

# Financial inclusion, income, and wealth inequality in Kenya

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## Abstract

This paper analyses the impact of financial inclusion on income, wealth and inequality in Kenya. The unobservable factors are controlled for using propensity score matching method to establish the effect of financial services on income and wealth inequality in the five waves of the Financial Access Household Surveys conducted in 2006, 2009, 2012, 2015 and 2018. The results show that using financial services increased income and wealth and reduced inequality significantly in the initial surveys, however, wealth and income increased marginally, while inequality reduced gradually in later surveys. In addition, saving had a larger impact on increasing income and reducing inequality compared to credit, while using financial services increased educational spending. Therefore, improvement in financial inclusion eases financial constraints thereby, increasing investment and earnings, which reduces the wealth gap between the rich and the poor.

**Keywords:** *Financial Inclusion; Income; Wealth; Inequality.*

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## 1. Introduction

Despite rapid income growth and a broad reduction in poverty levels, inequality in low-income countries is higher than emerging and advanced economies (UNECA, 2017, IMF, 2017). Persistent high levels of inequality has been attributed, in part, to financial under-development and the inability of a large portion of the population to participate in the formal financial market (Galor and Zeira, 2003; Beck and Demirguc-Kunt, 2007). Evidence from cross-country studies show that countries with high levels of financial exclusion tend to have high levels of income inequality (Flug, et. al., 1999; Kempson, et al., 2004; Burgess and Pande, 2005; Park & Mercado, 2015).

The effect of financial inclusion<sup>1</sup> on income and wealth inequality stems from enabling households that were hitherto credit constrained to either access affordable credit or increase savings

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<sup>1</sup>The Alliance for Financial Inclusion (AFI) measures financial inclusion along the four dimensions of access, usage, quality and welfare/impact. Access refers to the ability to use formal financial services, usage refers to the actual use of financial devices (regularity, frequency, duration), quality refers to the existence of products that match consumer needs and ensure consumer protection, and impact refers to the effect of financial inclusion on consumer livelihoods. The primary focus of financial inclusion efforts is to reduce involuntary exclusion, which can arise from insufficient incomes, high risk profiles, discriminatory policies, poor contractual or informational frameworks or inappropriate price and product features. This is distinct from voluntary exclusion, in which individuals may opt not to use financial services because they have no need for them, due to cultural or religious reasons, or because they have indirect access via family or friends (Beck, 2009).

(Levine, 2005). The increase in access to credit and/or savings enables the poor to invest akin to the rich, start businesses or shift from occupations with low productivity and hence low returns, to occupations with high returns.<sup>2</sup> In addition, financial inclusion increases the ability of the poor to hold a diversified portfolio of assets and income generating projects, which not only reduces the severity of shocks to incomes, but also increases their incomes (King and Levine, 1993; Acemoglu and Zilibotti, 1997).<sup>3</sup> This increases incomes of the poor relative to the rich, which reduces inequality.

The contribution of financial inclusion to reduction in income and wealth inequality has informed policy intervention to increase participation of household and entrepreneurial firms in the financial market (Government of Kenya, 2007). As a result, financial exclusion at individual and firm level has reduced. For instance, the proportion of individuals excluded from the financial services reduced from 38 percent in 2014 to 31 percent in 2017 (Demirgüç-Kunt, et al. 2018), while entrepreneurial firms citing lack of finance as the main challenge reduced to 35 percent from 46 percent in developing countries (Demirguc-Kunt, et al., 2018). In Kenya, financial innovation<sup>4</sup> and policy interventions reduced the financially excluded from 41.3 percent in 2006 to 11.6 percent in 2021 (FSD/CBK, 2021).

Despite tremendous gains in financial inclusion, the decline in income and wealth inequality in Kenya is insignificant (UNECA, 2017; KNBS, 2018). Empirical literature on the impact of financial inclusion on reducing income and wealth gap is thin and incoherent. Whereas some studies show that access to financial services can narrow income inequality (Flug, et. al., 1999; Burgess and Pande, 2005; Park and Mercado, 2015), others show that the effect of financial inclusion on inequality depends on the type of the financial service used, such as savings or credit (Karlan, Ratan, & Zinman, 2014; Banerjee, Karlan, & Zinman, 2015), type of investment and returns from investment (King and Levine, 1993). Further evidence shows that some dimensions of financial inclusion can positively impact inequality, while others can have an ambiguous or negative impact (Dabla-Norris, 2015).

This paper attempts to establish the impact of financial inclusion on income and wealth, as well as income and wealth inequality in Kenya. The focus on Kenya is informed by first, significant increase in access and utilisation of financial services between 2006 and 2021. On the one hand, financial innovation as well as the harnessing of telecommunication technology in the provision of financial services has increased financial inclusion (Jack and Suri, 2011; Jack and Suri, 2014; FSD/CBK, 2021). On the other hand, the synergy between mobile network operators and financial services providers has relaxed constraints to access and utilisation of financial services to a large proportion of Kenyans (Jack and Suri, 2014). Kenya has recorded an average GDP growth of 5.3 percent between 2005 and 2015, however, poverty and wealth gaps are higher compared to countries in the region with comparable growth and improvement in financial inclusivity<sup>5</sup> (UNECA, 2017; KNBS, 2018).

In this regard, financial services utilised are aggregated into financial services utilisation index akin to Sarma (2017). Financial inclusion is also measured by using bank, microfinance, insurance, savings and Credit Cooperative Societies (SACCOs) and mobile money services. In this way, the intensive margin (use) of financial inclusion is captured, which has a larger effect on savings and investment and hence, on income and wealth compared to access to financial services. The unobserved factors are controlled for using propensity score matching method to account for the differences in wealth and income between the financially included and the excluded in the four

<sup>2</sup>Jack and Suri (2014) access to finance enables household members to shift from low income and productivity occupations into those that not only have higher productivity, but also stable earnings

<sup>3</sup>Levine (2005) argues that the poor who access financial services are able to undertake investment in illiquid, high risk and lumpy projects, but with high returns because they can use the financial markets to ameliorate their liquidity position. Otherwise, without access to financial services, the poor can neither afford lumpy investment nor endure liquidity challenges inherent in illiquid but high expected return projects.

<sup>4</sup>Khraisha & Keren (2018) Financial innovation is a process, carried out by any institution, that involves the creation, promotion and adoption of new (including both incremental and radical) products, platforms, and processes or catalyst of technologies that introduce new ways or changes to the way a financial service is provided or start to be provided.

<sup>5</sup>Tanzania, Uganda and Ethiopia recorded higher growth and improvement in financial inclusion, but inequality and poverty gaps reduced (UNECA, 2017)

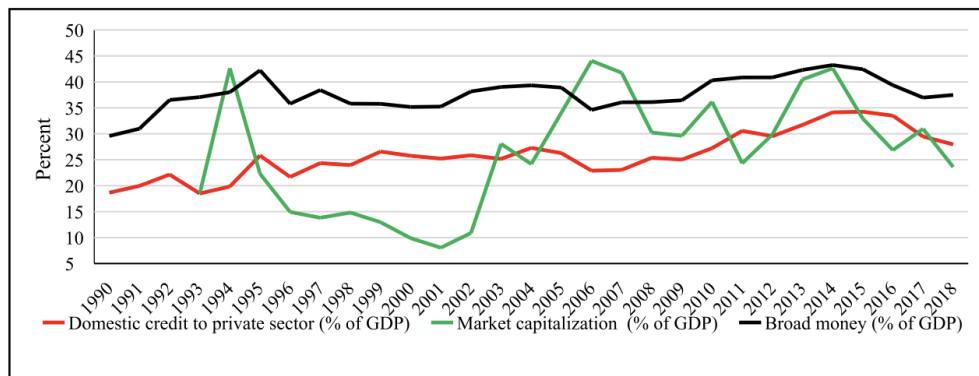
waves of Financial Access Household Surveys conducted in 2006, 2009, 2012 and 2015. The analysis shows that improvement in utilising financial services increases income and wealth by about 0.3 percentage points, reduces Gini coefficient by 1 percent. Utilising bank, insurance and saving services has a larger effect on income and reducing inequality than using macrofinance, SACCOs and credit.

The rest of the paper is organized follows: Section 2 and 3 presents the state of financial inclusion and income inequality in Kenya and literature. Section 4 outlines the empirical model, describes the data and variables. Section 5 presents results, while section 6 provides the conclusion.

## 2. Financial Inclusion, Income Inequality and Poverty in Kenya

Kenya has made significant progress in both the intensive (usage) and extensive (access) margins of financial inclusion due to innovation and supportive regulations (Ndung'u, 2018). With respect to intensive margin, usage of bank services and mobile money increased from 1.8 percent and 12.4 percent in 2016 to 2.0 and 23.4 percent in 2021, respectively. The ratio of broad money to GDP increased to 38 percent, while domestic credit, as a percent of GDP increased from 25.8 percent in 2003 to 33 percent in 2021. The depth of the capital market increased with market capitalisation as a ratio of GDP increased from 10.0 percent in 2000 to 25 percent of GDP in 2021 (Figure 1). This suggests that the depth of the financial sector has improved.

**Figure 1.** Developments in the Financial Sector



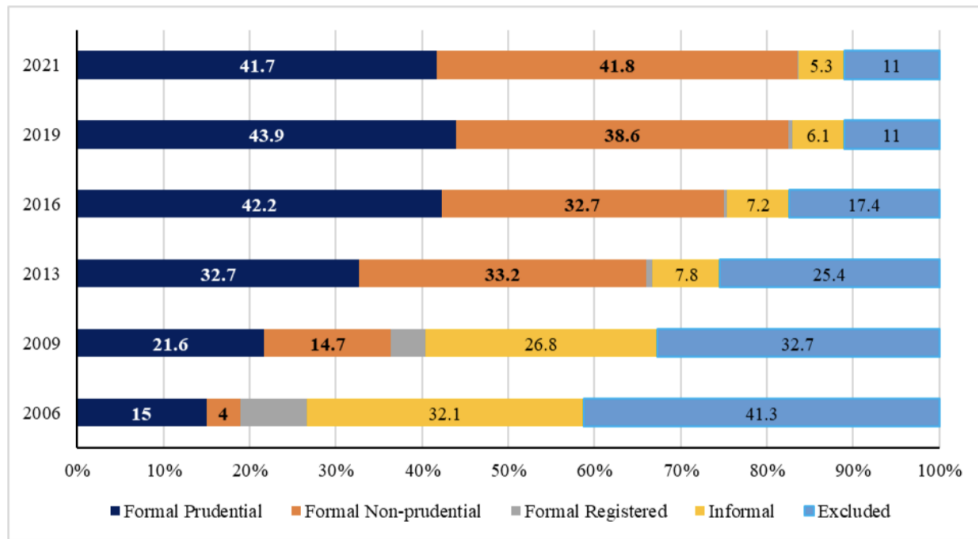
*Source: Author's illustration using Central Bank of Kenya data*

A deep financial sector enables households and firms to manage risks as well as mobilise savings for investment. This not only increases economic growth (Bagehot, 1873; King and Levine, 1993; Acemoglu, et al., 2006), but also reduces income inequality (Levine, 2005; Galor and Zeira, 1993; Banerjee and Newman, 1993). However, increase in financial depth does not necessarily translate into an increase in the number of individuals participating in the financial market. Rather, existing market participants may be increasing their utilization of financial services. In this regard, deepening of the financial sector exacerbate income and wealth inequality, especially when a large proportion of the population face insurmountable financial market participation constraints.

However, financial inclusion surveys between 2006 and 2021 show that access to formal financial services increased from 26.7 to 83.7 percent (Figure 2). Furthermore, the total number of financial touch points per 100,000 people increased from 161.9 in 2013 to nearly 405 in 2018, mainly due to increase in branches of banks, bank agents and mobile money agents (FSD/CBK, 2022). An improvement in financial inclusivity, not only reduce the cost of accessing financial services and but also increase saving and mobilization of deposits to amount to 15.4 percent of GDP in 2021, which can potentially be transformed into loans.

