further analyzing the relationship between FinTech and extreme poverty, with an emphasis on the MENA and the SSA regions. In addition, in response to the World Bank's self-questioning in the achievability of SDG 1, as they claim that "a slowdown in overall poverty reduction [makes] it unlikely the World Bank's 2030 target will be met" (World Bank, 2018), our paper also forecasts whether the poverty targets will be achieved based on the current trend. We follow Panda and Kumar's method of calculating the difference between specified Millennium Development Goals (MDGs) targets and projections. Specifically, our study employs a gap analysis against four poverty targets—0%, 1.5%, 3%, and 5%— which are based on the two benchmarks set by the World Bank and the UN, with intermediaries to capture error and give a fuller picture of what is possible.

Other econometric tools can be utilized in calculating the projected poverty rates. Gable, Lofgren, and Osorio Rodarte (2015) also establish a framework for SDG projection methods, relying on cross-country regressions of SDGs and their determinants on GNI per capita to help identify policy areas for accelerating the achievement of the SDGs. Nicolai et al. take a different approach to forecasting: The researchers analyze projections from various international organizations to score how the world would perform against the SDGs by 2030 if current trends persist, and offer their resulting scorecards as a benchmark for implementation efforts. Unlike the above methodologies, Cuaresma et al. (2018) use a model that combines country-specific historical estimates of the income distribution, using Beta–Lorenz curves, with projections of GDP, population changes, and education attainment level to make projections on poverty rates as well as absolute poverty changes worldwide. Another estimation approach – this one on health-related SDGs – uses weighted averages of indicator- and country-specific annualized rates of change from 1990 to 2017 to generate 2030 projections (Lozano, 2018). Moreover, in response to SDG 1's envisagement of halving the population living in poverty in all forms, Ram (2020) uses observed rates of decline in multidimensional poverty headcount, estimated from Multidimensional Poverty Index (MPI) and household data in three dimensions – education, health, and living standard, to forecast the achievability of SDG 1 by 2030 through projecting the time required for countries to have a multidimensional poverty headcount that is reduced by one-half.

3. Data

Our dataset is constructed as a panel of country observations from the World Development Indicators (WDI) of the World Bank's database and it covers 125 countries from East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, North America, Middle East and North Africa (MENA), and Sub-Saharan Africa (SSA) over the period 2004-2018[3]. The focus of our study is however on 12 MENA and 45 SSA countries. The list of countries MENA and SSA countries included in the sample are reported in Tables A1 and A2 of the Appendix, respectively.

The dependent variable in the model is the poverty headcount ratio at $1.90 a day as a percentage of the population. The set of explanatory variables contains common determinants of poverty, including real GDP per capita growth rate, inflation rate, trade openness as a percentage of GDP, population growth, and FinTech indicators. The measures of FinTech include mobile cellular subscriptions (per 100 people), individuals using the Internet (% of population), fixed broadband subscriptions (per 100 people). Table A3 and A4 in the Appendix provides a detailed list of the macroeconomic and Fintech variables used, their definitions, units of measurement, abbreviations, and data sources. And Tables A5, A6, and A7 of the Appendix report the descriptive statistics of the macroeconomic and FinTech variables for the full, MENA, and SSA samples, respectively.

Note that while some of the data predate the Millennium Development Goals (2000 – 2015) and the SDGs (2015 – 2030), the focus of this analysis is on poverty headcount ratio, the dependent variable. Targets the World Bank and the United Nations have set (on how much poverty reduction occurs, and by when) provide relevant framing devices for policy discussions, but our objective is to analyze poverty reduction itself rather than the achievement of MDG 1 or SDG 1.

4. Model Specification and Methodology

The poverty model is estimated using System GMM panel estimation methodology proposed by Arellano and Bover (1995), Blundell and Bond (1998), and Blundell, Bond, and Windmeijer (2001)[4] to examine the impact of changes in the macroeconomic variables and Fintech levels on poverty alleviation. Our main model is as follows,

$$Pov_{i,t} = \alpha + \rho Pov_{i,t-1} + \beta X_{i,t} + \delta FinTech_{i,t} + \varepsilon_{i,t} \qquad (1)$$
$$i = 1, 2, \ldots N,\ t = 2004, \ldots 2018$$

Where Pov_{it} denotes the Poverty headcount ratio at $1.90 a day as a percent of the population of country *i*, at time *t*, Pov_{it-1} is the lagged poverty variable, and X_{it-1} is the vector of explanatory variables. These include the annual GDP growth rate, inflation rate, trade openness as a percentage of GDP, and the annual population growth rate. The variable $FinTech_{it}$ is the financial technology index that cover the number of mobile cellular subscriptions per 100 people, the number of fixed broadband subscriptions per 100 people, the percentage of people in the population who use the internet in country *i* at time *t*, and ε_{it} is the error term.

Next, to estimate the impact of FinTech on poverty alleviation in the MENA region versus other countries in our sample, we add a dummy for MENA countries along with an interaction term of this dummy with the Fintech variable to the model as follows,

$$Pov_{i,t} = \alpha + \rho Pov_{i,t-1} + \beta X_{i,t} + \delta FinTech_{i,t} + \theta MENA_{i,t} + \varphi\,(MENA_i * FinTech_{i,t}) + \varepsilon_{i,t} \qquad (2)$$

where $MENA_i$ represents the dummy variable, which takes 1 if country *i* is in the MENA region and zero if not. The total effect of the different areas of FinTech is estimated by adding the coefficient δ to the coefficient φ and the statistical significance of the effect is estimated using the standard errors of these two

[3] We started with the widest possible data on our dependent variable, poverty headcount ratio (% of GDP).
[4] For more details on the estimation methodology, please check Emara and Kasa (2020) and Emara and El Said (2019).

coefficients. The same analysis is repeated for the SSA region by replacing the $MENA_i$ with the SSA_i dummy variable.

To analyze the impact of two types of policy variables, increasing school enrollments and improving governance, on the effect of FinTech on poverty alleviation, we add an interaction term for each policy variable with the FinTech index and we compute the total effect of FinTech. More specifically, to estimate the impact of the school enrollments variables, we expand Equation (2) by adding an interaction term of FinTech with primary, secondary, and tertiary school enrollments, all percent gross, and their principal component analysis, or *edu* in our dataset, each one in a turn.

Similarly, to access the impact of the improvement in governance, we expand Equation (2) by adding an interaction term of FinTech with the six indicators of governance including control of corruption, government effectiveness, political stability, regulatory quality, rule of law, voice and accountability, and their principal component analysis, or *gov* in our dataset, each one in a turn.

The last part of the estimation methodology involves performing a gap analysis on the ability of the MENA and SSA countries to achieve the extreme poverty goal by the year 2030 by depending only on the improvement in FinTech services and no other factors. Using the estimated δ and φ coefficients of Equation (2), the percent of the population living under $1.90 a day is projected for the year 2030. Applying Panda and Kumar's methodology for projection (2007) – also employed in Emara (2014), Emara and Moore (2014), and Emara and Moheildin (2020) – we proceed in four main steps for each country in our dataset. First, we identify the 2030 extreme poverty target level, second, we use a compound growth rate formula to calculate the required growth in poverty head count ratio to close the poverty gap, and third we use semi log trend function to compute the actual growth in the FinTech indicator. We use the actual growth in the FinTech index to compute the projected poverty rate and the gap between this projected level and targeted level for the year 2030. Finally, we compute the projected gap between the actual growth in the Fintech index and the required growth for closing the extreme poverty gap in the year 2030[5]. We repeat this process under four different poverty targets; 0%, 1.5%, 3%, and 5%.

5. Estimation Results

Before estimating the model, multiple econometric tests have been performed to check for heteroskedasticity, multicollinearity, endogeneity, and serial correlation. The results Breusch Pagan test confirm that the model is heteroskedastic, hence the robust standard error is used. The results of the Variance inflation factor (VIF) confirm that the mean of the model's VIF is only 1.47 points, hence no issues of multicollinearity in our model. Furthermore, since simultaneous causality could be a major econometric problem in our model, for instance poverty is affected by economic growth and also affects it, hence the choice of our estimation methodology of Arellano-Bond System GMM, where the set of instruments are tested for overidentification using the Hansen test. Finally, given the structure of our panel dataset, each cross section might suffer from a serial correlation issue; hence we performed the Arellano-Bond first and second order of autocorrelation. All estimation tables include the results of the Arellano-Bond serial correlation test and the Hansen test confirming the absence of serial correlation in second order and the exogeneity of our chosen set of instruments, respectively.

The estimation of Equation (1) for the full model is presented in Table A8, where the poverty variable ("*pov*" in our dataset) is regressed on the set of explanatory variables, namely GDP growth rate ("*gr*" in our dataset), inflation rate ("*inf*" in our dataset), openness ("*op*" in our dataset), population growth rate ("*popgr*" in our dataset), and the lagged poverty variable ("*L.pov*" in our dataset). The first column shows the results of a regressing poverty on its own lag only. The results show that the coefficient of the first lag coefficient

[5] For more details check Emara and Moheildin (2020).

of the poverty is positive and statistically significant where a one percent increase in poverty last year leads to an increase in poverty of the current year of about 0.64% of the population. Columns (2) to (6) show that the impact of the poverty lag remained positive and statistically significant in the range of 1.3%-1.5% of the population, consistent with the empirical evidence provided in Viadero (2011).

Next, adding GDP growth rate to the poverty model, the results confirm an expected statistically significant effect, where a one percent increase in economic growth reduces poverty head count ratio in the range of 0.11% - 0.15% of the population. This result is consistent with the empirical evidence provided in Emara and Moheildin (2020). It also aligns with the findings of similar studies conducted in other regions (Sehrawat and Giri, 2017; World Bank et al., 2004; Fanta and Upadhyay, 2009; Cruces et al., 2017).

Next, adding inflation rate to the model, the coefficients and statistical significance of the lagged poverty and economic growth remain unchanged. Looking at the results of Columns 3 to 6, the results confirm that a one percent increase in inflation leads to a decrease in poverty head count ratio in the range of 0.10% - 0.13% of the population. This result goes in line with the empirical findings of Talukdar (2012), who finds that for low-income developing countries, the relationship between inflation and poverty could be negative.

Columns 4 to 6 show that the trade openness measure has a positive statistically significant impact in increasing poverty, where a one percent increase in trade openness increases poverty in the range of around 0.01% as a percent the population. This result goes in line with the findings of Neaime and Gaysset (2018) and Emara and Moheildin (2020) who find that trade openness increases poverty in the MENA region.

Finally, adding the population growth rate variable, the results of Columns 5 and 6 show that a one percent increase in this variable results in about 0.84% decrease in poverty head count ratio as a percent of the population. This result is consistent with the neoclassical economists' school of thoughts that an increase in the population leads to market expansion and a reduction in poverty (Lutz, 1993; Jolly, 1994; Thampapillai et al., 2000).