Even though access to financial services has improved, it is the intensity of using services that influence investment and risk mitigation, and hence, income growth and inequality. Figure 3 shows that the proportion of respondents utilising mobile money, SACCOs and bank services per week increased, while microfinance services (MFI) declined. However, the frequency of utilising

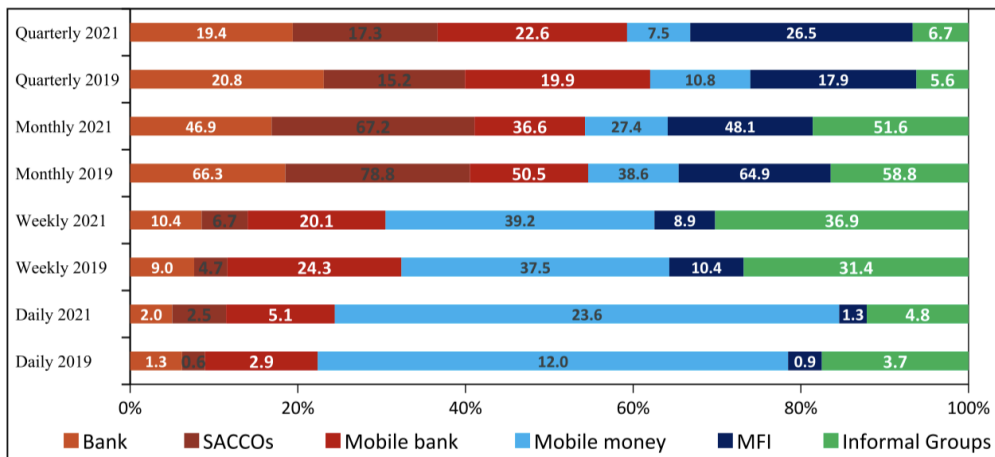
**Figure 2.** Access to financial services in Kenya



*Source: Author's Illustration using financial inclusion survey data sets 2006-2018*

all financial services daily increased. This indicates that impediments to access and utilisation of financial services have declined, thereby enabling individuals to use financial services frequently (Kodongo, 2018; Ndung'u, 2018) .

**Figure 3.** Frequency and Use of Financial Service Providers (%)



*Source: Author's Illustration using financial inclusion survey data sets 2006-2018*

Other than gains in financial inclusion, Kenya has also experienced a sustained economic growth between 2000 and 2021, recording an average of 4.9 percent growth in real GDP, while real GDP per capita increased by 1.80 percent annually, compared to an average of 2.8 percent and -0.68, respectively between 1990 and 2000 (Figure 4). Growth in per capita GDP has been slow compared to GDP growth, indicating a widening income gap (KNBS, 2021). Hence, sustained economic growth has not benefited the poor (Kabubo-Mariana, et al., 2012).

Despite an increase in GDP and GDP per capita, the number of people living in poverty has reduced marginally, from 16.6 million in 2005 to 16.4 million in 2015/16, amid an increase in the national population by approximately 10 million between the two periods. The overall poverty

and development, as a larger share of productivity growth is derived from the manufacturing sector (Van Ark et al., 2008; Francois and Hoekman, 2010).

Producer services are often employed in the manufacturing sector activities. An efficient financial sector engenders prompt deployment of capital from places of lower to highest returns. An efficient telecommunications service with better quality and cost-effectiveness can serve as intermediate input as well as information services. Also, good transport services can facilitate the distribution of goods within and between countries. The professional services such as, accounting and legal services (Business services) often ease the financial markets activities and contracts enforcement. Retail and wholesale services (distribution services) link the producers with the consumers, towards maximising profit and satisfaction respectively. Hence, the services sector productivity and policy have a lot of influence on manufacturing industries' output and trade.

Services are critical to global and regional value chains as inputs to manufacturing (often referred to as "servicification" that involves making manufacturing activities rely on services) (Su et al., 2019 and WTO, 2019). Servicification encompasses a rise in the use of services in manufacturing production and sales (Pattnayak and Chadha, 2022). Hence, producer services are more involved in manufacturing industry and manufacturing products encompass more services value. (Kozłowska, 2017). Jiang and Zhang (2020) also underscored the importance of servicification in developing countries Services sector value added to Gross Domestic Product (GDP) used to be about \$717.6 Billion, \$4.9 billion, \$3.8 billion, \$30.4 billion and \$3.1 billion for Economic Community of West African States (ECOWAS), Côte d'Ivoire, Ghana, Nigeria and Senegal respectively in the year 2000. The services sector value added to GDP rose to about \$4.2 trillion, \$31.9 billion, \$30.8 billion, \$199.4 billion, and \$12.7 billion for ECOWAS, Côte d'Ivoire, Ghana, Nigeria and Senegal respectively in the year 2020. While, manufacturing value added to GDP was about \$717.7 billion, \$2.3 billion, \$2.5 billion, \$9.7 billion, and \$1.2 billion for ECOWAS member countries, Côte d'Ivoire, Ghana, Nigeria and Senegal respectively in year 2000. These values increased to about \$4.3 trillion, \$6.7 billion, \$7.2 billion, \$54. Billion, and \$3.8 billion for ECOWAS member countries, Côte d'Ivoire, Ghana, Nigeria and Senegal respectively in the year 2020 (UNCTAD, 2022). ECOWAS member countries exported about \$26 billion worth of manufactured product in the year 2002, this value increased to about \$86 billion and \$106.2 billion in the years 2020 and 2021 respectively. The values of manufacturing exports for Nigeria, Ghana, Côte d'Ivoire and Senegal were about \$85.2 billion, \$5.1 billion, \$9.6 billion, and \$9.6 billion respectively in year 2010. The values rose to about \$46.9 billion, \$14.2 billion, \$12.3 billion, and \$3.4 billion for Nigeria, Ghana, Côte d'Ivoire and Senegal respective in the year 2021 <sup>1</sup>.

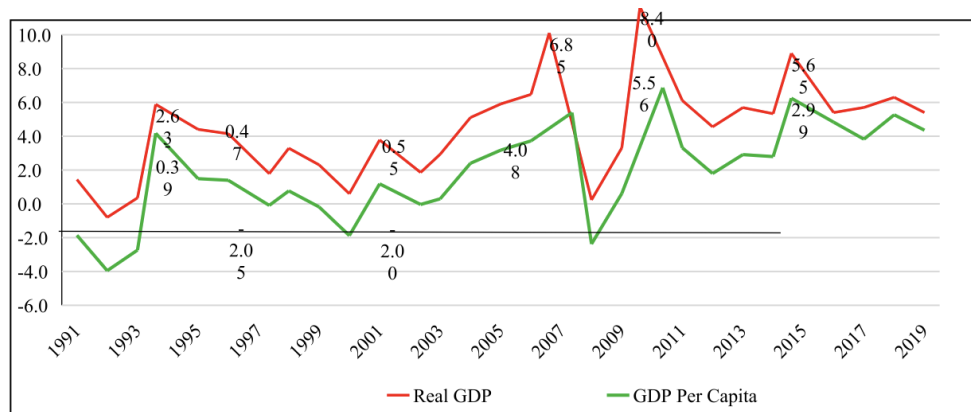
Though, there is evidence of central role played by producer services as inputs into the manufacturing production processes and facilitator of manufacturing exports in developed and developing countries (Pattnayak and Chadha, 2022). To the best of the author's knowledge, very little attention has been given to this concept in the empirical economic literature, particularly in Africa, as a result, this study investigates: the impact of services productivity on manufacturing productivity and manufacturing firm's exports, and the impacts of trade policies on manufactured goods exports in Selected West African countries<sup>2</sup>. The remaining parts of the paper are organized as follows: Section II presents a brief review of literature. Sections III and IV deal with the methodology and the empirical results of the paper respectively. Finally, Section V provides conclusions and suggests some policy recommendations.

## 2. Literature Review

There is a lot of theoretical evidence that link services trade liberalisation with productivity growth. Complex manufacturing firms are assisted to fragment their production activities through reduced price, better quality, and many choices of services. Sequentially, production process fragmentation calls for support from internationally competitive transportation, communication, professional as well as financial services providers (Deardorff, 2001). Higher variety of services often results in knowledge; raise its diffusion and exchange (Burgess and Venables, 2004).

<sup>1</sup>International Trade Centre Database, 2022.

<sup>2</sup>The West African Countries that were selected contribute over Eighty percent (80%) of West African manufacturing exports, they are: Côte d'Ivoire, Ghana, Nigeria and Senegal.

**Figure 4.** Real GDP and Real GDP per capita Growth Rate

Source: illustration using KNBS 2019 data

gap reduced from 16.2 percent in 2005 to 9.2 percent in 2015/16.<sup>6</sup> However, arid and semi-arid regions have higher concentration of the population living below the poverty line compared to the national average. Other countries in the region with similar or higher economic growth exhibit lower poverty levels than Kenya (Table 1).

**Table 1.** Kenya Poverty Rates 2005 - 2016

Kenya	2005/06	2015/16	Change
Overall Poverty Rate (%)	46.6	36.1	-10.7%
Population living in overall poverty (million)	16.6	16.4	-0.2 million
Overall Poverty Gap (%)	16.3	9.2	-7.1%
Comparison of Regional Poverty Rates			
Country	Survey year	National Poverty rate (%)	per capita GDP growth
Ethiopia	2010	29.6	5.5
Tanzania	2011	28.2	2.9
Ethiopia	2015/16	36.1	2.8
Ethiopia	2012	19.5	3.1

The pace of decline in income inequality is slower than economic growth. Whereas inequality reduced from 1992 through the mid-1990s, it increased between 1997 and 2005 (Figure 5). The Gini coefficient, for example, initially fluctuated from 56.5 percent in 1992 to 44.5 percent in 1994, before increasing to 57 in 1999 and then declined to 48.51 in 2005, which is above the African continental average of 44<sup>7</sup>. However, by 2015, Gini coefficient declined to 40.8 percent, but it is the highest compared to an average of 38.92 percent and 38.8 percent of Eastern Africa and East African Community regions, respectively. The persistence of inequality as captured by the Theil coefficient is consistent with the 2015/16 Kenya Integrated Budget Household survey, which indicates that the share of income of bottom 40 percent of the population is 10.2, while share of upper 60 percent is 89.8 (KNBS, 2018).

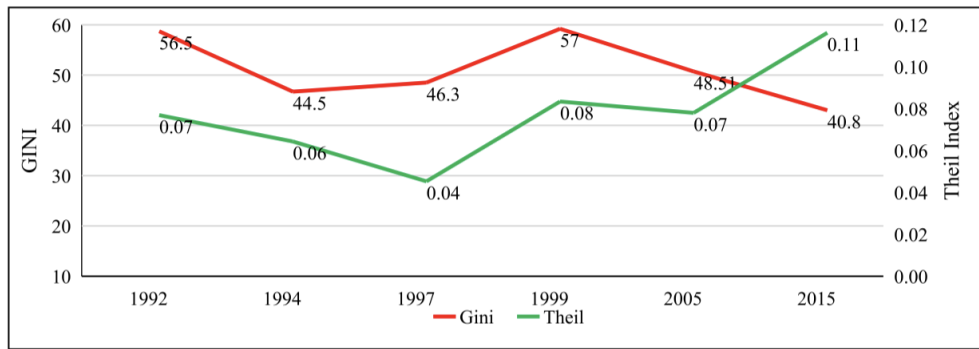
Hence, sustained economic growth has not benefited the poor (Kabubo-Mariana, et al., 2012). Yet, increasing financial inclusion enables agents to undertake financial transactions efficiently, save, borrow and invest, which increases income and wealth of the poor relative to the rich, thereby

<sup>6</sup>The poverty gap index measures the depth of poverty. It provides information on how much poorer the poor people are relative to the poverty line. This measure captures the average expenditure shortfall, or gap, for the poor relative to the poverty line. The poverty line for 2005/06 was KSh 1,562 and KSh 2,913 per person per month in rural areas and in urban areas, respectively, while in 2015/16 the poverty line was KSh 3,252 in rural areas and KSh 5,995 per person per month in urban areas.

<sup>7</sup>Gini and Theil indexes represent the share of  $i^{th}$  household income in the total income. Hence, as the indexes approach 100 percent the level of inequality increases.



**Figure 5.** Income Inequality as Measured by Theil Index and Gini Coefficient



Source: University of Texas Inequality Project, UN-WIDER World Income Inequality Database. The Gini and Theil index indicates the cumulative share of the poorest household. An increase in the indices indicates an increase in inequality

reducing inequality (Greenwood & Jovanovic 1990; Galor and Zeira 1993; Banerjee and Newman 1993, Dabla-Norris et al, 2015).

Therefore, this paper firstly, analyses the impact of utilising financial services on income and wealth. Then the paper analyses the change in the income and wealth Gini coefficients of households that used financial services in relation to those who did not use financial services in the four waves of Financial Access Surveys in Kenya. In this way, the paper estimates the impact of increased utilisation of financial services on inequality. Secondly the paper investigates the impact of financial inclusion on education spending. This aims at establishing the impact of financial inclusion on skills acquisition beyond generational bequest, which has a potential of reducing income and wealth gap between the rich and the poor.

### 3. Literature on the impact of financial inclusion on income and wealth inequality

Theoretical literature on financial inclusivity and income inequality posit financial inclusion either reduces, increases or reduces inequality in the long run. For instance, Galor and Zeira (1993) and Banerjee and Newman (1993) show that financial inclusion relaxes credit constraints which enables households with insufficient bequests to borrow and make indivisible and high return investments. This reduces income inequality by hastening the growth rate of income of the poor relative to the rich. However, Rajan and Zingales (2003) argue that the rich have higher propensity of utilising financial services than the poor. Hence, improvement in financial inclusion enables the rich to accumulate wealth faster than the poor, which widens the wealth gap. Greenwood & Jovanovic (1990) show that financial sector development reduces participation costs. This initially disproportionately benefits the rich, which widens inequality. However, in the long run, the decline in costs and easing financial market participations constraints enable the poor to use financial services akin to the rich. This accelerates growth in income and wealth of the poor relative to the rich, which reduces inequality.

Whereas there is empirical literature on the impact of financial inclusion on income (Beck, 2009; Clarke, 2006; Beck et al, 2007; Honohan, 2004), there are relatively few studies on the financial inclusion-inequality nexus. The empirical studies, albeit focusing on access to financial services are incoherent, similar to the theoretical analyses. For example, in the analysis of the impact of financial services on poverty using panel data from 38 Asian-Pacific countries, Park and Mercado (2015) find evidence that access to financial services enables households to increase investment in education thereby, increasing earnings, which reduces poverty in the long run. These findings are corroborated by Flug et al (1999) who establish that a more developed credit market increases investment in education. Burgess and Pande (2005) focusing on rural areas of India, similarly,

find that expansion of bank branches led to a reduction in rural poverty rates. Karlan, Ratan & Zinman (2014) also find evidence that increased usage of formal savings has a largely positive impact on individual welfare. Generally, these studies establish that financial inclusion increases educational attainment and skills among the less endowed, which enables them to be employed in higher skilled- higher wages jobs. This reduces poverty. Acemoglu and Zilibotti, (1997) find that financial reduces inequality by increasing diversity of assets, access to markets to trade assets and risks as well as a means through which financial transfers are undertaken. Financial inclusion enables the poor to increase diversity of asset like the rich, which mitigates severity shocks that drive the poor in poverty (Soniga, 1998 and Thorbecke, 2002).

However, Banerjee, Karlan, & Zinman, (2015) find that enhanced access to credit has a modest positive, but not transformative effect on income and hence, on inequality. The modest impact of increased access to credit emanates from the fact that credit is not the primary barrier inhibiting small-scale entrepreneurs from reaching their income-earning potential (Beck, 2016). Small-scale entrepreneurs may run their businesses to earn a subsistence wage, with no plans to expand their business to increase earnings, and thus they have limited need for credit (Emran, Morshed, & Stiglitz, 2011). Indeed, Dupas et al (2012) find that less than three percent of individuals in rural Kenya initiated a loan application even after receiving assistance with the collateral requirement. This may indicate low demand for financial services by the excluded segments of the society, and hence the marginal impact of access to financial services on poverty. Similarly, access to microfinance credit has been shown to have minimal effects on income redistribution (Buera, Kaboski, & Shin, 2012; Kaboski and Townsend, 2011, 2012).

However, Plotnikov et al (2017), find that increased households' access to borrowing, increases income share of bottom 40 percent relative to the income share of the middle 40 percent. This effect does not hold, however, when considering only loans from formal financial institutions, highlighting the importance of informal sources of finance. Poor households rely on savings to smoothen consumption and finance investment due to imperfection in the credit market and apathy to credit. Hence, financial services that enhance savings have a larger impact on income and poverty alleviation than credit (Beck et al., 2014). Ouma et al., (2017) analyse leveraging on mobile financial services to save in Kenya, Uganda, Malawi and Zambia. They find that access and utilisation of mobile financial services increases propensity to use diverse forms of savings services and increases amount of savings.

Suri and Jack (2016) analyse the effect of mobile money on long run poverty in Kenya. They find that access to M-Pesa services increases likelihood of shifting from occupations with low incomes to occupations with higher incomes and increases consumption of the poor. In their earlier analysis, Jack and Suri (2014) find that access to M-Pesa services increases remittances which smoothen incomes of poor households.

Therefore, this paper contributes to literature on financial inclusion income and wealth inequality by employing Propensity Score Matching (PSM) method to control for unobservable that drive inequality. Secondly, the differential effect of using banking, microfinance, SACCOs, and mobile money services on inequality is analysed. This is more informative because different types of financial products from different providers have diverse effects on risk mitigation and capital formation. Thirdly, the relative impact of utilising credit and savings on income and wealth inequality is established. On the one hand, accumulations of savings to undertake investments that have transformative impact on income and wealth takes longer. On the other hand, access to finance in form of credit enables households to undertake investment over and above current income and generational bequest, which hastens income and wealth growth. However, credit is more costly than saving and can undermine income and wealth accumulation if returns on investment financed by credit are not sufficient to meet debt obligation.

Fourthly, the paper analyses the impact of financial inclusion on education spending. This sheds some light on how gains in financial inclusion enables households to surmount financial constraints to invest in skills acquisition, which is one of the main priorities in Kenyan households (FSD-K/CBK, 2019). Disparity in skills is one of the ways in which inequality is perpetuated in societies (Flug and Spilimbergo, 1999, Park and Mercado, 2015). Fifth, the focus on Kenya, is motivated by exceptional improvement in financial inclusivity, amid persistence in income inequality. Thus,



Kenya offers a relevant case to study the contribution of financial inclusion to reducing inequality through relaxing financial constraint in skills acquisition as well as the differential impact of using various financial services on inequality.

#### 4. Empirical Framework and Data

The impact of financial inclusion on income and wealth inequality can be specified by the following model:

$$IQ_{ijk} = (FU_{ijk}, X_{ijk}) \quad (1)$$

Where  $IQ_{ijk}$  represents inequality, subscript represents household, subscript  $k$  ( $k = 1, 2, 3$ ) represents different dimensions in the measurement of inequality as a result of using financial service,  $FU_{ijk}$  is a dummy equal to 1 if a household uses a financial service and 0 otherwise, subscript  $j$  ( $j = 1, 2, 3 \dots 8$ ) represents the different types of financial services (bank, savings, credit, insurance, micro finance, savings and credit cooperative societies (SACCOs), mobile money and informal financial services) and  $X_{ijk}$  is a vector of characteristics that influence income and wealth inequality. The different forms of financial services can be aggregated into a financial inclusion index using principal component analysis, measuring the usage dimension akin to (Sarma, 2017).

Conventional analysis of the impact of using financial services, and hence, of financial inclusion on inequality involves estimating an ordinary least square model below:

$$IQ_{ijk} = \beta_1 FU_{ijk} + \beta_2 X_{ijk} + \varepsilon_{ijk} \quad (2)$$

Where  $\beta_1$  captures the direct effect of financial inclusion on inequality and  $\beta_2$  measures household and community specific characteristics that influence inequality. However, financially included and excluded households may differ in other characteristics beyond their inclusion status. Some of these characteristics may be observable (e.g. socioeconomic-, geographic- and community-specific characteristics) or unobservable. Whereas observable characteristics can be measured, the unobservable cannot be measured. Therefore, if unobservable characteristics determine a household's wealth in the sample, the covariance of  $FU_{ijk}$  and the error term  $\varepsilon_{ijk}$  in Equation 2 would not be zero. As a result, estimating Equation 2 with Ordinary Least Square yields biased and inconsistent parameter estimates. The bias and inconsistency in OLS parameters is estimated to be  $\frac{Cov(\varepsilon_{ijk} FU_{ijk})}{Var(\varepsilon_{ijk})} = \frac{Cov(\beta_2 X_{ijk} FU_{ijk})}{Var(\beta_2 X_{ijk})}$  and  $\text{plim } \beta_1 = \beta_1 + \frac{Cov(\varepsilon_{ijk} \bar{F}U_{ijk})}{Var(\bar{F}U_{ijk})}$ , respectively (Altonji et al., 2005). Whereas, an instrumental variable (IV) framework can be employed to capture the unobserved variables, finding appropriate instruments is fraught with even greater difficulties (DiPrete and Gangl, 2004; Kiiza et al., 2011). Similarly, while a selection model can capture the effects of access and usage of financial services, it cannot accurately estimate the causal effect of financial usage.

An impact evaluation procedure for survey data is a more suitable alternative to the selection model. In this regard, the PSM estimator is more appropriate to estimate the impact of financial inclusion on inequality, as measured by household expenditure, income and wealth Gini, since the outcome variable is continuous. This method has also been used by (Ogutu et. al., 2014; Dehejia and Wahba, 1999; Heckman et. al., 1998).

The PSM procedure begins by estimating the outcome of using a financial service (treatment), that is, inequality measure, and then compares the results with the outcome (inequality) of the households not using any financial service, the excluded. More broadly, the PSM estimator estimates the effects of a vector of observed explanatory variables ( $X$ ) in a single index referred to as propensity score. It defines the conditional probability that an individual will be financially included given his/her pre-inclusion characteristics. This enables comparison of individuals across the financial inclusivity statuses. PSM addresses selection bias and derives consistent estimates by imposing conditional independence assumption (CIA) and common support assumption (CSA). CIA states that when  $X$  is controlled for, financial inclusion and exclusion will be random and orthogonal to the outcome variables. The CIA can be expressed as:

$$P(FU_{ijk}) = Pr(FU_{ijk} = 1/X_{ijk}) = E(FU_{ijk}/X_{ijk}) \quad (3)$$

CSA restricts the probability of either using or not using a service to be positive but less than one, so that propensity scores across users and non-users are comparable. This is stated as:

$$0 < (FU_{ijk} = 1/X_{ijk}) < 1 \quad (4)$$

Once these conditions are met and the biases have been corrected, then, the desired effects of financial inclusion on inequality can be estimated as:

$$ATE_{ijk} = [E\{IQ_{1ijk}/FU_{ijk} = 1, pr(X_{ijk})\} - E\{IQ_{0ijk}/FU_{ijk} = 0, pr(X_{ijk})\}] \quad (5)$$

$$ATT_{ijk} = [E\{IQ_{1ijk}/FU_{ijk} = 1, pr(X_{ijk})\} - E\{IQ_{0ijk}/FU_{ijk} = 0, pr(X_{ijk})\} / FU_{ijk} = 1] \quad (6)$$

$$ATU_{ijk} = [E\{IQ_{1ijk}/FU_{ijk} = 1, pr(X_{ijk})\} - E\{IQ_{0ijk}/FU_{ijk} = 0, pr(X_{ijk})\} / FU_{ijk} = 0] \quad (7)$$

Where  $ATE_{ijk}$  is the average treatment effect (which measures the overall effect of using a financial service on inequality),  $ATT_{ijk}$  is the average treatment effect on the treated (which measures the effect of financial inclusion on inequality of those who are actually using a financial service) and  $ATU_{ijk}$  is average treatment effect on the untreated (the effect that using a financial service would have had on inequality for those who were not using a financial service). The average treatment effect is derived as:

$$\Delta Y_{ijk} = IQ_{1ijk} - IQ_{0ijk} \quad (8)$$

Where  $IQ_{1ijk}$  represents the Gini coefficient of the  $i_{th}$  household using a financial service  $j$  and  $IQ_{0ijk}$  represents the Gini coefficient of the  $i_{th}$  household not using a financial service  $j$ .  $\Delta Y_{ijk}$  cannot be evaluated because using a financial service and not using a financial service are mutually exclusive. Thus, we cannot observe an individual who is using and not using a financial service at the same time. However, the observed outcome of users and non-users can be specified as:

$$IQ_{ijk} = FU_{ij}IQ_{1ijk} + (1 - FU_{ij})IQ_{0ijk}. \quad (9)$$

Where  $FU_{ijk}$  is as defined earlier and is either 1 or 0 for using a financial service or not using a financial service, respectively. Empirically, the objective of PSM is to estimate the average treatment effect on the treated (ATT), with ATT given as

$$ATT_{ijk} = (IQ_{1ijk} - IQ_{0ijk}/FU_{ijk} = 1) - E(IQ_{0ijk}/FU_{ijk} = 1). \quad (10)$$

As indicated,  $(IQ_{0ik} | FU_{ijk} = 1)$  is the counterfactual and cannot be estimated. Instead, we can consider a financially excluded household with the observed outcome  $(IQ_{0ik} | FU_{ijk} = 0)$  to serve as an approximation. Then the propensity scores of the excluded are matched with the included using nearest neighbour with replacement algorithm. The matching with replacement achieves the least bias and variance between the scores of the included and the excluded (Caliendo & Kopeinig, 2008)<sup>8</sup>. However, the choice of the excluded as a counterfactual could introduce bias in the estimates due to the possibility that individuals who use or do not use a service may be systematically different even before using a financial service. Furthermore, imbalances can be introduced during matching users and non-users and the scores can be model dependent (King & Nielsen, 2019). Thus, balance and common support tests are conducted to determine comparability of using and not using a financial service.