The next part of our analysis focuses on estimating the impact of FinTech on poverty alleviation. Table A9 shows the results of adding mobile cellular subscription measured per 100 people ("*mob*" in our dataset), individuals using the Internet as a percent of the population ("*net*" in our dataset), fixed broadband subscription measured per 100 people ("*fbb*" in our dataset), and their principal component analysis ("*FinTech*" in our dataset). All FinTech measures are in logarithm.

The table shows that Columns 1 through 4, all coefficients of the main model remain around the same magnitude and statistical significance. For instance, Column 1 shows that a one percent increase in poverty last year leads to an increase in poverty of the current year by about 1.39%, a one percent increase in economic growth reduces poverty head count ratio by about 0.15%, a one percent increase in inflation leads to a drop in poverty head count ratio by about 0.09%, a one percent increase in openness results in an increase in poverty head count ratio by about 0.02%, and finally a one percent increase in the growth of the population results in an increase in poverty head count ratio of about 0.70% as a percent of the population, consistent with the empirical evidence provided in L. and Birdsall (1980) and Ahlburg (1996) that population growth increases incidences of poverty.

Furthermore, Column 1 shows that a ten percent increase in mobile cellular subscription leads to a drop poverty head count ratio by about 0.05% of the population, all else equal. Column 2 shows that a ten percent increase in individuals using the Internet leads to a statistically significant drop in poverty by about 0.4% of the population. Similarly, Column 3 shows that a ten percent increase in fixed broadband subscription leads to a drop-in poverty by about 0.03% of the population. Finally, the results of Column 4 confirm that the advancement in FinTech statistically significantly helps in reducing poverty rates, where a ten percent increase in the index of FinTech reduces poverty rate by about 0.06% of the population. This result is in line with the empirical finding of Berkmen et al. (2019) that FinTech has the poverty-reducing effect by supporting growth and inclusion.

Next, we analyze whether the impact of FinTech on poverty might be different in the MENA region. To do so we estimate Equation (4) by adding a dummy variable for the MENA region and an interaction term of this dummy with the FinTech measures, as shown in Table A10. In Columns 1 through 4 the dummy variable for the MENA region is interacted with *mob*, *net*, *fbb*, and the principal component *fintech*, respectively. The interaction terms are all negative and statically significant, as expected, with the exception of the interaction term of *fbb*, with coefficients larger than the full sample.

Additionally, Table A10 provides the calculations of the total effect of *mob*, *net*, *fbb,* and the *FinTech* index on the poverty head count ratio in the MENA region. As the table shows, the total effects of the three FinTech measures and their linear combination have statistically significant impact on poverty reduction. More specifically, Column (1) shows that the total a one percent increase in mobile cellular subscription leads to a decrease in the poverty head count ratio by about 0.03% of the population. Column (2) shows that a one percent increase in the Internet use leads to about 0.04% decrease in poverty. And Column (3) shows that a one percent increase in fixed broadband subscription results in a drop of about 0.02% of poverty. Finally, Column (4) shows that a one percent increase in the FinTech index leads to a statistically significant decrease in the poverty head count ratio by about 0.037% of the population, all else equal. This result is consistent with the studies of Haftu (2019) and Donou-Adonsou, Lim, and Mathey (2016) that increasing the use of mobile phones and the Internet will effectively reduce extreme poverty rates.

Similarly, Table A11 shows the estimation results of adding the SSA dummy to our main model and the calculation of the total effect[6]. It is interesting to note that for this region, as shown in Columns 1 through 4, the increase in economic growth leads to an increase in poverty headcount ratio. This might be due to the fact that the SSA region has one of the world's highest income inequalities. To be more specific, Fosu (2009) finds that initial inequality differences may give rise to substantial differences in growth-poverty elasticity, particularly in the SSA region. Fosu's later study (2014) further highlights that where poverty increased, inequality was more important in explaining the change. It is also important to note that we could not find a consistent significant impact of inflation, openness, and population growth on poverty alleviation, as is the case for the full sample.

As the results of the table shows, the total effects of *mob*, *net*, *fbb*, and the *FinTech* index is negative and statistically significant on poverty reduction. Column 1 shows that a ten percent increase in mobile cellular subscription leads to a fall in poverty by about 0.17%. The results of Column (2) shows that the impact of Internet use is even larger where a ten percent increase in this variable leads to about 0.44% reduction in poverty. And with a slightly lower magnitude, the results of Column (3) shows that a ten percent increase in fixed broadband subscription leads to a fall in poverty by about 0.31%. And Column (4) shows that a one percent increase in the FinTech index results in a decrease in poverty by about 0.39% of the population, all else equal. As it can be noticed, all the total effects coefficients of the SSA region are higher than the MENA region with the exception of the mobile cellular subscription coefficient. This difference between the SSA and MENA regions corresponds to the fact that the SSA region has fewer population having access to the Internet and mobile cellular and fixed broadband subscriptions compared to the MENA region (Figure 2), and it is the region with largest population of extreme poverty worldwide (Figure 1). Thus, it is reasonable that the improvement of FinTech exerts greater influence on the SSA than the MENA region.

Finally, we end this section by analyzing the ability of the countries in the MENA and the SSA regions to close the poverty gap by the year 2030 if they exclusively depend on the advancement in FinTech services. To do so we perform this analysis based on four different scenarios: a poverty target of 0%, 1.5%, 3%, and 5%.

To perform the poverty gap analysis for the MENA region, we use the estimated coefficient of the total effect of the Fintech index computed in Table A10, which is equal to 0.037%, and the results are reported in Tables A12 through A15 for the poverty targets of 0%, 1.5%, 3%, and 5%, respectively[7]. It is important to note that countries are arranged in order of the highest projected poverty gap for the year 2030.

Table A12 confirms that based on the UN's 0% poverty target, none of the MENA countries will be able to close the poverty gap by 2030 if they depend exclusively on the advancement in FinTech and no other factors. The results show that the worst performing country is Yemen with a latest poverty head count ratio of 18.8% of the population and a projected poverty rate of only 17.11% in the year 2030. According to our estimation results, Yemen requires an annual increase of 21% in the FinTech for it to close the poverty gap by 2030, if it depends only on the improvement in FinTech. Similarly, the results of Djibouti confirm that

[6] Due to data limitation on the poverty variable, we interpolated the data using linear interpolation technique.
[7] Check Emara and Moheildin (2020) for more details on the computation of the gap analysis.

the poverty gap will be equal to 15.55% in the year 2030 and an annual growth rate of about 23% is needed in the FinTech index for the country to close the gap by 2030.

On the other hand, the results for Jordan are more promising, a country performing the best out of the 12 MENA countries in our sample. Despite the fact that this country will not close the poverty gap by 2030, the gap is projected at only 0.09% of the population. For this country to completely close the gap, the FinTech index is required to grow at a rate of 16.34% annually. Similarly, the results of Israel, Malta, and Tunisia show that each country will reach a gap of only about 0.2% of the population in 2030, with a required growth in FinTech Index of about 20% annually for each country to reach the 0% poverty.

Table A13 shows the results of the poverty projections based on an intermediary target for the poverty head count ratio of 1.5% of the population. As the results show, all MENA countries will be able to close the poverty gap by 2030 with the exception of four countries; Yemen, Djibouti, Egypt, and Iraq, with projected poverty gap of 15.61%, 14.05%, 1.49%, and 0.79%, respectively. The results suggest that the required annual growth rates in the FinTech index for the four countries are 9.78%, 11.37%, 9.19%, and 6.673%, respectively, for them to close the poverty gap.

Analyzing poverty projections based on the 3% poverty target set by the World Bank, Table A14 shows that only two of the MENA countries; Yemen and Djibouti will not be able to close the poverty gap by 2030. The projected poverty gaps are 14.11% and 12.55% in both countries, respectively. The results also show that an annual increase in the FinTech index of 9.01% and 10.5% would guarantee closing the gap in the two countries, respectively.

With the most flexible poverty target of 5%, Table A15 shows that Yemen and Djibouti still stand as the only two countries in the MENA region unable to reach the poverty target and with projected poverty gap of above 10% in the year 2030. An average annual increase of about 9% in FinTech is required for both countries to close the 5% poverty gap, respectively.

Turning to the SSA region, the results of Table A16 confirms that the situation in this region is much worse than the MENA region, revealing serious problems with poverty stagnation, with none of the countries are reaching the 0% poverty target. The results show that Madgascar is performing the worst out of the 45 SSA countries in our sample, with a projected poverty gap as high as 71% of the population and with a required increase in FinTech index of about 19% annually for it to close the gap in 2030. The results also reveal high projected poverty rates in the Democratic Republic of Congo, Central African Republic, Guinea-Bissau, and Burundi with projected poverty rates above 62% of the population and a required Fintech growth rate in the range of 18%-19% annually.

On the other hand, only few SSA countries are relatively performing better than the rest of the sample. The results show that Gabon, Cabo Verde, and Seychelles have projected poverty rates of 3.2%, 2.89%, and 1.04%, respectively. Those three countries require an annual increase in FinTech index of about 21.06%, 19.83%, 18.25%, respectively, for them to reach the complete eradication of poverty in 2030. The results also show that Mauritius is performing the best out of the SSA sample with a projected poverty rate of 0.19% and a required annual increase of 19.9% in the FinTech index to ensure achieving the 0% UN's poverty target.

Analyzing the achievability of the poverty target under the 1.5%, Table A17 shows only two countries, Seychelles and Mauritius are on track. The results confirm that all the remaining 42 SSA countries will not be able to close the gap with poverty gaps of 60%. For instance, the projected poverty gap in Madagascar, Democratic Republic of Congo, Central African Republic, Guinea-Bissau, Burundi, and Malawi, are 69.30%, 68.15%, 63.14%, 61.71%, 60.56%, and 60.25%, respectively. Accordingly, these countries would require an annual increase in the FinTech index by about 9.77%, 9.76%, 8.20%, 8.87%, 10.14%, and 11.71%, respectively, to achieve the 1.5% poverty target by the year 2030.

The situation in the SSA region is not significantly different when we evaluate the results based on the 3% poverty target, the results of Table A18 shows that in addition to Seychelles and Mauritius, Cabo Verde

is also on track. Additionally, the situation is also not bad for Gabon with a projected poverty gap of 3.2%, or a gap of only 0.2%, which can be closed by an annual increase in FinTech index of 7.88%.

Next, the projection analysis of the SSA region under the 5% poverty target of the World Bank is shown in Table A19. The results confirm that even under the most flexible poverty target, only four countries; Gabon, Cabo Verde, Seychelles, and Mauritius are on track. The results also show that Mauritania will miss the target by only 0.59% but it can close it with an annual FinTech growth of about 0.11%.