Financial services and products are complimentary as a result they are utilized as a package. For instance, access to bank account for transactionary purposes increases propensity of saving

<sup>8</sup>Since  $FU_{ijk}$  is binary, the probability distribution of  $P(FU_{ijk})$  can either follow a logistic or normal distribution, so we estimate a probit or logit model for probability of  $P(FU_{ijk})$ . The two models yield a similar result. With respect to matching algorithms the nearest neighbour matching (NNM), Kernel-Based Matching (KBM) and the effect estimator can be used. The effect estimator algorithm does not apply weights to observations in the common support before matching like KBM.

with a bank as well as accessing bank credit. In addition, the impact of financial inclusion on household wealth depends more on the services utilized and not the financial services provider. Therefore, financial inclusion is better measured by a financial inclusion index that aggregate access to financial services and products. In this regard, a financial inclusion index is constructed using principal component method based on utilising bank, SACCOs, insurance, MFI, saving and credit services as in (Sarma, 2017).<sup>9</sup>

#### 4.1. Data, Variables and Descriptive statistics

The Financial Access Household Survey data for 2006, 2009, 2012, 2015 and 2018 was collected from randomly selected households based on a national sampling frame using a multistage sampling procedure. The survey instrument has consistent questions that captured same variables of interest across the four surveys. A standardized dataset on variables of interest across the four waves is amenable for analyzing the evolution of income and wealth inequality amid improvements in financial inclusion over time.

Table 2 presents household characteristics, income, and wealth as well as usage of financial services in the five surveys after data cleaning. The average age of the household head and the proportion of household heads who completed secondary education in the survey reduced in the four waves of the survey, despite a national increase in life expectancy from 54.6 years in 2005 to 62 years and educational attainment between 2006 and 2015. The average spending on education and share of education in household expenditure increased between 2015 and 2018. This could be due to households prioritizing education. The financially included spend about KSh 4149 and have higher educational attainment, while the excluded spend KSh 2313, with a larger proportion of household heads having primary education. Whereas the proportion of household heads married and living with their spouse(s) has been reducing, the average household size of those surveyed increased from 3 to about 4 members between 2006 and 2018, respectively. This suggests an increase in the dependency burden due to increase in the number of household members provided for by one household head.

**Table 2.** Household characteristics, wealth and financial services

	2006	2009	2012	2015	2018
Average Age of Household Head	44.7(50.04)	47.04(16)	43.62(15.5)	37.20(16.5)	39.3(17.1)
Completed Secondary (%)	15.95	17.01	13.23	10.92	16.7
Completed Tertiary (%)	8.12	8.84	4.47	4.49	2.1
Completed University (%)	4.4	4.03	1.57	1.26	3.4
Average household size	2.67(1.40)	4.96(2.60)	4.43(2.54)	4.39(2.46)	3.97(2.32)
Single	29.98	29.55	35.91	39.60	41.8
Married	70.02	70.45	64.09	60.4	58.3
Avg. Monthly Expenditure (USD)		188.92(358.3)	63.00(134.2)	104.26(187.4)	220.7(700.4)
Avg. Monthly Income (USD)		116.28(313.9)	54.03(129.0)	86.58(176.9)	98.3(186.3)
Income Gini		68.13(0.181)	80.88(20.8)	79.14(16.9)	59.4(0.3)
Expenditure Gini		63.78(0.188)	78.8(21.3)	68.3(20.1)	53.1(0.2)
Wealth Gini**	44.3(0.181)	49.3(0.170)	48.1(22.4)	44.5(9.2)	38.7(0.29)
Average Spending on Education		40.15(92.2)	18.92(62.4)	20.16(100.7)	37.5(9465)
Average share of Education		9.7(0.156)	12.82(0.4)	13.28(0.2)	14.0(0.2)
Savings	70.05	82.69	62.23	69.84	73
Credit	47.07	38.8	27.65	32.08	61
Informal (family, friend and shylock)	44.38	13.20	31.94	41.38	50.18
Real income excluded		75.31(71.35)	11.67(3427.9)	21.3(5847.7)	17.40
Real income included		119.11(323.87)	60.37(137.78)	98.38(1090.7 4)	60.14
<b>N</b>	4407	6598	6449	8665	8669

*Notes:* Income, expenditure and education is real, Income is for an individual \*Weight accorded to education is 0.031 \*\* wealth index without land (with land the Gini coefficient is 60.5), () are standard deviations

The average expenditure on major consumer items and necessities as well as average income per month increased between 2009 and 2018, except for a decline in 2012. The financially included have

<sup>9</sup>The factors in the principal component regression index are bank, SACCO, insurance, MFI, credit, savings, mobile money, with services utilized assuming 1 for those who utilized and zero for those who did not utilized.

higher income than the excluded (Table 2). The Gini coefficient derived from income and household expenditure indicate that inequality increased between 2009 and 2012 but declined between 2012 and 2018.

However, income and household expenditure are narrow indicators of overall wealth and earning potential of a household. Therefore, a wealth index <sup>10</sup> developed from a broad range of basic household assets using principal component analysis is a better measure of household wealth (**appendix**). This is because, assets are accumulated over time and are devoid of short-term fluctuations, and therefore, they are a more accurate measure of household wealth as well as household earning potential than income or expenditure, which are more subject to fluctuation. The Gini <sup>11</sup> coefficient from a wealth index averaged 38.7 percent. The average income and expenditure Gini are higher than East African average of 38.3 percent.

The proportion of household member using financial services increased between 2006 and 2018, across almost all financial products and services. The proportion of households with a member using banking and insurance services increased by about 13.26 and 13.23 percentage points, respectively, while on average about 71 percent use savings services. The improvement in utilisation of banking, insurance and savings services suggests that a household member is increasingly able to save, invest and make efficient transactions, which increases earnings as well as enhancing resilience of earnings to shocks. The high proportion of households accessing mobile money enables them to undertake efficient transactions, which eases the resource constraint. The efficiency gains in undertaking transactions enables households to channel their cost savings to other expenditures such as acquisition of assets and savings (Jack and Suri, 2014; Ouma et al., 2017).

Despite the increase in the utilisation of banking, insurance and savings services, the use of formal credit is lower relative to saving products. The access to credit and its utilisation enables households to invest beyond their endowment, thereby hastening the rate of human and physical capital accumulation. Since households are using saving services more than credit, they are effectively delaying their investment to accumulate funds. This then delays earnings from potential investment projects, which may undermine efforts by low income households to increase their income and wealth to close the inequality gap. However, terms and condition of credit advanced may decelerate income growth by reducing returns on investment and household income, especially of the relatively rich households who have social and physical capital to participate in the credit market (Dabla-Norris et al., 2015). In this regard using credit may accentuate convergence of income. Hence the next section clarifies the relative impact of credit and saving on income and wealth. The speed at which the income and wealth gap can be closed is also reduced by the increase in the use of informal financial services. Informal financial service providers not only have limited capacity to fund investments that have a significant effect on households' wealth and income, but also their financial services are more expensive than formal financial services (Imran et al., 2002).

## 5. Results

### 5.1. Baseline results: Financial Inclusion on Income Wealth

This section estimates the effect of using financial services on income and wealth. The parameters in Table 3 are estimated using Ordinary Least Square (OLS) (models 1 and 2) and Instrumental Variable (IV) (models 3 and 4) methods. The effect of financial inclusion on wealth and income is estimated using financial inclusion index, while controlling for household, location, and occupational characteristics. Results in model 1 indicate that an improvement in using financial services by 1 point is associated with increase in wealth by 0.28 points, while households in rural areas

<sup>10</sup>The wealth index is constructed from household assets as outlined in Vyas Kumaranayake, (2006) and Córdova, (2009). A principal component analysis is applied to assets taking into account differential effect of asset ownership on poverty in urban and rural areas as well as educational attainment. A list of assets included is in annex Table I. A kernel density for the wealth index is plotted in figure I in the appendix.

<sup>11</sup>The Gini coefficient  $IQ_i = \frac{\left( \sum_{i=1}^n \bar{x}_i - \frac{\sum_{i=1}^n x_i}{N} \right)}{\left( \sum_{i=1}^n \bar{x}_i - \frac{\sum_{i=1}^n x_i}{N} \right) + \left( \frac{\sum_{i=1}^n x_i}{N} \right)}$  is based on the Lorenz curve, closer to 1 indicates high inequality

have lower income compared to urban areas. An increase in household size is associated with a declined in wealth by 0.35 points. This implies that an additional household member increases dependency burden, which undermines the household's efforts to accumulate assets. An increase in the age of household head is negatively associated with wealth. Recipients of remittances have less wealth compared to those who did not receive. Despite, remittances mitigating shocks as well as enable households to invest beyond their current wealth Jack and Suri (2014), the recipient have less income and wealth. An increase in distance from social economic amenities is associated with a decline in wealth and income. Access to amenities such as trading centers, school and hospital increase wealth by enabling households to access markets, education and health services, which augment physical and human capital.

**Table 3.** Impact of using financial services on Income and wealth

	Model(1)	Model(2)	Model(3)	Model(4)	Model(5)	Model(6)
	OLS	OLS	OLS	IV	IV	IV
	Wealth	Income	Expenditure	Wealth	income	Expenditure
FU	0.276** (0.014)	0.282** (0.010)	0.242** (0.008)	2.597** (0.348)	0.804** (0.138)	1.028** (0.142)
Remittance	-0.068* (0.035)	-0.119** (0.024)	-0.026 (0.020)	-0.263** (0.078)	-0.157** (0.030)	-0.088** (0.032)
<b>Location characteristics</b>						
Urban	-0.817** (0.034)	0.257** (0.024)	0.300** (0.020)	-1.095** (0.089)	0.194** (0.035)	0.206** (0.037)
Amenities	-0.216** (0.016)	-0.049** (0.011)	-0.074** (0.009)			
<b>Household characteristics</b>						
Size	-0.354** (0.025)	-0.082** (0.018)	0.299** (0.015)	-0.017 (0.074)	-0.002 (0.031)	0.412** (0.031)
Household head Gender	-0.149** (0.032)	0.209** (0.022)	0.011 (0.019)	-0.414** (0.075)	0.156** (0.029)	-0.079* (0.031)
Married/living partner	0.266** (0.048)	0.230** (0.033)	0.211** (0.028)	-0.186 (0.120)	0.131** (0.047)	0.059 (0.049)
Education	1.286** (0.070)	0.223** (0.049)	0.379** (0.041)	-2.392** (0.587)	-0.602** (0.233)	-0.866** (0.240)
Age	1.348 (0.696)	6.418** (0.490)	1.659** (0.414)	-18.336** (3.225)	2.155** (1.244)	-4.876** (1.302)
Age squared	-0.186* (0.096)	-0.869** (0.067)	-0.254** (0.057)	2.374** (0.424)	-0.316 (0.163)	0.595** (0.171)
<b>Main source of income</b>						
Employed	0.67** (0.059)	0.555** (0.041)	0.348** (0.035)	-1.358** (0.326)	0.101 (0.129)	0.338* (0.133)
Pension	0.691** (0.240)	0.305 (0.165)	0.214 (0.144)	-1.075 (0.550)	-0.078 (0.215)	-0.387 (0.230)
Transfers	0.467** (0.051)	-0.203** (0.036)	0.248** (0.030)	0.659 (0.110)**	-0.164** (0.044)	0.315** (0.046)
Investment	0.643** (0.214)	0.913** (0.152)	0.596** (0.127)	-1.675** (0.557)	0.392 (0.224)	-0.187 (0.229)
Farming	-0.026 (0.045)	0.065* (0.031)	0.184** (0.027)	-0.627** (0.123)	-0.075 (0.050)	-0.02 (0.051)
_ cons	-2.809* (1.256)	-3.771** (0.882)	5.681 (0.746)**	32.301** (5.832)	3.826 (2.250)	17.325** (2.355)
$R^2$	0.29	0.42	0.35	0.21		
$N$	8,641	8,641	8,641	8,641	8,641	8,641
Estimated bias	1.642	1.104	0.961	1.615	0.890	1.753

Notes: FU is the financial inclusion index .The index is developed using Principal Component Analysis and it consist of using accounts from all institutions, credit, savings and mobile money, Urban is binary taking 1 for rural and 2 for urban area, household head is a dummy with male as a reference category, age years of the respondent, remittances dummy with reference being those who did not received remittances, amenities is time taken to reach school, market, health facility. Business is the reference category for main source of income. Income and expenditure are in logarithm \* p<0.05; \*\* p<0.01

Models 2 and 3 are estimated with self-reported income and household expenditure, respectively using OLS to establish the effect of financial inclusion on household income. In this regard, coefficient on financial inclusion index is of interest. The results in models 2 and 3 indicate that increase in using financial services by 1 point, is associated with an increase in income by about 0.28 percent. An additional household member reduces earning and households headed by female have lower income than male. Living with a partner or household heads being married is associated with higher income compared to single or unmarried. Marriage enables partners to pool resources for investment and wealth accumulation, which generates more income compared to widows, the divorced and single. An increase in age, initially increases income, however income reduces after

attaining more than 33 years. Results in models 1, 2 and 3 indicate that households' wealth and expenditure is higher for those deriving a large proportion of income from investment and employment relative to income derived from businesses. Most of the business could be survivalist and vulnerable to shocks, which reduce income and wealth (Emran, Morshed, & Stiglitz, 2011) and Dupas et al., 2012).