Given the results of the poverty analysis for the SSA region, our estimation analysis ends with pausing a question as of whether the human capital accumulation and the improvement in governance can help this region in bridging the poverty gap if it depends exclusively on the improvement in FinTech services. To do so, first, the model of Equation (2) is expanded by including an interaction term of the FinTech index with

the three levels of school enrollments; primary ("*schp*" in our dataset), secondary ("*schs*" in our dataset), tertiary ("*scht*" in our dataset), and their linear combination using the principal component analysis ("*edu*" in our dataset), each one in a turn.

As per the results of the first row of Table A20, when FinTech index is interacted with the variable *edu*, its impact on poverty is magnified. The results show that a one percent increase in FinTech index in the presence of high levels of school enrollments statistically significantly decreases poverty by about 0.042% of the population, a 10.34% improvement over the case without the *edu* interaction. This result implies that education matters and is a pre-condition for the FinTech to have a stronger poverty alleviation effect. Additionally, the remaining results of the table reveals that this impact is mainly derived from the statistically significant effect of *schp* where a one percent increase FinTech index when interacted with this variable decrease poverty rate by about 0.072% of the population, an 87.86% improvement over the case without the *edu* interaction. The impact of *schs* and *scht* are both statistically significant, however, with smaller magnitudes. It makes sense that, all else equal, education can help to maximize the poverty alleviation effects of the improvement in FinTech services in a given economy. These services are accessed and used by humans, whom when educated will efficiently use these services up to their potential (Barham et al., 1995, Wu et al., 2008, and Emara and Zecheru, 2021). Additionally, human capital theory (Becker, 1964) affirms that education is a core capital that creates skills, increases productivity, opens economic opportunities, and thus breaks the poverty trap (Azariadis and Stachurski, 2005).

Next, the model of Equation (2) is expanded to include the interaction term of the FinTech index with the six measures of governance and their linear combination using the principal component analysis (or "*gov*" in our dataset), each one in a turn. As the results of the first-row of Table A21 shows, when FinTech index is interacted with *gov*, a one percent increase in this index statistically significantly decreases poverty by about 0.047%, a 23.26% improvement over the case without the *gov* interaction. The table also shows that the impact of the six indices is also statistically significant with an average total effect of about 0.045% and an average improvement of about 18.09% over the case without the interaction. It therefore makes sense that the poverty alleviation effect of FinTech is maximized in places with political stability and freedom, credible and effective government, less corruption and stronger rule of law and accountability. This result is consistent with the empirical evidence provided in Sobhan (1998) that bad governance increases incidences of poverty and with the findings of Emara and Zecheru (2021) that improvement in governance increases the deflationary effects of digitization on domestic inflation, and hence reduces poverty.

6. Conclusion

FinTech, or financial technology, offers a new solution to financial difficulties in Emerging Market and Developing Economies in the Middle East and Africa. According to the latest World Bank statistics, the number of people living in extreme poverty in the Middle East and Africa region has increased significantly. In the Middle East and North Africa (MENA) the number has doubled over the period 2013 to 2015, reaching 18.6 million. For Sub Saharan Africa (SSA), this number grew from 405 million to 413 million over the

same period[8]. In both regions, a large portion of the population lacks access to financial services. FinTech offers many opportunities for economies, from making their financial systems more efficient to broadening access to financial services for the under-served populations, especially those who suffer from extreme poverty as part of the digital dividends (Jack and Suri 2014, Mbiti and Weil 2015, Suri and Jack 2016, Munyegara and Matsumoto 2016, Burbuz 2017, El-Zoghbi et al. 2019). However, it can also pose potential risks and cause more pressures on the poor if there is a digital divide resulting from barriers to access. Nevertheless, based on the latest available data of 2018, 66% of the MENA population and 39% of the SSA population have a smartphone[9]. Thus, FinTech has the potential to improve access to financial services at a low cost, increasing the frequency of financial activities and alleviating extreme poverty in both regions.

In this paper we use system GMM dynamic panel estimation methodology on annual data for 12 MENA and 45 SSA countries in addition to 70 emerging markets and developing economies from outside the two regions over the period from 2004-2018. Three different measures characterize FinTech adoption: the number of mobile cellular subscriptions per 100 people, the number of fixed broadband subscriptions per 100 people, the percentage of people in the population who use the internet. The results of the study show that FinTech has a statistically significant impact on reducing extreme poverty for the full sample as well as the MENA and the SSA regions. The results confirm that a ten percent increase in the Fintech index results in a fall in poverty head count ratio by about 0.06% for the full sample and with larger impacts of 0.37% and 0.39% in the MENA and the SSA regions, respectively.

Using these predicted coefficients of Fintech, we performed a gap analysis to project the ability of the MENA and the SSA regions to reach four poverty targets 0%, 1.5%, 3%, and 5% by the year 2030 if they depend exclusively on the improvement in FinTech. The results of the gap analysis reveal that the situation in the MENA region is more promising than that of the SSA region where improvements in FinTech along will bring extreme poverty below 5% in all MENA countries with the exception of Yemen and Djibouti. For the SSA region, only four countries; Gabon, Cabo Verde, Seychelles, and Mauritius are able to close the extreme poverty target of 5%.

Based on the empirical evidence provided in the paper, we conclude by offering three main policy implications. First, for all countries in our sample, including MENA and SSA regions, national policies should be directed towards increasing the investments in FinTech services to help in alleviating extreme poverty. These investments should include increasing mobile and fixed broadband subscriptions and expanding networks for internet coverage for individuals, businesses, and governments. Second, our results imply that countries in the SSA region with fewer population having access to the Internet and mobile cellular and fixed broadband subscriptions compared to the MENA region and with largest population of extreme poverty worldwide, would benefit the most from the improvement in FinTech services, hence a more aggressive national strategic plan is required aiming towards the investment in their FinTech to ensure lower rates of extreme poverty. Finally, since the entire effect of the improvement in FinTech in the SSA region is strengthened by the investment in human capital and improvement in governance, policy makers should move beyond digital dividends and emphasize on expanding access to education and school quality, controlling corruption, enhancing government effectiveness and regulations, and strengthening rule of law and accountability as prerequisites for realizing the potential of FinTech and its contribution to the efforts of eradicating extreme poverty within a policy framework to achieve the SDGs.

[8] World Bank (2018).
[9] GSMA Report (2018).

7. References

Acemoglu, Daron, and James Robinson. 2012. *Why Nations Fail: The Origins of Power, Prosperity, and Poverty*. New York: Crown Publishers.

Aguera, P. (2015). Financial Inclusion, Growth and Poverty Reduction. *World Bank Group*.

Agusalim, L. (2017). The Dynamic Impact of Trade Openness on Poverty: An Empirical Study of Indonesia's Economy. *International Journal of Economics and Financial Issues*, *7*(1), 566–574.

Ahlburg D.A. (1996) Population Growth and Poverty. In: Ahlburg D.A., Kelley A.C., Mason K.O. (eds) *The Impact of Population Growth on Well-being in Developing Countries. Population Economics*. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-662-03239-8_7

Asongu, S. A. (2015). Conditional Determinants of Mobile Phones Penetration and Mobile Banking in Sub-Saharan Africa. *Journal of the Knowledge Economy*, *9*(1), 81–135.

Atamanov, A., and Tandon, S. (2018, November 27). *Measuring regional poverty in MENA: Update and remaining challenges*. World Bank Blogs. Retrieved from this link.

Azariadis, C. and Stachurski, J. (2005). Poverty traps, *Handbook of Economic Growth*, 1, 295-384.

Banerjee, A., and A. Newman. (1994). "Poverty, Incentives and Development." American Economic Review Papers and Proceedings, Vol. 84, No. 2, 211–5.

Banerjee, A., and Duflo, E. (2011). Poor Economics: A Radical Rethinking of the Way to Fight Global Poverty. New York: Public Affairs.

Barham, V., Marchan, M., and Pestieau, P. (1995). Education and the poverty trap, *European Economic Review*, 39, 1257-1275

Beck, T., A. Demirguc-Kunt, and R. Levine. 2007. "Finance, Inequality, and the Poor." *Journal of Economic Growth* 12, 27–49.

Becker, G. (1964). Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education, *National Bureau of Economic Research*, New York. ISBN 0-226-04120-4.

Berkmen, P., Beaton, K., Gershenson, D., Granado, J. A. D., Ishi, K., Kim, M., … Rousset, M. (2019). Fintech in Latin America and the Caribbean: Stocktaking. *IMF Working Papers*, *19*(71), 1.

Brune, L., X. Gine, J. Goldberg, and D. Yang. 2015. "Facilitating Savings for Agriculture: Field Experimental Evidence from Malawi." NBER Working Paper 20946. Cambridge, Mass.: National Bureau of Economic Research.

Burgess, R., and R. Pande. 2005. "Do Rural Banks Matter? Evidence from the Indian Social Banking Experiment." American Economic Review Vol. 95, No. 3, 780–95.

Cardoso, E. (1992). Inflation and Poverty. https://doi.org/10.3386/w4006

Coffie, C. P. K., Zhao, H., and Mensah, I. A. (2020). Panel Econometric Analysis on Mobile Payment Transactions and Traditional Banks Effort toward Financial Accessibility in Sub-Sahara Africa. *Sustainability*, *12*(3), 895.

Cruces, G., Fields, G. S., Jaume, D., and Viollaz, M. (2017). *Growth, employment, and poverty in Latin America*. Oxford University Press.

Cuaresma, J. C., Fengler, W., Kharas, H., Bekhtiar, K., Brottrager, M., and Hofer, M. (2018). Will the Sustainable Development Goals be fulfilled? Assessing present and future global poverty. Palgrave Communications, 4(1).

Cuberes, D. and M. Teignier. 2015. "Aggregate Effects of Gender Gaps in the Labor Market: A Quantitative Estimate." *Journal of Human Capital.*

Cumming, D., Johan, S., Zhang, M., 2014. The economic impact of entrepreneurship: comparing international datasets. Corp. Gov. Int. Rev. 22 (2), 162–178.

Demirgüç-Kunt, A., and Klapper, L. (2013). Measuring Financial Inclusion: Explaining Variation in Use of Financial Services across and within Countries. *Brookings Papers on Economic Activity*, *2013*(1), 279–340.

Department for International Development. (2008). Growth: Building Jobs and Prosperity in Developing Countries. *Department for International Development, UK*.

Donou-Adonsou, F., Lim, S., and Mathey, S. A. (2016). Technological Progress and Economic Growth in Sub-Saharan Africa: Evidence from Telecommunications Infrastructure. *International Advances in Economic Research*, *22*(1), 65–75.