The parameter estimates for models 1, 2 and 3 cannot be used to infer causality and are also biased due to omitted unobserved factors that influence using financial services, household wealth and income. The unobserved household and individual characteristics correlated with using financial services, income and household wealth omitted in OLS are controlled for using IV method in models 4, 5 and 6. Financial inclusion index is instrumented for using an amenities index constructed from distance to the nearest shopping center, school or health facility. The amenities index is constructed using Principal Component Analysis. The amenities index has a correlation coefficient of 0.06, with wealth and income, but has a correlation of 0.3 with financial inclusion index. Furthermore, Wu-Hausman test statistic is 71.1 indicating that amenities index is exogenous, hence it is a valid instrument. Distance to socio-economic amenities increases propensity of using financial services, but weakly correlated with household wealth and income outcomes (Danquah, Quartey & Abdul Malik, 2017). The IV results in model 4, 5 and 6 indicate that improvement in using financial services increases wealth, income and expenditure by 2.6 points, 123 percent and 179 percent, respectively. Despite the fact the coefficient from OLS and IV are almost of the same size, the estimated coefficients are biased by about 0.89 and 1.75.

## **5.2. Impact of financial inclusion on income and wealth: Propensity score matching method**

The impact of financial services is estimated using propensity score matching method where utilisation of financial services is the treatment variable and the outcomes are household income and wealth. The difference in expenditure between household with a member that used financial services relative to those that did not use is shown in table 4. Table II in the appendix shows the probit regression estimates for propensity scores used for matching the financially included with the excluded. The nearest neighbour with replacement algorithm is used to match the included with the excluded. The balance test and common support graph are shown in appendix table III and figure III. Figure III in the appendix shows that there is significant overlap after matching, while table III shows that the bias between the financially included and the excluded is low after matching. Furthermore, the standardised bias in income, household expenditure and wealth is below 4 and the differences between the included and excluded covariates is insignificant. The aggregate bias of 4.5 is below the acceptable level of 5 percent (Caliendo and Kopeinig, 2008). The income, household expenditure and wealth of the financially included is higher by 55.6 percent, 61.3 percent and 80.4 percent, respectively compared to the financially excluded (table 4 column 1).

The IV and OLS estimates significantly differ from the propensity score matching results. The results in table 4 can be interpreted as causal impact of using financial services on income and wealth due to the ability of propensity score matching method to capture the effect of unobserved characteristics that influence utilisation of financial services, income and wealth. Therefore, utilising financial services increases income and household wealth. Financial services enhance investment in human capital and ease the switching from occupation with low incomes to high income, which increase earnings and wealth.

## **5.3. Financial inclusion dividends: improvement in income and household wealth**

The next issue that this paper attempts to address is the incremental impact of utilising financial services on income and wealth inequality. Kenya has experienced a tremendous improvement in financial inclusion between 2005 and 2018, yet inequality has reduced slowly. In this regard, the contribution of financial services to reducing income and household wealth inequality is estimated from the four waves of Financial Access surveys for 2009, 2012, 2015 and 2018 using PSM method. The impact of using financial services on household expenditure is comparable across the surveys,

**Table 4.** Effect of financial inclusion on income and household wealth (included=1)

	Wealth	Income	Expenditure
Probiy regression coefficient for propensity scores			
Urban	0.247*** (0.040)	0.213*** (0.043)	0.238*** (0.040)
Female	-0.042 (0.037)	0.007 (0.040)	-0.042 (0.037)
Age	0.433*** (0.052)	12.381*** (0.771)	0.422*** (0.052)
Primary	0.477*** (0.046)	-1.649*** (0.106)	0.471*** (0.047)
Secondary	0.863*** (0.058)	0.387*** (0.049)	0.858*** (0.058)
post-secondary	2.045*** (0.127)	0.772*** (0.061)	2.044*** (0.129)
Married and living with partner	0.412*** (0.051)	1.909*** (0.148)	0.407*** (0.051)
Household size	-0.052* (0.029)	0.032 (0.074)	-0.054* (0.029)
Earning from investment	0.479 (0.352)	-0.084*** (0.031)	0.483 (0.352)
Employed	1.007*** (0.125)	0.806*** (0.455)	1.004*** (0.125)
Farming	-0.081* (0.048)	0.960*** (0.127)	-0.076 (0.048)
Transfers	-0.576*** (0.050)	0.036 (0.050)	-0.567*** (0.050)
Amenities	-0.101*** (0.016)	-0.316** (0.156)	-0.105*** (0.016)
Remittances	0.041 (0.039)	-0.121** (0.017)	0.029 (0.039)
Constant	-1.268*** (0.226)	0.065 (0.042)	-1.206*** (0.227)
Financial included	0.133	8.630	9.568
Financial excluded	-0.671	8.074	8.955
Difference	0.804*** (0.099)	0.556*** (0.081)	0.613*** (0.065)

Notes: The financially included are the reference category. \*\*\* 1% \*\* 5% \* 10% level of significant

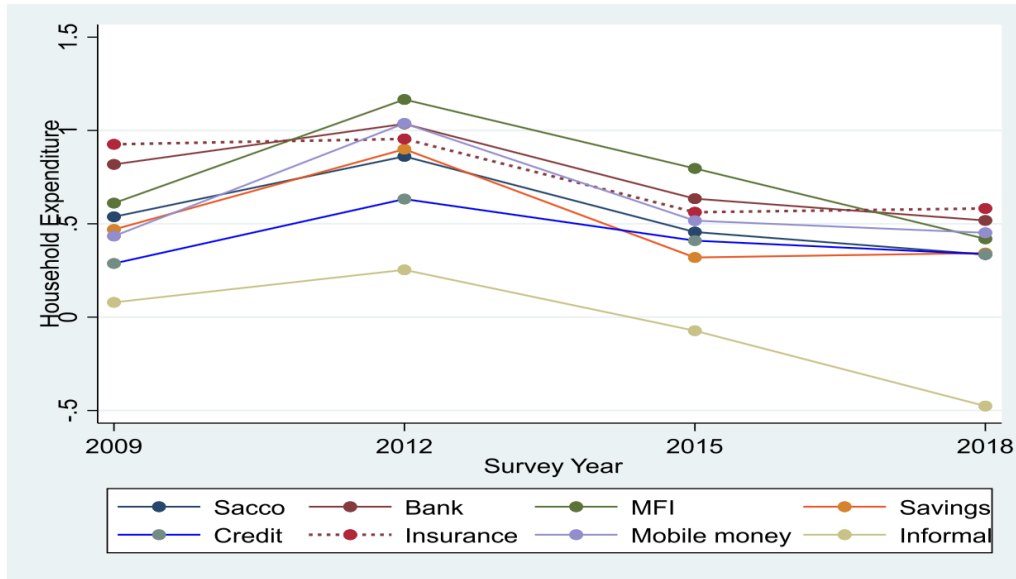
because the propensity scores used for matching those who used and those who did not use financial services control for observed and unobserved factors that influence using financial services, income and wealth. Table IV columns 2 to 5 and Figure 6 presents differences in household expenditure between the financially excluded and included households obtained from PSM method. The propensity scores have significant overlaps and the two groups are balanced. The post estimation test also indicates that there is a good balancing over all covariates (see Appendix figure I). All the differences in Figure 6 are statistically significant at 5 percent. The household expenditure in 2009, 2012 and 2015 of the financially included is 0.367 (about 30.71 percent), 1.020 (63.94 percent) and 0.025 (2.47 percent) more on average than the financially excluded, respectively. The results in table IV also show that the excluded households were wealthier than the included in 2006 survey. However, the financially included had more wealth on average in 2009, 2012, 2015 and 2018 surveys compared to the excluded.

Utilisation of financial services provided by different financial institutions have different impact on income. Hence, overall utilisation of financial services confounds the differential impact of diverse financial services on household income. In addition, different financial services are utilised in different intensities, depending on their relevance to needs. In this regard, the impact of using financial services from different financial institutions on household expenditure is plotted in figure 6. Households with a member that used informal financial services have the least expenditure



compared to those who did not use informal financial services. Informal financial services tend to be short term and expensive, and hence, inappropriate to finance long term investments that have a transformative impact on income. In addition, informal financial services reduce return on investment accrued to the borrower. The results also show that MFI services had the largest effect in increasing household expenditure in 2012 and 2015, while households that utilised credit had a lower expenditure compared to utilising savings in 2009 and 2012. Suffice to note that the average differences in household expenditure between the financially included and the excluded increased marginally in 2015 and 2018 surveys.

**Figure 6.** Effect of Financial Inclusion on Average Household Expenditure



*Notes: The differences in household expenditure between those who used and those who did not use in the four waves are obtained from PSM.*

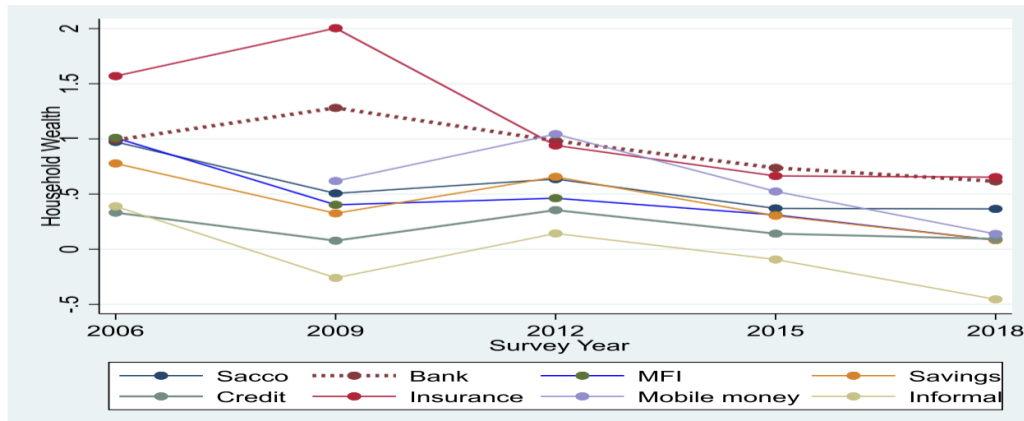
Figure III in the appendix plots the differences in income for those who used financial services relative to those that did not use in 2009, 2012, 2015 and 2018 surveys. The results show that individuals who used financial services have higher income in 2009 compared to those who did not use financial services. The differences in income is significant for all services except for credit, savings and MFI (Table V in the appendix). However, using financial services increased incomes significantly in 2012 and 2018 relative to household that did use financial services.

Individuals that used informal services had the least income, while the financially excluded experienced a decrease in average income in all the surveys. This indicates that although utilisation of financial services had a small effect on average income in 2009, improved utilisation of financial services between 2009 and 2018 had a large effect on average earnings. The impact of using financial services on income is similar to expenditure. Hence the results are consistent with Burgess and Pande (2005) findings. Furthermore, saving with a financial institution has a larger impact on income compared to utilising credit. This can be attributed to borrowers either incurring exorbitant interest cost on loans or returns from investment financed by credit may not be sufficient to meet debt obligations, occasioning a marginal increase in income. Even though these results are consistent with Banerjee, Karlan, & Zinman, (2015) and Beck (2016) studies, the impact of credit on income may be understated because long term and illiquid investment financed using credit, has a small contribution to income in the short run (Acemoglu and Zilibotti, 1997). Hence, the relative impact of credit and saving on household income and wealth is better measured using wealth.