Duflo, E. (2012). "Women Empowerment and Economic Development." *Journal of Economic Literature* 50(4): 1051-1079.

El-Zoghbi, Mayada, Nina Holle, and Matthew Soursourian. 2019. "Emerging Evidence on Financial Inclusion: Moving from Black and White to Color." Focus Note. Washington, D.C.: CGAP.

Emara, N. (2014). Income Elasticity and the Gender Gap: A Challenging MDG for the MENA Countries, Review of Middle East Economics and Finance, 10(3): 263–292.

Emara, N. and El Said, A. (2019). Financial Inclusion and Economic Growth: The Role of Governance in Selected MENA Countries. Retrieved from this link.

Emara, N. and Kasa, H. (2020). The Non-Linear Relationship between Financial Access and Domestic Saving, *Applied Economics*, 52 (2)

Emara, N. and Moore, R. (2014). Effect of Income Elasticity on MDG Health Indicators: The Case of MENA Countries, 2014, Review of Middle East Economics and Finance, 10(1): 53–73.

Emara, N., and Mohieldin, M. (2020). Financial inclusion and extreme poverty in the MENA region: a gap analysis approach. *Review of Economics and Political Science*, *5*(3), 207–230.

Emara, N. and Zecheru, D. (2021). Is the Impact of Digitization on Domestic Inflation Non-Linear? The Case of Emerging Markets.

Ending Poverty. United Nations. Retrieved from this link.

Erbaykal, E., and Okuyan, A. H. (2008). Does Inflation Depress Economic Growth? Evidence from Turkey. *International Journal of Finance End Economics*, *13*(17).

Fanta, F., and Upadhyay, M. (2009). Poverty reduction, economic growth and inequality in Africa. *Applied Economics Letters*, *16*(18), 1791–1794. https://doi.org/10.1080/13504850701719587

Fauzan, I. F., Firdaus, M., and Sahara, S. (2020). Regional financial inclusion and poverty: Evidence from Indonesia. *Economic Journal of Emerging Markets*, *12*(1), 25–38.

Figini, P., and Santarelli, E. (2006). Openness, Economic Reforms, and Poverty: Globalization in Developing Countries. *The Journal of Developing Areas*, *39*(2), 129–151. https://doi.org/10.1353/jda.2006.0003

Fosu, A. K. (2009). Inequality and the impact of growth on poverty: comparative evidence for sub-Saharan Africa. *Journal of Development*

Studies 45(5), 726-745.

Fosu, A. K. (2014). Growth, inequality and poverty in sub-Saharan Africa: Recent progress in the global context. C*SAE Working Paper WPS/2014-17*.

Oxford, University of Oxford.

Gable, Susanna, Hans Lofgren, and Israel Osorio Rodarte (2015). "Trajectories for Sustainable Development Goals: Framework and Country Applications."

Ghosh, S. (2016). Does mobile telephony spur growth? Evidence from Indian states. *Telecommunications Policy*, *40*(10-11), 1020–1031.

Gokal, V., and Hanif, S. (2004). RELATIONSHIP BETWEEN INFLATION AND ECONOMIC GROWTH.

Greenwood, J., and B. Jovanovic. 1990. "Financial Development, Growth, and the Distribution of Income." The Journal of Political Economy, Vol. 98, No. 5, 1076–107.

Haftu, G. G. (2019). Information communications technology and economic growth in Sub-Saharan Africa: A panel data approach. *Telecommunications Policy*, *43*(1), 88–99.

Heng, D., Ivanova, A., Mariscal, R., Ramakrishnan, U., and Wong, J. (2016). Advancing Financial Development in Latin America and the Caribbean. *IMF Working Papers*, *16*(81), 1.

Honohan, P. 2004. "Financial Development, Growth and Poverty: How Close Are the Links?" World Bank Policy Research Working Paper 3203. Washington, D.C.: World Bank.

International Monetary Fund; World Bank. (2018). The Bali Fintech Agenda: Chapeau Paper. World Bank Group. Retrieved from this link.

Jolly, C L. (1994) Four Theories of Population Change and the Environment. Population and Environment, A journai of Interdisciplinary Studies 16: 61-90.

Karlan, D., A. L. Ratan, and J. Zinman. (2014). "Savings By and For the Poor: A Research Review and Agenda." Review of Income and Wealth, Series 60, No. 1.

Kim, Dai-Won, Jung-Suk Yu, and M. Kabir Hassan. (2018). "Financial Inclusion and Economic Growth in OIC Countries." Research in International Business and Finance 43 (C): 1–14.

Kirk, M., J. Steele, and L. Crow. 2011. *Connected Agriculture—The Role of Mobile.* London: Accenture.

Klapper, L., M. El-Zoghbi, and J. Hess. (2016). Achieving the Sustainable Development Goals: The Role of Financial Inclusion. Washington, D.C.: CGAP.

Lutz, E. (1993) Towards Improving Accounting for the Environment. An UNST AT- World Bank Symposium. The World Bank, Washington, D. C.

Lozano, R. (2018). Measuring Progress from 1990 to 2017 and projecting attainment to 2030 of the health-related Sustainable Development Goals for 195 countries and territories: A systematic analysis for the Global Burden of Disease Study. Retrieved from this link.

L., S. S., and Birdsall, N. (1980). Population and Poverty in the Developing World. *Population and Development Review*, *6*(4), 670. https://doi.org/10.2307/1972935

Mushtaq, R., and Bruneau, C. (2019). Microfinance, financial inclusion and ICT: Implications for poverty and inequality. *Technology in Society*, *59*, 101154.

Ncube, M., Anyanwu, J. C., and Hausken, K. (2014). Inequality, Economic Growth and Poverty in the Middle East and North Africa (MENA). *African Development Review*, *26*(3), 435–453.

N'dri, L. M., and Kakinaka, M. (2020). Financial inclusion, mobile money, and individual welfare: The case of Burkina Faso. *Telecommunications Policy*, *44*(3), 101926.

Neaime, S. and Gaysset, I. (2018). Financial Inclusion and Stability in MENA: Evidence from Poverty and Inequality. Finance Research Letters 24, 230-237.

Nesse, P. J., Risnes, O., and Hallingby, H. S. (2018). Management of Mobile Financial Services—Review and Way Forward. *Finance and Economics Readings*, 49–67.

Sobhan, R. (1998). How Bad Governance Impedes Poverty Alleviation in Bangladesh. OECD Development Center, working Paper No. 143.

Page, L., and Pande, R. (2018). Ending Global Poverty: Why Money Isn't Enough. *Journal of Economic Perspectives*, *32*(4), 173–200.

Park, C.-Y., and R. V. Mercado. 2018. "Financial Inclusion, Poverty, and Income

Inequality." *Singapur Economic Review* 63 (1).

Population Action International. (2012). *Why Population Matters to Poverty Reduction*. https://pai.org/wp-content/uploads/2012/04/PAI-1293-POVERTY-4PG.pdf

Poverty Overview. World Bank. (2020, April 16). https://www.worldbank.org/en/topic/poverty/overview.

Pradhan, B. K., and Mahesh, M. (2014). Impact of trade openness on poverty: a panel data analysis of a set of developing countries. *Economics Bulletin, AccessEcon*, *34*(4), 2208–2219.

Priyanka, S., K. Xu, and D. B. Evans. 2011. "Impact of Out-of-Pocket Payments for Treatment of Non-Communicable Diseases in Developing Countries: A Review of Literature." World Health Organization Discussion Paper 2. Geneva: World Health Organization.

Ram, R. (2020). Attainment of multidimensional poverty target of sustainable development goals: a preliminary study. Applied Economics Letters, 1–5.

Rana, N. P., Luthra, S., and Rao, H. R. (2019). Key challenges to digital financial services in emerging economies: the Indian context. *Information Technology and People*, *33*(1), 198–229. https://doi.org/10.1108/itp-05-2018-0243

Rupasingha, A., and Goetz, S. (2007). Social and political forces as determinants of poverty: A spatial analysis. *The Journal Of Socio-Economics*, *36*(4), 650-671.

Schubert, D. (2019). Impacts of financial inclusion in low- and middle-income countries. https://doi.org/10.23846/b/sr/201915

Sehrawat, M., and Giri, A. K. (2017). The impact of financial development, economic growth, income inequality on poverty: evidence from India. *Empirical Economics*, *55*(4), 1585–1602. https://doi.org/10.1007/s00181-017-1321-7

Seven, Ünal, and Yener Coskun. 2016. "Does Financial Development Reduce Income Inequality and Poverty? Evidence from Emerging Countries." *Emerging Markets Review* 26 (C): 34–63.

Siddik, M. N. A., Ahsan, T., and Kabiraj, S. (2019). Does Financial Permeation Promote Economic Growth? Some Econometric Evidence From Asian Countries. *SAGE Open*, *9*(3), 215824401986581.

Sugema, I., Irawan, T., Adipurwanto, D., Holis, A., and Bakhtiar, T. (2010). The Impact of Inflation on Rural Poverty in Indonesia: an Econometrics Approach. *International Research Journal of Finance and Economics*, (58).

Talukdar, S. (2012). The effect of inflation on poverty in developing countries: A panel data analysis. *Texas Tech University Libraries*.

Thampapillai, D. J., C H. Hanf, and H. Uhlin (2000) Environmental Macroeconomics. Department of Agricultural Economics, Christian-Albrechts-University of Kiel, Germany. (Working Paper No. 9)

Ulman, S.R. and Căutișanu, C., 2020. Determinants of Persistent Poverty in the EU Countries. In: R. Pamfilie, V. Dinu, L. Tăchiciu, D. Plește, C. Vasiliu eds. *6th BASIQ International Conference on New Trends in Sustainable Business and Consumption.* Messina, Italy, 4-6 June 2020. Bucharest: ASE, pp. 267-274

Viadero, D. (2011, April 6). Rural Poverty; "education in chronically poor rural areas lags across generations". *Education Week*, *30*(27), 5.

Wadhwa, D. (2018, September 19). *The number of extremely poor people continues to rise in Sub-Saharan Africa*. World Bank Blogs. https://blogs.worldbank.org/opendata/number-extremely-poor-people-continues-rise-sub-saharan-africa.

Ward, M. R., and Zheng, S. (2016). Mobile telecommunications service and economic growth: Evidence from China. *Telecommunications Policy*, *40*(2-3), 89–101.

World Bank. 2014. "Global Financial Development Report 2014: Financial Inclusion." Washington, D.C.: World Bank.

World Bank. (2018). Poverty and Shared Prosperity 2018: Piecing Together the Poverty Puzzle. *World Bank.*

World Bank, Dollar, D., Glewwe, P., and Agrawal, N. (2004). Economic Growth, Poverty, and Household Welfare in Vietnam. *Regional And Sectoral Studies*. https://doi.org/10.1596/0-8213-5543-0.

Wu, F., Zhang, D., and Zhang, J. (2008). Unequal education, poverty and low growth – a theoretical framework for rural education of China, *Economics of Education Review*, 27 (3) (2008), pp. 308-31

Appendix

Table A1 –List of MENA included in the Sample

Country ID	Country	Code	IMF classification	World Bank Classification
1	Algeria	DZA	EM	Lower middle income
2	Djibouti	DJI	LIDC	Lower middle income
3	Egypt, Arab Rep.	EGY	EM	Lower middle income
4	Iran, Islamic Rep.	IRN	EM	Upper middle income
5	Iraq	IRQ	EM	Upper middle income
6	Israel	ISR	Advanced	High income
7	Jordan	JOR	EM	Upper middle income
8	Malta	MLT	Advanced	High income
9	Morocco	MAR	EM	Lower middle income
10	Syrian Arab Republic	SYR	EM	Low income
11	Tunisia	TUN	EM	Lower middle income
12	Yemen, Rep.	YEM	LIDC	Low income

Table A2 –List of SSA included in the Sample

Country ID	Country	Code	IMF classification	World Bank Classification
1	Angola	AGO	EM	Lower middle income
2	Benin	BEN	LIDC	Lower middle income
3	Botswana	BWA	EM	Upper middle income
4	Burkina Faso	BFA	LIDC	Low income
5	Burundi	BDI	LIDC	Low income
6	Cabo Verde	CPV	EM	Lower middle income
7	Cameroon	CMR	LIDC	Lower middle income
8	Central African Republic	CAF	LIDC	Low income
9	Chad	TCD	LIDC	Low income
10	Comoros	COM	LIDC	Lower middle income
11	Congo, Dem. Rep.	COD	LIDC	Low income
12	Congo, Rep.	COG	LIDC	Lower middle income
13	Cote d'Ivoire	CIV	LIDC	Lower middle income
14	Eswatini	SWZ	EM	Lower middle income
15	Ethiopia	ETH	LIDC	Low income
16	Gabon	GAB	EM	Upper middle income
17	Gambia, The	GMB	LIDC	Low income
18	Ghana	GHA	LIDC	Lower middle income
19	Guinea	GIN	LIDC	Low income
20	Guinea-Bissau	GNB	LIDC	Low income
21	Kenya	KEN	LIDC	Lower middle income
22	Lesotho	LSO	LIDC	Lower middle income
23	Liberia	LBR	LIDC	Low income
24	Madagascar	MDG	LIDC	Low income
25	Malawi	MWI	LIDC	Low income
26	Mali	MLI	LIDC	Low income
27	Mauritania	MRT	LIDC	Lower middle income
28	Mauritius	MUS	EM	High income

29	Mozambique	MOZ	LIDC	Low income
30	Namibia	NAM	EM	Upper middle income
31	Niger	NER	LIDC	Low income
32	Nigeria	NGA	LIDC	Lower middle income
33	Rwanda	RWA	LIDC	Low income
34	Sao Tome and Principe	STP	LIDC	Lower middle income
35	Senegal	SEN	LIDC	Lower middle income
36	Seychelles	SYC	EM	High income
37	Sierra Leone	SLE	LIDC	Low income
38	South Africa	ZAF	EM	Upper middle income
39	South Sudan	SSD	LIDC	Low income
40	Sudan	SDN	LIDC	Low income
41	Tanzania	TZA	LIDC	Lower middle income
42	Togo	TGO	LIDC	Low income
43	Uganda	UGA	LIDC	Low income
44	Zambia	ZMB	LIDC	Lower middle income
45	Zimbabwe	ZWE	LIDC	Lower middle income

Table A3 - Definitions of Economic Variables

Variable Name	WDI Definition	Unit of Measurement	Abbreviation	Data Source
Poverty	Poverty headcount ratio at $1.90 a day (2011 PPP) (% of population). Increase in poverty gap at $1.90 ($ 2011 PPP) poverty line due to out-of-pocket health care expenditure, as a percentage of the $1.90 poverty line	Percent	*Pov*	WDI
Growth	Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2010 U.S. dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.	Percent	*gr*	WDI
Inflation	Change in the log of Consumer price index (2010 = 100) (Authors computation). Consumer price index reflects changes in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used. Data are period averages.	Percent	*inf*	WDI
Openness	The sum of net exports of goods and services, net primary income, and net secondary income.	Percent of GDP	*op*	WDI
Population Growth	Change in the log of Population (Total). Annual population growth rate for year t is the exponential rate of growth of midyear population from year t-1 to t, expressed as a percentage. Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship.	Percent	*popgr*	WDI

Table A4 - Definitions of Fintech Variables

Variable Name	WDI Definition	Unit of Measurement	Abbreviation	Source
Mobile cellular subscriptions	Mobile cellular telephone subscriptions are subscriptions to a public mobile telephone service that provide access to the PSTN using cellular technology. The indicator includes (and is split into) the number of post paid subscriptions, and the number of active prepaid accounts (i.e. that have been used during the last three months). The indicator applies to all mobile cellular subscriptions that offer voice communications. It excludes subscriptions via data cards or USB modems, subscriptions to public mobile data services, private trunked mobile radio, telepoint, radio paging and telemetry services.	Per 100 people	*mob*	WDI
Individuals using the Internet	Internet users are individuals who have used the Internet (from any location) in the last 3 months. The Internet can be used via a computer, mobile phone, personal digital assistant, games machine, digital TV etc.	Percent of population	*net*	WDI
Fixed broadband subscriptions	Fixed broadband subscriptions refer to fixed subscriptions to high-speed access to the public Internet (a TCP/IP connection), at downstream speeds equal to, or greater than, 256 kbit/s. This includes cable modem, DSL, fiber-to-the-home/building, other fixed (wired)-broadband subscriptions, satellite broadband and terrestrial fixed wireless broadband. This total is measured irrespective of the method of payment. It excludes subscriptions that have access to data communications (including the Internet) via mobile-cellular networks. It should include fixed WiMAX and any other fixed wireless technologies. It includes both residential subscriptions and subscriptions for organizations.	Per 100 people	*fbb*	WDI
FinTech	Principal component analysis of the above three variables.	Index	*FinTech*	Author Computation

Table A5: Descriptive Statistic - Full Sample

Variable	Obs	Mean	Std. Dev.	Min	Max
pov	1,048	0.067	0.140	0.000	0.941
gr	2,636	0.021	0.051	-0.978	0.797
inf	2,440	0.049	0.074	-0.929	1.568
op	2,302	0.920	0.560	0.182	4.344
popgr	2,696	0.015	0.016	-0.091	0.175
mob	2,657	83.666	47.295	0.190	328.79
net	2,703	35.536	29.214	0.024	100.00
fbb	2,625	9.408	11.583	0.000	46.421
FinTech	2,415	41.747	24.716	0.099	133.848

Table A6: Descriptive Statistic – MENA Sample

Variable	Obs	Mean	Std. Dev.	Min	Max
pov	102	0.036	0.058	0.000	0.227
gr	251	0.003	0.094	-0.978	0.797
inf	258	0.050	0.060	-0.106	0.427
op	228	1.053	0.563	0.298	3.145
popgr	280	0.029	0.031	-0.045	0.175
mob	280	94.021	48.512	2.181	212.64
net	292	39.778	28.269	0.781	100.00
fbb	278	6.874	8.934	0.000	43.673
FinTech	258	44.034	23.920	1.940	104.402

Table A7: Descriptive Statistic – SSA Sample

Variable	Obs	Mean	Std. Dev.	Min	Max
pov	332	0.387	0.231	0.002	0.941
gr	644	0.018	0.051	-0.646	0.166
inf	587	0.071	0.110	-0.929	1.568
op	611	0.751	0.319	0.203	2.430
popgr	666	0.025	0.009	-0.026	0.050
mob	662	52.009	39.565	0.210	173.50
net	656	10.381	12.689	0.031	62.00
fbb	594	0.768	2.523	0.000	21.639
FinTech	547	21.065	15.480	0.118	76.266

Table A8: Extreme Poverty: The Benchmark Model – Full Sample
Dependent variable: Poverty headcount ratio at $1.90 a day (2011 PPP) (% of population)
Estimation Method: Arellano-Bover/Blundell-Bond Dynamic Panel System GMM.

Regressors	(1)	(2)	(3)	(4)	(5)	(6)
L.pov	0.644***	1.278***	1.326***	1.537***	1.523***	1.523***
	(0.061)	(0.223)	(0.262)	(0.326)	(0.301)	(0.301)
gr		-0.113**	-0.108**	-0.150**	-0.154**	-0.154**
		(0.050)	(0.049)	(0.064)	(0.064)	(0.064)
inf			-0.128*	-0.113*	-0.095*'	-0.095*'
			(0.071)	(0.068)	(0.063)	(0.063)
op				0.012*	0.007*'	0.007*'
				(0.007)	(0.005)	(0.005)
popgr					-0.835*'	-0.835*'
					(0.526)	(0.526)
Constant	0.007***	-0.007*'	-0.004	-0.021*	-0.011*	-0.011*
	(0.002)	(0.005)	(0.004)	(0.012)	(0.007)	(0.007)
Observations	731	730	701	690	690	690
Number of countries	69	68	65	64	64	64
AB Test Order 1 p-value	0.0101	0.0325	0.0494	0.0837	0.0828	0.0828
AB Test Order 2 p-value	0.471	0.894	0.917	0.912	0.919	0.919
Hansen p-value	0.0111	0.00372	0.0647	0.0402	0.0393	0.0393

*Notes: ***, **, * and *' denotes statistical significance at the 1%, 5%, 10%, and 15% levels respectively*
Numbers in round parentheses (.) are the robust standard errors

Table A9: Extreme Poverty and FinTech Measures

Dependent variable: Poverty headcount ratio at $1.90 a day (2011 PPP) (% of population)
Estimation Method: Arellano-Bover/Blundell-Bond Dynamic Panel System GMM.