The differences in wealth among households that used informal financial services and those that did not use is the least (figure 7). Even though households that used credit have higher wealth relative to those that did not use credit, households that used saving services were wealthier

compared to those that used credit. These results are consistent with the results in Figure 6. The small effect of credit on household income and wealth compared to savings can be attributed to terms and conditions of credit curtailing increase in income and wealth. In addition, impediments to growth such as poor infrastructure, weak enforcement of property rights and market rigidities (World Bank, 2014; Beck, 2016). With regards to the financial service provider, insurance services had the largest impact on wealth in 2006, 2009 and in 2018 surveys. This can be attributed to utilisation of National Health Insurance Fund, general and life insurance, which mitigates the severity of illness and shocks on income and wealth (Atake, 2018). However, in 2012 and 2015, bank services had a largest impact on wealth compared to Mobile money, MFI, SACCOs and insurance.

**Figure 7.** Effect of Financial services on Household Wealth



*Notes: The differences in household expenditure between those who used and those who did not use in the four waves are obtained from PSM.*

The effect of financial inclusion on household wealth is consistent with the effect on income and expenditure. Namely, financial inclusion initially has a small or negative effect on all three measures, which then increases in 2009 or 2012 surveys, and levels off or declines in 2015 and 2018 surveys. Suffice to note that financial inclusion in terms of access and usage increased in the five waves of the survey (FSD and CBK, 2016). Therefore, there is evidence that improvements in financial inclusion increases income and wealth. A possible channel through which financial inclusion increases income and wealth is by enabling households to save, invest, and mitigate the severity of shocks to income. In addition, financial inclusion also increases income and wealth by reducing the cost of undertaking transactions. This is indicated by the positive impact of mobile money on income and wealth. These findings are consistent with predictions of Galor and Zeira (1993), Banerjee and Newman (1993) and (Levine, 2005) and corroborates with empirical results from (Burgess & Pande, 2005, Jack and Suri, 2011 and Beck, 2016).

Besides financial inclusion enabling households to acquire physical assets, it also enables them to afford indivisible and illiquid, but high return investment such as education, which has a large impact on incomes of the poor (Flug and Spilimbergo, 1999). The impact of financial inclusion on education spending is analysed in Section 5.5.

#### 5.4. Financial inclusion income and wealth Inequality

This section analyses the effect of financial inclusion on income, expenditure and wealth inequality. Inequality is measured by the Gini coefficient, whereby a decrease in the coefficient indicates a decline in inequality. The difference in Gini coefficient of wealth, expenditure and income between those who utilised financial services relative to those that did not use financial services estimated by PSM are shown in table 5. Figure IV in the appendix shows that there is significant overlap after matching, while balance test results in Table III shows that the bias reduced significantly after applying nearest neighbor matching with replacement. Furthermore, the standardised bias in household income, expenditure and wealth is below 2.5, which is lower than acceptable level

of 5 percent (Caliendo and Kopeinig, 2008). The PSM estimates indicates that financial services reduced income and household expenditure Gini coefficients by 7.3 percent to 11.1 percent (Table 5).

**Table 5.** Financial inclusion and differences in Gini coefficients (financially included=1)

	Expenditure	Income	Wealth
Urban	0.242*** (0.040)	0.242*** (0.397)	0.242*** (0.040)
Gender	-0.061* (0.036)	-0.061** (0.036)	-0.061*** (0.036)
Age	0.496*** (0.044)	0.496*** (0.044)	0.496*** (0.044)
Primary	0.473*** (0.046)	0.473*** (0.046)	0.473*** (0.046)
secondary	0.845*** (0.057)	0.845*** (0.057)	0.845*** (0.057)
Post secondary	2.011*** (0.126)	2.011*** (0.126)	2.011*** (0.126)
married	0.490*** (0.038)	0.490*** (0.038)	0.490*** (0.038)
Household size	-0.058** (0.029)	-0.058** (0.029)	-0.058* (0.029)
Earnings from investment	0.457 (0.349)	0.457 (0.349)	0.457 (0.349)
Employed	0.992*** (0.124)	0.992*** (0.124)	0.992*** (0.124)
Farming	-0.083** (0.048)	-0.083** (0.048)	-0.083** (0.048)
Transfer	-0.583*** (0.050)	-0.583*** (0.050)	-0.583*** (0.050)
Self employed	0.408*** (0.064)	0.408*** (0.064)	0.408*** (0.064)
pension	0.825* (0.446)	0.825** (0.446)	0.825** (0.446)
amenities	-0.100*** (0.016)	-0.100*** (0.016)	-0.100*** (0.016)
Remittances'	0.040*** (0.039)	0.040 (0.039)	0.040 (0.039)
_cons	-1.548*** (0.191)	-1.548*** (0.191)	-1.548*** (0.191)
Financially included	0.753	0.721	0.589
Financially excluded	0.864	0.794	0.745
Differences	-0.111*** (0.011)	-0.073*** (0.019)	-0.156*** (0.016)

Notes: \*\*\* 1% \*\* 5% \* 10% level of significant

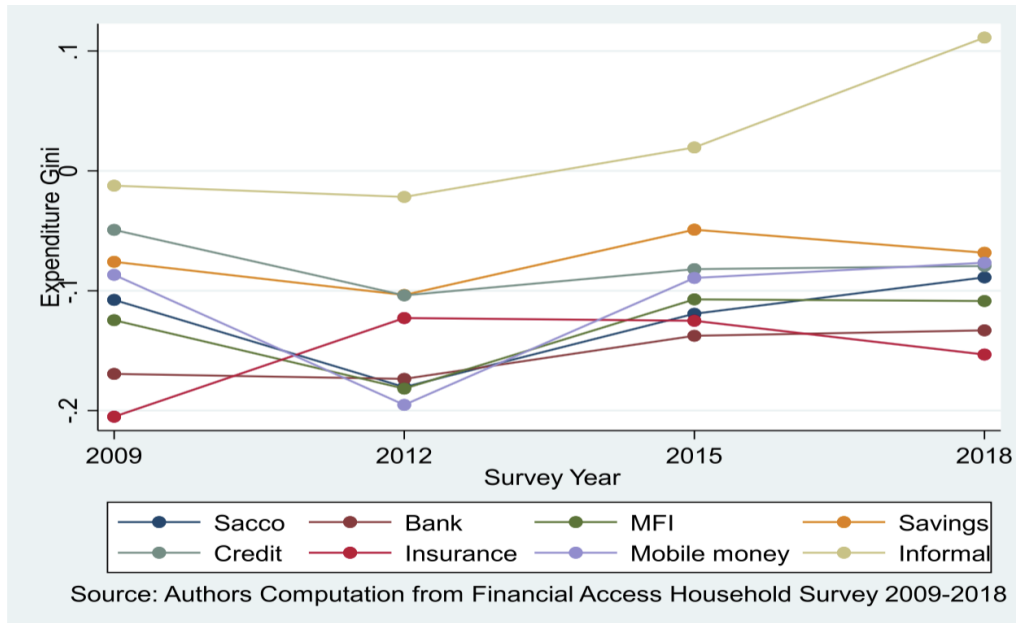
Whereas income and expenditure measure one dimension of household wealth, the wealth index is a comprehensive measure of household endowment since it is an aggregation of household assets, in which respondents have the least incentive to under or over-state in a household survey (Vyas & Kumaranayake, 2006 and Córdova, 2009). Hence, a wealth Gini coefficient indicates the wealth status of a household in relation to other households in the survey. Therefore, changes in the Gini coefficient developed from the wealth index because of using financial services is a good indicator of the effect of financial inclusion on household wealth inequality. The wealth Gini coefficient for the financially included is 15.6 percent lower compared to financially excluded. Similarly, income, and expenditure Gini coefficients computed from the 2009, 2012 and 2015 financial inclusion household survey waves declined by 2.5 percent to 10.4 percent, while wealth Gini declined by an average of 8.8 percent (Table VI). This implies that wealth disparity among the financially included declined faster compared to the financially excluded.

The robustness of the effect of financial services on inequality is also assessed by estimating

OLS models with wealth and income and results are presented in Table V in the appendix. The results, even though biased, are consistent with PSM estimate in terms of decline in inequality. The implication of this results is that using financial services increased the wealth and income share of the poor by 5.4 percent relative to the rich. This is consistent with finding from (Galor & Zeira, 1993; Banerjee & Newman, 1993) . The implication of these results is that using financial services mitigates severity of shocks, catalyses switching to higher pay occupation and hasten capital accumulation by the poor relative to the rich, which accentuate convergence of wealth.

The differences in expenditure Gini coefficient of utilising Sacco, Banking, MFI, insurance, saving and credit services, relative to those who did not use the services are plotted in figure 8.

**Figure 8.** Financial Inclusion and Expenditure Inequality



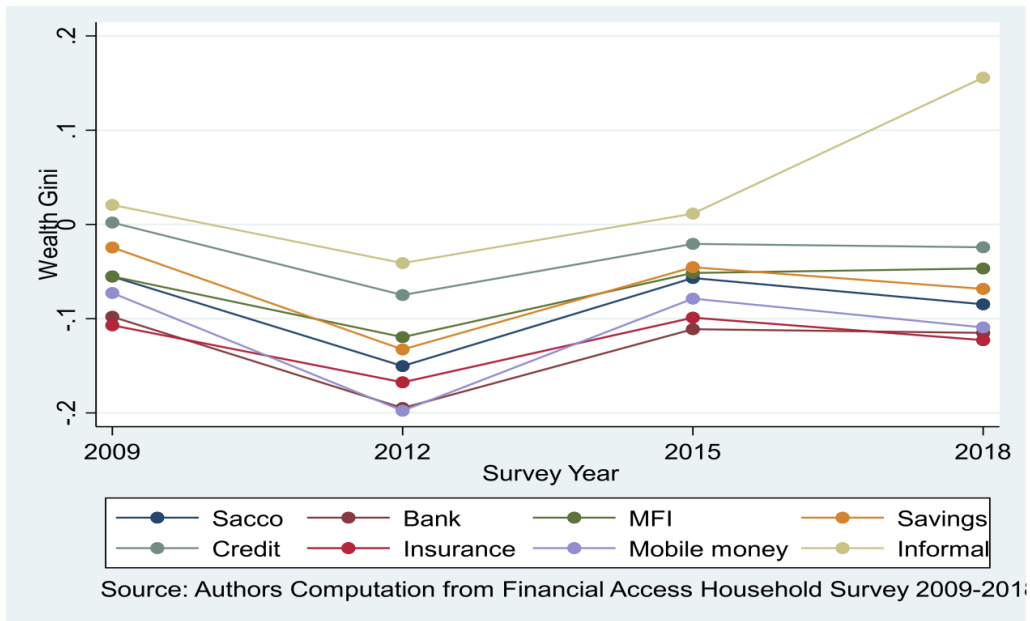
The Gini coefficients of using banking, insurance, MFI, savings and Sacco services in 2009 survey are positive and statistically significant, while credit reduced expenditure Gini. In the 2009 and 2012 surveys, households that used financial services increased their expenditure share relative to those that did not use financial services. The differences in expenditure reduced slightly in 2015, despite users of financial services having a larger share compared to non-users. In all the surveys, utilization of informal financial services had the least impact on inequality (Figure 8). This implies that, using financial services reduced inequality in expenditure. Conversely, the income gap between financially excluded and the included widened. Furthermore, using informal financial services, although reduces income inequality compared to those who do not use the informal services, the households are not better off compared to their counter parts using formal financial services. This can be attributed to either high cost of informal services, which stifles accumulation of human and physical capital or the amount of credit is inadequate to enable the households to ease the financial constraints. However, informal services have a significant contribution to bridging financial constraints of households at least as compared to households who do not use financial service whatsoever.

Figure V in the appendix checks the robustness of results in figure 8 using Gini coefficient developed from self-reported income. The pattern of differences in income Gini between users of financial services and non-users is similar to that for household expenditure Gini in figure 8. Notably, using financial services increased income share in 2009 and 2012 survey, but then the share reduced in 2016 survey. Hence, the contribution of financial services to reduction in income inequality diminishes akin to figure 8 even at individual level.

The Gini coefficients constructed from wealth index are plotted in Figure 9 below, to further examine the impact of financial services on household wealth gap. Figure 9 shows that utilising

informal financial services has the least impact on wealth Gini followed by credit. Using mobile money had the largest effect in reducing the Gini in 2012. Mobile money enables households to receive transfers and also save, which can be used to accumulate assets (Jack and Suri, 2014; Suri and Jack, 2016). In addition, the ease of undertaking transaction over the mobile money platform increases savings which are then channeled to accumulation of asset. Households that used insurance services increased their share of wealth in 2006 and 2009 compared to those that did not use insurance services. This can be attributed to insurance services mitigating severity in fluctuations in income and wealth as a result of loss of household assets (Akotey and Adjasi, 2014). In addition, insurance services enable households to afford medical services and education, which have a significant effect on household income and wealth outcomes.