Regressors	(1)	(2)	(3)	(4)
L.pov	1.385***	1.283***	1.221***	1.545***
	(0.250)	(0.200)	(0.207)	(0.374)
gr	-0.145**	-0.148**	-0.215**	-0.198**
	(0.060)	(0.060)	(0.091)	(0.091)
inf	-0.093*'	-0.093*	-0.057*'	-0.103*'
	(0.058)	(0.050)	(0.040)	(0.066)
op	0.015*	0.012*	0.009*'	0.015*'
	(0.008)	(0.007)	(0.007)	(0.009)
popgr	0.699*	0.494*'	0.549*	0.819*'
	(0.413)	(0.311)	(0.334)	(0.570)
mob	-0.005**			
	(0.002)			
net		-0.004**		
		(0.002)		
fbb			-0.003*	
			(0.002)	
FinTech				-0.006*
				(0.004)
Observations	683	682	675	675
Number of countries	64	64	63	63
AB Test Order 1 p-value	0.0649	0.0554	0.0509	0.0733
AB Test Order 2 p-value	0.888	0.870	0.546	0.762
Hansen p-value	0.0858	0.0915	0.127	0.0656

*Notes: ***, **, * and *' denotes statistical significance at the 1%, 5%, 10%, and 15% levels respectively*
Numbers in round parentheses (.) are the robust standard errors

Table A10: Extreme Poverty and FinTech Measures – MENA Region

Dependent variable: Poverty headcount ratio at $1.90 a day (2011 PPP) (% of population)
Estimation Method: Arellano-Bover/Blundell-Bond Dynamic Panel System GMM.

Regressors	(1)	(2)	(3)	(4)
L.pov	1.369***	1.329***	1.100***	1.583***
	(0.245)	(0.214)	(0.227)	(0.351)
gr	-0.139**	-0.080	-0.142*	-0.157
	(0.058)	(0.084)	(0.085)	(0.118)
inf	-0.096*	-0.154*	-0.154**	-0.135*
	(0.057)	(0.081)	(0.072)	(0.076)
op	0.015*	0.021*	0.025**	0.019*
	(0.009)	(0.012)	(0.012)	(0.011)
popgr	0.739*	0.571*'	0.466*'	0.888*'
	(0.409)	(0.393)	(0.332)	(0.602)
mena	0.104*	0.103*	0.006	0.105*
	(0.060)	(0.055)	(0.006)	(0.056)
mob	-0.005**			
	(0.002)			
mob_mena	-0.025*'			
	(0.016)			
net		-0.008**		
		(0.004)		
net_mena		-0.029*'		
		(0.018)		
fbb			-0.011**	
			(0.004)	
fbb_mena			-0.008	
			(0.006)	
FinTech				-0.008**
				(0.004)
FinTech_mena				-0.028*'
				(0.018)
Total Effect in MENA	-0.02996*	-0.0368*	-0.01894**	-0.03677*
	(0.0177)	(0.02122)	(0.0093)	(0.0206)
Observations	683	682	675	675
Number of countries	64	64	63	63
AB Test Order 1 p-value	0.0647	0.0684	0.0604	0.0767
AB Test Order 2 p-value	0.895	0.936	0.658	0.882
Hansen p-value	0.116	0.422	0.0669	0.212

*Notes: ***, **, * and *' denotes statistical significance at the 1%, 5%, 10%, and 15% levels respectively*
Numbers in round parentheses (.) are the robust standard errors

Table A11: Extreme Poverty and FinTech Measures – SSA Region

Dependent variable: Poverty headcount ratio at $1.90 a day (2011 PPP) (% of population)
Estimation Method: Arellano-Bover/Blundell-Bond Dynamic Panel System GMM.

Regressors	(1)	(2)	(3)	(4)
L.pov	0.887***	0.669***	0.577***	0.806***
	(0.028)	(0.080)	(0.112)	(0.047)
gr	-0.039*'	0.112*	0.160*	0.084**
	(0.026)	(0.059)	(0.096)	(0.034)
inf	-0.080**	-0.006	-0.030	0.037
	(0.036)	(0.045)	(0.063)	(0.041)
op	0.004	0.015	0.006	0.001
	(0.005)	(0.012)	(0.018)	(0.007)
popgr	-0.095	-0.630	-0.715	-0.649*
	(0.162)	(0.564)	(0.588)	(0.375)
SSA	0.038	0.199***	0.088***	0.260***
	(0.042)	(0.060)	(0.028)	(0.059)
mob	-0.014			
	(0.010)			
mob_SSA	-0.003			
	(0.010)			
net		-0.002		
		(0.003)		
net_SSA		-0.042***		
		(0.013)		
fbb			0.003	
			(0.009)	
fbb_SSA			-0.034***	
			(0.011)	
FinTech				0.021**
				(0.010)
FinTech_SSA				-0.059***
				(0.014)
Total Effect in SSA	-0.01689***	-0.0438***	-0.0308***	-0.0387*
	(0.0037)	(0.01313)	(0.0084)	(0.0090)
Observations	1,215	1,210	1,179	1,179
Number of countries	127	127	125	126
AB Test Order 1 p-value	0.0227	0.0594	0.0364	0.0454
AB Test Order 2 p-value	0.896	0.361	0.565	0.185
Hansen p-value	0.0394	0.168	0.0948	0.0344

*Notes: ***, **, * and *' denotes statistical significance at the 1%, 5%, 10%, and 15% levels respectively*
Numbers in round parentheses (.) are the robust standard errors

Table A12: Extreme Poverty and FinTech Gap Analysis in MENA Region – Assessment Against the UN's 0% Poverty Target

Country	Poverty Latest Year	Poverty Latest Value (%)	Poverty Required Growth "r"	2030 Poverty Projection (%)	Poverty Gap 2030	"Required" Increase in the growth of the FinTech Index	"Actual" growth in Fintech Index, or "b_req"	Fintech Index Gap
Yemen, Rep.	2014	18.8	-0.77	17.11	-17.11	21.00	0.16	20.84
Djibouti	2017	17.1	-0.84	15.55	-15.55	22.76	0.20	22.56
Egypt, Arab Rep.	2017	3.2	-0.81	2.99	-2.99	22.15	0.14	22.00
Iraq	2012	2.5	-0.70	2.29	-2.29	19.02	0.13	18.89
Syrian Arab Republic	2004	1.7	-0.56	1.48	-1.48	15.19	0.15	15.04
Morocco	2013	1	-0.70	0.93	-0.93	19.16	0.11	19.05
Algeria	2011	0.5	-0.65	0.46	-0.46	17.72	0.12	17.60
Iran, Islamic Rep.	2017	0.3	-0.78	0.28	-0.28	21.14	0.14	21.00
Israel	2016	0.2	-0.74	0.20	-0.20	20.25	0.04	20.22
Malta	2017	0.2	-0.77	0.19	-0.19	20.94	0.06	20.89
Tunisia	2015	0.2	-0.72	0.19	-0.19	19.59	0.10	19.49
Jordan	2010	0.1	-0.60	0.09	-0.09	16.37	0.09	16.27

Source: Authors computation.
Note: The FinTech coefficient from TableA10 is equal to -0.0368.

Table A13: Extreme Poverty and FinTech Gap Analysis in MENA Region – Assessment Against the 1.5% Poverty Target

Country	Poverty Latest Year	Poverty Latest Value (%)	Required Growth "r" in Poverty to close the SDG1 gap	2030 Poverty Projection (%)	Poverty Gap 2030	"Required" Increase in the growth of the FinTech Index	"Actual" growth in Fintech Index, or "b_req"	Fintech Index Gap
Yemen, Rep.	2014	18.8	-0.36	17.11	-15.61	9.78	0.16	9.62
Djibouti	2017	17.1	-0.42	15.55	-14.05	11.37	0.20	11.17
Egypt, Arab Rep.	2017	3.2	-0.34	2.99	-1.49	9.19	0.14	9.05
Iraq	2012	2.5	-0.25	2.29	-0.79	6.73	0.13	6.59
Syrian Arab Republic	2004	1.7	-0.17	1.48	0.02	4.52	0.15	4.38
Morocco	2013	1	-0.22	0.93	0.57	5.95	0.11	5.84
Algeria	2011	0.5	-0.17	0.46	1.04	4.58	0.12	4.46
Iran, Islamic Rep.	2017	0.3	-0.21	0.28	1.22	5.60	0.14	5.46
Israel	2016	0.2	-0.17	0.20	1.30	4.59	0.04	4.56
Malta	2017	0.2	-0.18	0.19	1.31	4.91	0.06	4.85
Tunisia	2015	0.2	-0.16	0.19	1.31	4.31	0.10	4.22
Jordan	2010	0.1	-0.09	0.09	1.41	2.46	0.09	2.37

Source: Authors computation.
Note: The FinTech coefficient from TableA10 is equal to -0.0368.

Table A14: Extreme Poverty and FinTech Gap Analysis in MENA Region – Assessment Against the 3% Poverty Target

Country	Poverty Latest Year	Poverty Latest Value (%)	Required Growth "r" in Poverty to close the SDG1 gap	2030 Poverty Projection (%)	Poverty Gap 2030	"Required" Increase in the growth of the FinTech Index	"Actual" growth in Fintech Index, or "b_req"	Fintech Index Gap
Yemen, Rep.	2014	18.8	-0.33	17.11	-14.11	9.01	0.16	8.85
Djibouti	2017	17.1	-0.39	15.55	-12.55	10.50	0.20	10.31
Egypt, Arab Rep.	2017	3.2	-0.30	2.99	0.01	8.21	0.14	8.06
Iraq	2012	2.5	-0.22	2.29	0.71	5.92	0.13	5.79
Syrian Arab Republic	2004	1.7	-0.14	1.48	1.52	3.91	0.15	3.77
Morocco	2013	1.0	-0.19	0.93	2.07	5.07	0.11	4.96
Algeria	2011	0.5	-0.14	0.46	2.54	3.74	0.12	3.62
Iran, Islamic Rep.	2017	0.3	-0.16	0.28	2.72	4.41	0.14	4.28
Israel	2016	0.2	-0.13	0.20	2.80	3.45	0.04	3.41
Malta	2017	0.2	-0.14	0.19	2.81	3.69	0.06	3.63
Tunisia	2015	0.2	-0.12	0.19	2.81	3.23	0.10	3.13
Jordan	2010	0.1	-0.06	0.09	2.91	1.59	0.09	1.49

Source: Authors computation.
Note: The FinTech coefficient from TableA10 is equal to -0.0368.