**Figure 9.** Financial inclusion and wealth inequality



However, convergence in wealth between household using insurance services and those not using dissipate akin to MFI, banking Sacco, savings and credit services in 2015 survey (Figure 9). Hence, financial services have a diminishing contribution to reducing wealth inequality. These results are consistent with finding of Burgess and Pande (2005) for rural areas of India and Karlan, Ratan & Zinman (2014) on the impact of financial inclusion on poverty reduction. This implies that wealthy households initially benefit from the increase in financial inclusion more than the less wealthy households, but further gains in financial inclusion benefit the poor even though incremental benefits diminish. This is due to financial inclusion easing borrowing constraints, facilitating savings, and increasing efficiency in undertaking financial transaction, which enables the wealthy to hasten accumulation of human and physical capital, which widens the gap between the wealthy and the less wealthy in the initial stages. However, as financial inclusion progresses, the less wealthy households can take advantage of increased access to financial services. They are thus able to save and invest, as well as choose careers independent of generational wealth influence, which enables them to accumulate assets at a faster rate than the wealthy households (King and Levine, 1993, Rajan and Zingales, 2003, Jack and Suri, 2014). This reduces wealth gap between the rich and the poor. In terms of literature, the effect of financial services on income and wealth inequality is consistent with the prediction of Greenwood & Jovanovic (1990) in so far as the effect of financial inclusion initially increases inequality.

### 5.5. Financial inclusion and investment in education

One of the main channels through which financial inclusion can reduce income and wealth inequality in the long term is by easing the resource constraints that households experience when

making indivisible investments, especially in human capital (via education). Whereas acquiring education can increase the wealth as well as income of the educated once employed, the cost has no immediate return. In addition, due to financial market imperfections, students cannot borrow against their future earnings to finance their education. However, a household can use financial services like insurance, saving and borrowing to finance education of household members (Flug and Spilimbergo, 1999).

The effect of financial inclusion on education expenditure is presented in Table 6. The results are obtained using propensity score matching framework in which the outcome is spending on education <sup>12</sup>, while the treatment is the financial inclusion status. The control variables in the outcome equation are: geographical location, education of the household head, gender of the household head, size of the household, wealth and access to amenities. The quality of education and the skills accumulated overtime are highly correlated with the amount a household spends on education. Furthermore, household spending on education captures aggregate household investment in education and skills acquisition (Park and Mercado, 2015).

**Table 6.** Financial exclusion and investment in education (financially included=1)

	Coefficient	Treated	Control	%Bias	t	Prob
		Mean				
Urban	0.553*** (0.052)	0.394	0.398	-1	-0.42	0.672
Gender	-0.017 (0.044)	0.397	0.400	-0.6	-0.27	0.79
Age	0.498*** (0.055)	3.599	3.652	-12.1	-6.07	0
Wealth	0.214*** (0.015)	-0.016	-0.040	1.6	0.69	0.491
Married	0.468*** (0.049)	0.681	0.674	1.4	0.68	0.499
Household size	-0.154*** (0.045)	1.410	1.429	-3.7	-1.65	0.099
Earnings from investment	0.257	0.005	0.009	-7	-2.04	0.041
Employed	1.195*** (0.201)	0.048	0.026	9.1	5.3	0
Farming	-0.049 (0.058)	0.296	0.302	-1.3	-0.59	0.552
Transfer	-0.627*** (0.063)	0.166	0.159	1.5	0.8	0.425
Self employed	0.349*** (0.082)	0.212	0.204	2.3	0.83	0.406
pension	0.086 (0.531)	0.003	0.000	7	3.36	0.001
amenities	-0.112*** (0.021)	1.598	1.552	4.2	2.23	0.026
remittances	0.023 (0.049)	0.283	0.307	-5.2	-2.44	0.015
Constant	-0.772*** (0.218)					
Financially included	7.705					
Financially excluded	7.200					
Difference	0.505*** (0.093)					

Notes: spending on education is in logarithm.

\*\* 1% \*\* 5% \* 10% level of significant

<sup>12</sup>Investment in education is captured by expenditure weights households attach on education, while in 2009, 2012 and 2015 educational spending is in Kenya Shillings.

The results in table 6 indicate that the financially included spend about 39.6 percent more on education. Other results in table VI in the appendix show that the financially included spent about 56.7 percent more than the excluded in 2009, while in 2012 and 2015, the financially included spent 50.5 percent and 37.5 percent more on education relative to the financially excluded, respectively. The difference in educational spending between the financially excluded and the included households is not only statistically significant, but also diminishes in the four waves. The impact of financial services on education spending is slightly higher than findings from Tabetando & Matsumoto (2020) for Uganda, but lower than Apiors & Suzuki, (2018) for Ghana. This implies that using financial services increases human capital accumulation, which affects income and wealth gap between the rich and the poor. Schooling is a catalyst for income growth and inequality reduction due to the higher propensity of the educated to use financial services. The nexus between education, financial inclusion and wealth implies that investment in education can have a positive impact on financial access and poverty reduction. Another implication of these results is that financial inclusion affects investment in education and since returns to education are correlated with investment in education, the poor can close wealth and income gap by investing in education.

In summary, the analysis indicates that using financial services increases income and wealth. In particular saving, insurance services and mobile money have a substantial impact on wealth and income as well as reducing income and wealth inequality. However, using informal services has the least impact on increasing income and wealth as well as reducing inequality. Financial services facilitate assets accumulation and enables household to make indivisible investments, such as skills acquisition (Acemoglu and Zilibotti 1997, Clark, 2006). Since high skills are employed in skill-intensive firms, which also pay higher average wages, poor households that invest in skills acquisition hasten the rate of growth of their wealth, thereby reducing inequality.

## 6. Conclusion

The persistence of income and wealth inequality in Kenya, amid economic growth and increase in financial inclusion, not only undermine inclusive growth efforts, but also compromise long-run economic growth. This paper analyses the impact of financial inclusion on income and wealth inequality in Kenya. The Gini coefficients are constructed from income, household expenditure and wealth. The unobservable factors are controlled for in the five waves of financial inclusion surveys undertaken in 2006, 2009, 2012, 2015 and 2018 using propensity score matching method to establish the impact of using financial services on household income, wealth and educational spending as well as inequality in household income and wealth.

The results show that households that used financial services have higher overall household expenditure, investment in education and household income compared to households that did use financial services. Using bank and insurance services has a greater impact on wealth compared to microfinance and Saccos, while saving has a large impact on increasing income and reducing inequality compared to credit. Further, the analysis show that using financial services initially increases inequality, but utilisation of financial services increases, inequality reduces at a decreasing rate. Utilisation of financial services increases education attainment, which hasten increase in income and reduction in inequality.

The implication of this result is that expansion of financial inclusion relaxes households' resource constraints, enabling them to invest in education, expand their businesses, and make occupational choices that are independent of generational wealth endowment. As result, poor households augment their earnings and wealth at a faster rate than wealthy households, thereby reducing the income and wealth gap. Therefore, policies geared towards enhancing financial inclusion should take cognizance of nonlinear benefits of financial sector development. Financial inclusion policies emphasizing utilisation of banking, insurance and saving services have more drastic impact on alleviating poverty and inequality compared to credit. More importantly, increasing interoperability and cost of mobile money services, will be leverage on by other financial services providers to increase access and utilisation of financial services. A policy to enhance educational attainment will also hasten utilisation financial services, increase income and reduce inequality.



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## Appendix

### Wealth Index

The household wealth index is developed from durable asset ownership, access to utilities and infrastructure (e.g. sanitation facility and source of water), and housing characteristics (e.g. number of rooms for sleeping and building material). The set of variables in the wealth index can be denoted as  $X_1$  to  $X_n$ . These are assets in table I used to develop the wealth index. The household assets in table I were consistently captured in the four waves of financial access survey. Table I: Indicators and assets in the wealth index

The functional relationship of the principal component regression is given by:

$$\begin{aligned}
 w_1 &= a_{11}X_{11} + a_{12}X_{12} \dots \dots a_{1n}X_{1n} \\
 &\vdots \\
 w_m &= a_{m1}X_{11} + a_{m2}X_{12} \dots \dots a_{nm}X_n
 \end{aligned}$$

Where  $a_{nm}$  represents the weight for the  $m^{th}$  principal component and the  $n^{th}$  variable and  $w_1$  is the first principle component. The weight for each principal component is given by the eigenvectors

**Table I:** Indicators and assets in the wealth index

Indicators	Assets
Type of dwelling	Radio, camera
Wall, roof and floor material	Television (Black and White, colour)
Source of energy	Bicycle, motorcycle
Source of lighting	Built in kitchen sink
Source of water	Refrigerator
Type of lighting	Hi-fi music
Number of sleeping rooms per household member	Ox plough, donkey cart
Residence ownership	Electric stove, microwave,
Toilet facility	livestock

of the correlation matrix. The eigenvalue is the amount of variation attributable to the component subject to the sum of squared weights being equal to 1 .

The components such as livestock, source of water, material used for floor, walls and roof, type of energy used for cooking are positively and negatively correlated with poverty in rural and urban clusters, respectively. This distorts the index. Hence, the wealth index for urban and rural clusters are developed separately. The categorical variables are recoded to binary variables, which can be interpreted once they are converted into continuous variables.

The distribution of wealth index is skewed to the right due to the existence of few wealthy households amid many poor households. This indicates that there is wealth inequality in the Financial access data.

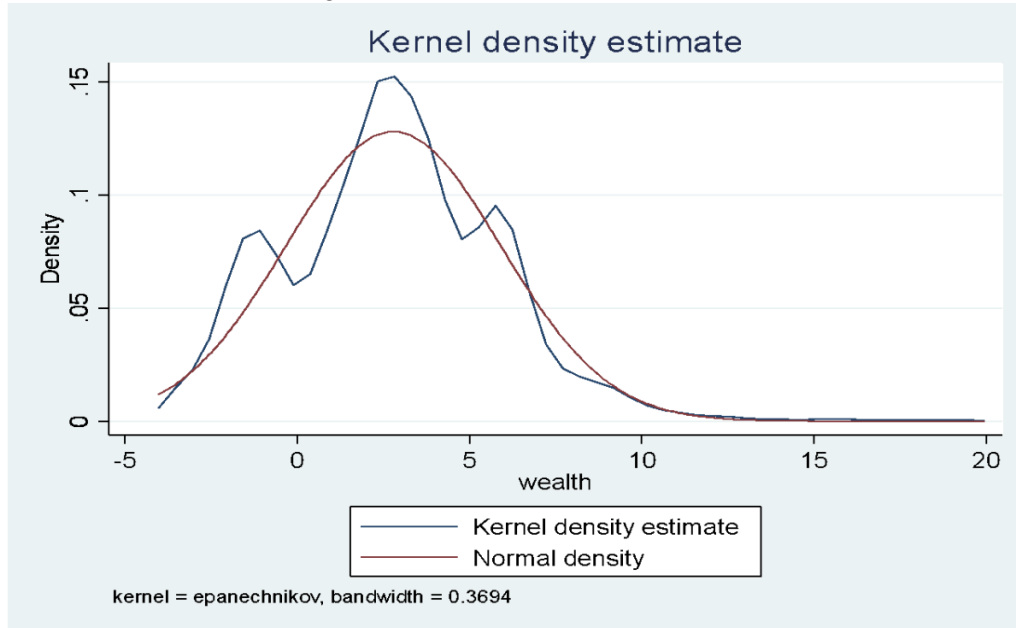
**Figure I:** Distribution of wealth index

Table II: Summary statistics of the financially excluded and the included

Variable	included			excluded		
	N	Mean	Std. Dev.	N	Mean	Mid. Dev. Min
Share of education	6,741	13.9	0.183	1,811	0.14	0.19
Income	6,248	11562.5	20531.85	1,671	3344.35	3982.90
Expenditure	6,796	24867.3	78298.84	1,862	11839.09	17458.06
Age	6,801	39.5	15.6697	1,868	38.41	21.51
Education spending	6,741	4148.6	10100.92	1,845	2313.05	6439.52
Wealth Gini	6,801	0.4	0.291867	1,868	0.25	0.25
				1,868	0.13	0.18
Expenditure Gini	6,801	0.3	0.231685	1,868	0.17	0.30
Income Gini	6,801	0.3	0.298447	1,868	4.42	2.46
Household size	6,801	3.9	2.268046	1,868	1.98	1.36
Amenities	6,801	1.5	0.879346	2,815	41.113	18.317
		Percent			Percent	
Male	2966	43.61		697	37.31	
Female	3835	56.39		1,171	62.69	
Urban	3,122	45.91		489	26.18	
Rural	3,679	54.09		1,379	73.82	
Remittances	1,926	28.39		651	35.04	