Table A15: Extreme Poverty and FinTech Gap Analysis in MENA Region – Assessment Against the 5% Poverty Target

Country	Poverty Latest Year	Poverty Latest Value (%)	Required Growth "r" in Poverty to close the SDG1 gap	2030 Poverty Projection (%)	Poverty Gap 2030	"Required" Increase in the growth of the FinTech Index	"Actual" growth in Fintech Index, or "b_req"	Fintech Index Gap
Yemen, Rep.	2014	18.8	-0.31	17.11	-12.11	8.42	0.16	8.26
Djibouti	2017	17.1	-0.36	15.55	-10.56	9.83	0.20	9.64
Egypt, Arab Rep.	2017	3.2	-0.27	2.99	2.01	7.45	0.14	7.30
Iraq	2012	2.5	-0.20	2.29	2.71	5.31	0.13	5.18
Syrian Arab Republic	2004	1.7	-0.13	1.48	3.52	3.45	0.15	3.30
Morocco	2013	1.0	-0.16	0.93	4.07	4.39	0.11	4.28
Algeria	2011	0.5	-0.11	0.46	4.54	3.10	0.12	2.98
Iran, Islamic Rep.	2017	0.3	-0.13	0.28	4.72	3.50	0.14	3.37
Israel	2016	0.2	-0.09	0.20	4.80	2.56	0.04	2.53
Malta	2017	0.2	-0.10	0.19	4.81	2.75	0.06	2.69
Tunisia	2015	0.2	-0.09	0.19	4.81	2.40	0.10	2.30
Jordan	2010	0.1	-0.03	0.09	4.91	0.93	0.09	0.83

Source: Authors computation.
Note: The FinTech coefficient from TableA10 is equal to -0.0368.

Table A16: Extreme Poverty and FinTech Gap Analysis in SSA Region – Assessment Against the UN 0% Poverty Target

Country	Poverty Latest Year	Poverty Latest Value (%)	Required Growth "r" in Poverty to close the SDG1 gap	2030 Poverty Projection (%)	Poverty Gap 2030	"Required" Increase in the growth of the FinTech Index	"Actual" growth in Fintech Index, or "b_req"	Fintech Index Gap
Madagascar	2012	77.6	-0.75	70.80	-70.80	19.42	0.13	19.29
Congo, Dem. Rep.	2012	76.6	-0.75	69.65	-69.65	19.42	0.14	19.28
Central African Republic	2008	66.3	-0.68	64.64	-64.64	17.51	0.03	17.49
Guinea-Bissau	2010	67.1	-0.71	63.21	-63.21	18.41	0.08	18.33
Burundi	2013	71.8	-0.77	62.06	-62.06	19.90	0.22	19.68
Malawi	2016	70.3	-0.83	61.75	-61.75	21.50	0.24	21.26
Mozambique	2014	62.9	-0.79	56.79	-56.79	20.38	0.16	20.21
Zambia	2015	57.5	-0.81	51.08	-51.08	20.89	0.20	20.68
Nigeria	2009	53.5	-0.69	47.58	-47.58	17.87	0.14	17.73
Rwanda	2016	55.5	-0.83	47.21	-47.21	21.43	0.30	21.13
Togo	2015	49.8	-0.81	46.04	-46.04	20.84	0.14	20.70
Tanzania	2017	49.1	-0.85	44.81	-44.81	21.95	0.18	21.77
Sierra Leone	2011	52.2	-0.73	44.46	-44.46	18.79	0.22	18.57
Benin	2015	49.5	-0.81	44.00	-44.00	20.84	0.20	20.63
South Sudan	2009	42.7	-0.69	42.05	-42.05	17.79	0.02	17.77
Mali	2009	49.7	-0.69	41.44	-41.44	17.84	0.22	17.62
Liberia	2016	40.9	-0.83	38.19	-38.19	21.33	0.13	21.20
Niger	2014	44.5	-0.78	37.80	-37.80	20.26	0.26	20.00
Uganda	2016	41.7	-0.83	37.59	-37.59	21.34	0.19	21.14
Burkina Faso	2014	43.7	-0.78	37.06	-37.06	20.25	0.26	19.99
Chad	2011	38.4	-0.72	35.82	-35.82	18.68	0.09	18.58
Congo, Rep.	2011	37	-0.72	35.13	-35.13	18.66	0.07	18.59
Kenya	2015	36.8	-0.80	33.90	-33.90	20.74	0.14	20.60
Senegal	2011	38	-0.72	33.61	-33.61	18.67	0.17	18.50
Sao Tome and Principe	2017	34.5	-0.85	32.33	-32.33	21.84	0.13	21.71
Guinea	2012	35.3	-0.74	31.68	-31.68	19.14	0.16	18.98
Zimbabwe	2017	33.9	-0.85	29.68	-29.68	21.84	0.26	21.58
Angola	2008	30.1	-0.67	27.34	-27.34	17.21	0.11	17.10
Eswatini	2016	28.4	-0.82	27.13	-27.13	21.21	0.08	21.13
Cote d'Ivoire	2015	28.2	-0.80	25.07	-25.07	20.65	0.20	20.44
Lesotho	2017	26.9	-0.84	24.29	-24.29	21.77	0.20	21.56
Ethiopia	2015	30.8	-0.80	24.23	-24.23	20.68	0.41	20.27
Cameroon	2014	23.8	-0.78	21.48	-21.48	20.04	0.16	19.87
South Africa	2014	18.9	-0.77	17.74	-17.74	19.95	0.10	19.85
Comoros	2014	17.6	-0.77	15.18	-15.18	19.93	0.24	19.69
Botswana	2015	16.1	-0.79	14.82	-14.82	20.45	0.14	20.30
Namibia	2015	13.4	-0.79	12.32	-12.32	20.38	0.14	20.24
Ghana	2016	13.3	-0.81	11.89	-11.89	20.95	0.21	20.75
Sudan	2014	12.7	-0.77	10.92	-10.92	19.80	0.24	19.56
Gambia, The	2015	10.1	-0.78	9.20	-9.20	20.28	0.16	20.12

Mauritania	2014	6	-0.76	5.59	-5.59	19.51	0.11	19.40
Gabon	2017	3.4	-0.82	3.20	-3.20	21.06	0.12	20.94
Cabo Verde	2015	3.2	-0.77	2.89	-2.89	19.83	0.17	19.66
Seychelles	2013	1.1	-0.71	1.04	-1.04	18.25	0.08	18.17
Mauritius	2017	0.2	-0.77	0.19	-0.19	19.90	0.10	19.80

Source: Authors computation.
Note: The FinTech coefficient from TableA11 is equal to -0. 0387.

Table A17: Extreme Poverty and FinTech Gap Analysis in SSA Region – Assessment Against the 1.5% Poverty Target

Country	Poverty Latest Year	Poverty Latest Value (%)	Required Growth "r" in Poverty to close the SDG1 gap	2030 Poverty Projection (%)	Poverty Gap 2030	"Required" Increase in the growth of the FinTech Index	"Actual" growth in Fintech Index, or "b_req"	Fintech Index Gap
Madagascar	2012	77.6	-0.38	70.80	-69.30	9.77	0.13	9.64
Congo, Dem. Rep.	2012	76.6	-0.38	69.65	-68.15	9.76	0.14	9.62
Central African Republic	2008	66.3	-0.32	64.64	-63.14	8.20	0.03	8.17
Guinea-Bissau	2010	67.1	-0.34	63.21	-61.71	8.87	0.08	8.79
Burundi	2013	71.8	-0.39	62.06	-60.56	10.14	0.22	9.92
Malawi	2016	70.3	-0.45	61.75	-60.25	11.71	0.24	11.47
Mozambique	2014	62.9	-0.41	56.79	-55.29	10.50	0.16	10.33
Zambia	2015	57.5	-0.42	51.08	-49.58	10.93	0.20	10.73
Nigeria	2009	53.5	-0.32	47.58	-46.08	8.34	0.14	8.19
Rwanda	2016	55.5	-0.44	47.21	-45.71	11.47	0.30	11.17
Togo	2015	49.8	-0.42	46.04	-44.54	10.79	0.14	10.65
Tanzania	2017	49.1	-0.46	44.81	-43.31	11.98	0.18	11.79
Sierra Leone	2011	52.2	-0.35	44.46	-42.96	9.02	0.22	8.80
Benin	2015	49.5	-0.42	44.00	-42.50	10.78	0.20	10.58
South Sudan	2009	42.7	-0.32	42.05	-40.55	8.15	0.02	8.13
Mali	2009	49.7	-0.32	41.44	-39.94	8.27	0.22	8.05
Liberia	2016	40.9	-0.43	38.19	-36.69	11.15	0.13	11.03
Niger	2014	44.5	-0.39	37.80	-36.30	10.16	0.26	9.90
Uganda	2016	41.7	-0.43	37.59	-36.09	11.17	0.19	10.98
Burkina Faso	2014	43.7	-0.39	37.06	-35.56	10.14	0.26	9.88
Chad	2011	38.4	-0.34	35.82	-34.32	8.74	0.09	8.65
Congo, Rep.	2011	37	-0.34	35.13	-33.63	8.71	0.07	8.64
Kenya	2015	36.8	-0.41	33.90	-32.40	10.48	0.14	10.34
Senegal	2011	38	-0.34	33.61	-32.11	8.73	0.17	8.57
Sao Tome and Principe	2017	34.5	-0.45	32.33	-30.83	11.59	0.13	11.47
Guinea	2012	35.3	-0.35	31.68	-30.18	9.05	0.16	8.90
Zimbabwe	2017	33.9	-0.45	29.68	-28.18	11.57	0.26	11.31
Angola	2008	30.1	-0.29	27.34	-25.84	7.55	0.11	7.44
Eswatini	2016	28.4	-0.42	27.13	-25.63	10.77	0.08	10.68
Cote d'Ivoire	2015	28.2	-0.40	25.07	-23.57	10.21	0.20	10.01
Lesotho	2017	26.9	-0.44	24.29	-22.79	11.32	0.20	11.12
Ethiopia	2015	30.8	-0.40	24.23	-22.73	10.30	0.41	9.89
Cameroon	2014	23.8	-0.37	21.48	-19.98	9.54	0.16	9.37
South Africa	2014	18.9	-0.36	17.74	-16.24	9.30	0.10	9.20
Comoros	2014	17.6	-0.36	15.18	-13.68	9.23	0.24	8.99
Botswana	2015	16.1	-0.37	14.82	-13.32	9.61	0.14	9.47
Namibia	2015	13.4	-0.36	12.32	-10.82	9.41	0.14	9.27
Ghana	2016	13.3	-0.38	11.89	-10.39	9.93	0.21	9.72
Sudan	2014	12.7	-0.34	10.92	-9.42	8.88	0.24	8.64
Gambia, The	2015	10.1	-0.35	9.20	-7.70	9.10	0.16	8.94
Mauritania	2014	6	-0.31	5.59	-4.09	8.07	0.11	7.96
Gabon	2017	3.4	-0.34	3.20	-1.70	8.81	0.12	8.69

Cabo Verde	2015	3.2	-0.30	2.89	-1.39	7.77	0.17	7.59
Seychelles	2013	1.1	-0.22	1.04	0.46	5.77	0.08	5.69
Mauritius	2017	0.2	-0.18	0.19	1.31	4.67	0.10	4.57

Source: Authors computation.
Note: The FinTech coefficient from TableA11 is equal to -0. 0387.

Table A18: Extreme Poverty and FinTech Gap Analysis in SSA Region – Assessment Against the 3% Poverty Target

Country	Poverty Latest Year	Poverty Latest Value (%)	Required Growth "r" in Poverty to close the SDG1 gap	2030 Poverty Projection (%)	Poverty Gap 2030	"Required" Increase in the growth of the FinTech Index	"Actual" growth in Fintech Index, or "b_req"	Fintech Index Gap
Madagascar	2012	77.6	-0.35	70.80	-67.80	9.14	0.13	9.01
Congo, Dem. Rep.	2012	76.6	-0.35	69.65	-66.65	9.13	0.14	8.99
Central African Republic	2008	66.3	-0.30	64.64	-61.64	7.63	0.03	7.60
Guinea-Bissau	2010	67.1	-0.32	63.21	-60.21	8.27	0.08	8.19
Burundi	2013	71.8	-0.37	62.06	-59.06	9.49	0.22	9.27
Malawi	2016	70.3	-0.43	61.75	-58.75	10.99	0.24	10.76
Mozambique	2014	62.9	-0.38	56.79	-53.79	9.82	0.16	9.65
Zambia	2015	57.5	-0.40	51.08	-48.08	10.23	0.20	10.03
Nigeria	2009	53.5	-0.30	47.58	-44.58	7.75	0.14	7.60
Rwanda	2016	55.5	-0.42	47.21	-44.21	10.74	0.30	10.45
Togo	2015	49.8	-0.39	46.04	-43.04	10.08	0.14	9.94
Tanzania	2017	49.1	-0.43	44.81	-41.81	11.22	0.18	11.04
Sierra Leone	2011	52.2	-0.32	44.46	-41.46	8.39	0.22	8.18
Benin	2015	49.5	-0.39	44.00	-41.00	10.07	0.20	9.87
South Sudan	2009	42.7	-0.29	42.05	-39.05	7.55	0.02	7.53
Mali	2009	49.7	-0.30	41.44	-38.44	7.69	0.22	7.46
Liberia	2016	40.9	-0.40	38.19	-35.19	10.41	0.13	10.28
Niger	2014	44.5	-0.37	37.80	-34.80	9.47	0.26	9.21
Uganda	2016	41.7	-0.40	37.59	-34.59	10.43	0.19	10.24
Burkina Faso	2014	43.7	-0.37	37.06	-34.06	9.45	0.26	9.19
Chad	2011	38.4	-0.31	35.82	-32.82	8.11	0.09	8.01
Congo, Rep.	2011	37	-0.31	35.13	-32.13	8.07	0.07	8.00
Kenya	2015	36.8	-0.38	33.90	-30.90	9.76	0.14	9.62
Senegal	2011	38	-0.31	33.61	-30.61	8.10	0.17	7.93
Sao Tome and Principe	2017	34.5	-0.42	32.33	-29.33	10.81	0.13	10.69
Guinea	2012	35.3	-0.32	31.68	-28.68	8.39	0.16	8.24
Zimbabwe	2017	33.9	-0.42	29.68	-26.68	10.79	0.26	10.53
Angola	2008	30.1	-0.27	27.34	-24.34	6.97	0.11	6.85
Eswatini	2016	28.4	-0.39	27.13	-24.13	10.00	0.08	9.92
Cote d'Ivoire	2015	28.2	-0.37	25.07	-22.07	9.47	0.20	9.27
Lesotho	2017	26.9	-0.41	24.29	-21.29	10.52	0.20	10.32
Ethiopia	2015	30.8	-0.37	24.23	-21.23	9.56	0.41	9.15
Cameroon	2014	23.8	-0.34	21.48	-18.48	8.82	0.16	8.65
South Africa	2014	18.9	-0.33	17.74	-14.74	8.57	0.10	8.47
Comoros	2014	17.6	-0.33	15.18	-12.18	8.49	0.24	8.25

Botswana	2015	16.1	-0.34	14.82	-11.82	8.85	0.14	8.70
Namibia	2015	13.4	-0.33	12.32	-9.32	8.64	0.14	8.49
Ghana	2016	13.3	-0.35	11.89	-8.89	9.12	0.21	8.91
Sudan	2014	12.7	-0.31	10.92	-7.92	8.13	0.24	7.89
Gambia, The	2015	10.1	-0.32	9.20	-6.20	8.31	0.16	8.15
Mauritania	2014	6	-0.28	5.59	-2.59	7.28	0.11	7.17
Gabon	2017	3.4	-0.31	3.20	-0.20	7.88	0.12	7.76
Cabo Verde	2015	3.2	-0.27	2.89	0.11	6.91	0.17	6.74
Seychelles	2013	1.1	-0.19	1.04	1.96	4.93	0.08	4.85
Mauritius	2017	0.2	-0.14	0.19	2.81	3.51	0.10	3.41

Source: Authors computation.
Note: The FinTech coefficient from TableA11 is equal to -0. 0387

Table A19: Extreme Poverty and FinTech Gap Analysis in SSA Region – Assessment Against the 5% Poverty Target

Country	Poverty Latest Year	Poverty Latest Value (%)	Required Growth "r" in Poverty to close the SDG1 gap	2030 Poverty Projection (%)	Poverty Gap 2030	"Required" Increase in the growth of the FinTech Index	"Actual" growth in Fintech Index, or "b_req"	Fintech Index Gap
Madagascar	2012	77.6	-0.34	70.80	-65.80	8.66	0.13	8.53
Congo, Dem. Rep.	2012	76.6	-0.33	69.65	-64.65	8.65	0.14	8.51
Central African Republic	2008	66.3	-0.28	64.64	-59.64	7.20	0.03	7.17
Guinea-Bissau	2010	67.1	-0.30	63.21	-58.21	7.81	0.08	7.74
Burundi	2013	71.8	-0.35	62.06	-57.06	8.99	0.22	8.77
Malawi	2016	70.3	-0.40	61.75	-56.75	10.44	0.24	10.21
Mozambique	2014	62.9	-0.36	56.79	-51.79	9.30	0.16	9.13
Zambia	2015	57.5	-0.37	51.08	-46.08	9.69	0.20	9.48
Nigeria	2009	53.5	-0.28	47.58	-42.58	7.30	0.14	7.16
Rwanda	2016	55.5	-0.39	47.21	-42.21	10.18	0.30	9.88
Togo	2015	49.8	-0.37	46.04	-41.04	9.53	0.14	9.40
Tanzania	2017	49.1	-0.41	44.81	-39.81	10.63	0.18	10.45
Sierra Leone	2011	52.2	-0.31	44.46	-39.46	7.92	0.22	7.70
Benin	2015	49.5	-0.37	44.00	-39.00	9.53	0.20	9.32
South Sudan	2009	42.7	-0.27	42.05	-37.05	7.10	0.02	7.08
Mali	2009	49.7	-0.28	41.44	-36.44	7.24	0.22	7.02
Liberia	2016	40.9	-0.38	38.19	-33.19	9.84	0.13	9.71
Niger	2014	44.5	-0.35	37.80	-32.80	8.94	0.26	8.68
Uganda	2016	41.7	-0.38	37.59	-32.59	9.86	0.19	9.67
Burkina Faso	2014	43.7	-0.35	37.06	-32.06	8.92	0.26	8.65
Chad	2011	38.4	-0.30	35.82	-30.82	7.63	0.09	7.53
Congo, Rep.	2011	37	-0.29	35.13	-30.13	7.59	0.07	7.52
Kenya	2015	36.8	-0.36	33.90	-28.90	9.20	0.14	9.06

Senegal	2011	38	-0.29	33.61	-28.61	7.62	0.17	7.45
Sao Tome and Principe	2017	34.5	-0.40	32.33	-27.33	10.21	0.13	10.08
Guinea	2012	35.3	-0.31	31.68	-26.68	7.89	0.16	7.74
Zimbabwe	2017	33.9	-0.39	29.68	-24.68	10.19	0.26	9.93
Angola	2008	30.1	-0.25	27.34	-22.34	6.52	0.11	6.41
Eswatini	2016	28.4	-0.36	27.13	-22.13	9.41	0.08	9.33
Cote d'Ivoire	2015	28.2	-0.34	25.07	-20.07	8.90	0.20	8.70
Lesotho	2017	26.9	-0.38	24.29	-19.29	9.91	0.20	9.71
Ethiopia	2015	30.8	-0.35	24.23	-19.23	9.00	0.41	8.59
Cameroon	2014	23.8	-0.32	21.48	-16.48	8.26	0.16	8.10
South Africa	2014	18.9	-0.31	17.74	-12.74	8.01	0.10	7.91
Comoros	2014	17.6	-0.31	15.18	-10.18	7.93	0.24	7.69
Botswana	2015	16.1	-0.32	14.82	-9.82	8.26	0.14	8.11
Namibia	2015	13.4	-0.31	12.32	-7.32	8.04	0.14	7.90
Ghana	2016	13.3	-0.33	11.89	-6.89	8.50	0.21	8.29
Sudan	2014	12.7	-0.29	10.92	-5.92	7.56	0.24	7.32
Gambia, The	2015	10.1	-0.30	9.20	-4.20	7.70	0.16	7.54
Mauritania	2014	6	-0.26	5.59	-0.59	6.68	0.11	6.57
Gabon	2017	3.4	-0.28	3.20	1.80	7.16	0.12	7.04
Cabo Verde	2015	3.2	-0.24	2.89	2.11	6.26	0.17	6.08
Seychelles	2013	1.1	-0.17	1.04	3.96	4.30	0.08	4.22
Mauritius	2017	0.2	-0.10	0.19	4.81	2.61	0.10	2.51

Source: Authors computation.
Note: The FinTech coefficient from TableA11 is equal to -0. 0387.

Table A20: Poverty and FinTech - Does Education Matter in SSA?

Regressors	Total Effects
FinTech and Edu	-0.042*** (0.013)
FinTech and schp	-0.072*** (0.016)
FinTech and schs	-0.032*** (0.012)
FinTech and scht	-0.039*** (0.012)

*Notes: ***, **, and * denotes statistical significance at the 1%, 5%, 10%, and 15% levels respectively. Numbers in round parentheses (.) are the robust standard errors*

Table A21: Poverty and FinTech - Does Governance Matter in SSA?

Regressors	Total Effects
FinTech and gov	-0.047*** (0.011)
FinTech and corrup	-0.045*** (0.011)
FinTech and geff	-0.046***

	(0.012)
FinTech and pols	-0.045*** (0.011)
FinTech and regq	-0.044*** (0.011)
FinTech and rl	-0.046*** (0.011)
FinTech and vacc	-0.044*** (0.010)

*Notes: ***, **, and * denotes statistical significance at the 1%, 5%, and 10%, respectively. Numbers in round parentheses (.) are the robust standard errors*