Figure II: Common Support before marching

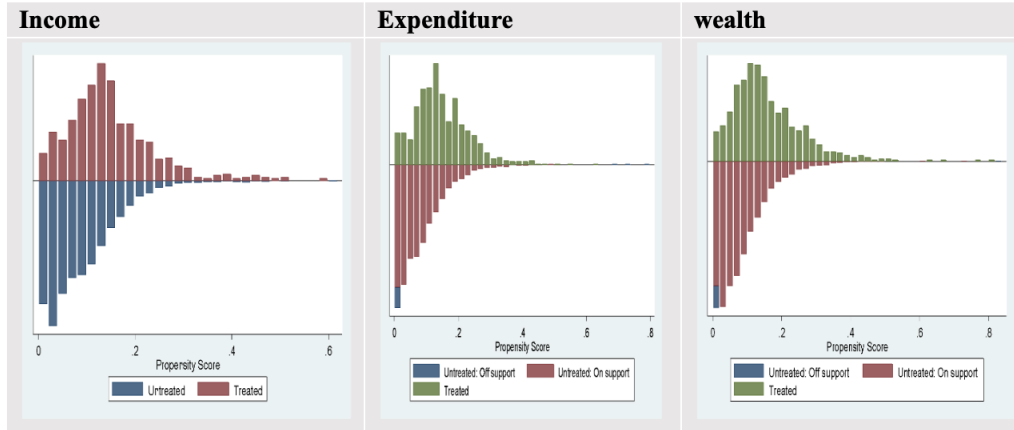


Table III: Propensity core test

Variable	Wealth			Income			Expenditure		
	%bias	t	p> t	%bias	t	p> t	%bias	t	p> t
Urban	2.5	0.52	0.60	3.1	0.49	0.62	7.7	1.61	0.11
Size of the household	-2.7	-0.49	0.62	-1.7	-0.24	0.81	-1.1	-0.18	0.86
Gender of household head	0.8	0.16	0.87	-0.9	-0.14	0.89	1.2	0.22	0.82
Marital status	4	0.78	0.43	11.8	1.74	0.08	5.3	1	0.32
Education	-2.4	-0.56	0.58	3.9	0.7	0.48	-5.9	-1.31	0.19
amenities	1.3	0.21	0.83	13.2	1.89	0.06	-5.6	-0.75	0.45
Age	3.1	0.58	0.56	7.8	1.13	0.26	2.7	0.46	0.65
Remittances	1.7	0.58	0.56	1.3	0.3	0.76	-0.9	-0.33	0.74
Ps R2	0.001			0.007			0.05		
Mean Bias	2.3			5.5			3.8		
Med Bias	2.4			3.5			4.0		
N	21,433			16,72			121,7		

\* if B&gt;25%, R outside [0.5; 2]

Figure III: Effect of Financial Inclusion on Average Household Income

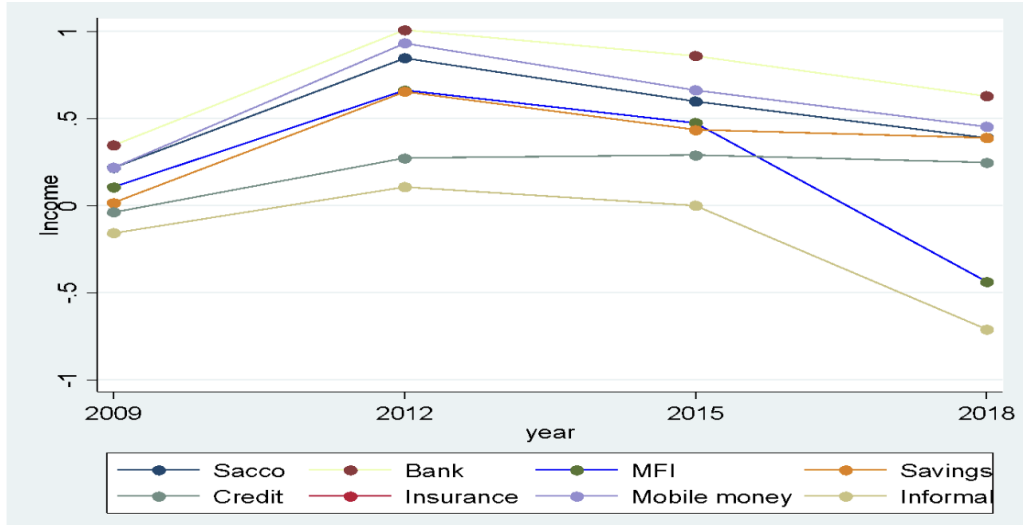


Figure IV: Common Support before matching for Gini coefficient

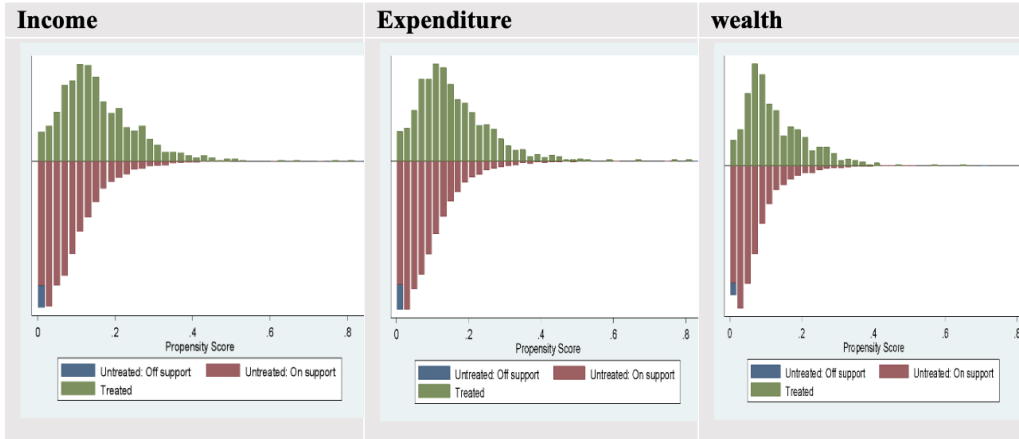


Table IV: Propensity core test Gini coefficient

Variable	Wealth			Income			Expenditure		
	t-test			t-test			t-test		
	%bias	t	p> t	%bias	t	p> t	%bias	t	p> t
Urban	-1.3	-0.21	0.4	3	0.6	0.5	3.6	0.76	0.45
Size of the household	3.5	0.52	0.60	-4.3	-0.8	0.4	1.9	0.35	0.72
Gender of household head	-5.3	-0.8	0.43	8.5	1.6	0.1	-4.2	-0.8	0.43
Marital status	8.0	1.23	0.22	2.5	0.5	0.6	0.4	0.08	0.94
Education	2.5	0.45	0.65	-1.1	-0.3	0.8	0.1	0.03	0.98
amenities	5.6	0.8	0.42	0.9	0.1	0.9	1.0	0.14	0.89
Age	-3.0	-0.44	0.66	5.6	1.0	0.3	-4.0	-0.71	0.48
Remittances	1.2	0.3	0.76	-1.7	-0.7	0.5	-0.8	-0.33	0.74
Ps R2	0.003			0.005			0.003		
Mean Bias	3.8			3.5			2.0		
Med Bias	3.3			2.8			1.5		

\* if B>25%, R outside [0.5; 2]



Table V: Financial inclusion, income and wealth inequality

	OLS Wealth	OLS Income	OLS Expenditure	IV wealth	IV income	IV Expenditure
FU	-0.052** (0.002)	-0.041** (0.001)	-0.052** (0.002)	-0.179** (0.020)	-0.038** (0.011)	-0.046** (0.013)
Remittances	0.075** (0.014)	0.069** (0.009)	0.094** (0.011)	-0.018 (0.023)	0.071** (0.012)	0.098** (0.014)
Urban	0.106** (0.006)	-0.038** (0.004)	-0.074** (0.005)	0.141** (0.010)	-0.039** (0.005)	-0.076** (0.006)
Amenities	0.018** (0.002)	-0.000 (0.002)	-0.001 (0.002)			
<b>Household characteristics</b>						
Size	0.026** (0.001)	0.001 (0.001)	-0.013** (0.001)	0.019** (0.002)	0.001 (0.001)	-0.012** (0.001)
Gender household head	-0.005 (0.008)	0.029** (0.005)**	0.005** (0.006)	-0.003 (0.010)	0.029** (0.005)	0.005 (0.006)
Married/living with partner	0.019* (0.009)	-0.016 (0.006)**	-0.025** (0.007)	0.040** (0.011)	-0.016** (0.006)	-0.026** (0.007)
Age	0.001 (0.001)	-0.003** (0.001)	-0.005** (0.001)	0.014** (0.002)	-0.003* (0.001)	-0.006** (0.001)
Agesq	-0.000 (0.000)	0.000** (0.000)	0.000** (0.000)	-0.000** (0.000)	0.000** (0.000)	0.000** (0.000)
<b>Main source of income</b>						
Employed	-0.113** (0.007)	-0.006 (0.005)	-0.019** (0.006)	-0.064** (0.012)	-0.007 (0.006)	-0.021** (0.008)
Pension	-0.016 (0.043)	0.024 (0.027)	-0.000 (0.032)	0.078 (0.055)	0.022 (0.028)	-0.005 (0.034)
Transfers	-0.156** (0.009)	0.040** (0.006)	0.008 (0.007)	-0.195** (0.013)	0.041** (0.007)	0.009 (0.008)
Investments	-0.131** (0.030)	-0.133** (0.019)	-0.098** (0.022)	-0.033 (0.040)	-0.134** (0.021)	-0.103** (0.025)
No income	-0.119** (0.033)	0.039 (0.021)	-0.036 (0.024)	-0.149** (0.040)	0.040 (0.021)	-0.034 (0.025)
_cons	0.405** (0.027)	0.859** (0.017)	0.920** (0.020)	0.169** (0.052)	0.864** (0.027)	0.931** (0.032)
R <sup>2</sup>	0.29	0.28	0.30	.	0.28	0.30
N	21,433	21,327	16,721	21,433	21,327	16,721

Notes: FU is the financial inclusion index. The index is developed using Principal Component Analysis and it consist of using accounts from all institutions, credit, savings and mobile money, Urban is binary taking 1 for rural and 2 for urban area, household head is a dummy with male as a reference category, age years of the respondent, remittances dummy with reference being those who did not received remittances, amenities is time taken to reach school, market, health facility. Agriculture is the reference category for main source of income \*  $p < 0.05$ ; \*\*  $p < 0.01$

The OLS results in table V indicate that an improvement in the utilisation of financial services reduces expenditure and wealth Gini coefficient by about 5 percent, while income reduces by 4.3 percent. IV estimates indicate that wealth Gini reduces by 17.5 percent, income reduces by 4.4 percent, while expenditure reduces by 5.2 percent. The reduction in wealth and income Gini coefficients for IV estimates is less than OLS. However, expenditure Gini estimated by OLS is greater than IV estimate. This implies that utilising financial services reduced income and wealth inequality. However, the IV results seem to be biased due to correlation between the instrument and the error term.

Table VI: Financial inclusion and differences in Gini coefficients (financially included=1)

	<b>2006</b>	<b>2009</b>	<b>2012</b>	<b>2015</b>	<b>2018</b>
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>Expenditure</b>		0.367***	1.020***	0.250***	0.613***
		(0.061)	(0.097)	(0.008)	(0.065)
<b>Income</b>		0.367**	0.673**	0.404**	0.556***
		(0.061)	(0.087)	(0.071)	(0.081)
<b>Wealth</b>	1.258***	0.256***	1.123***	0.333***	0.804***
	(0.134)	(0.146)	(0.084)	(0.089)	(0.099)
<b>Expenditure Gini</b>		-0.053***	-0.104***	-0.091***	-0.111***
		(0.010)	(0.009)	(0.010)	(0.011)
<b>Income Gini</b>		0.003	-0.076***	-0.025***	-0.072***
		(0.011)	(0.008)	(0.008)	(0.019)
<b>Wealth Gini</b>	-0.089***	-0.025***	-0.167***	-0.071***	-0.156
	(0.017)	(0.014)	(0.015)	(0.017)	(0.016)
<b>Spending on education</b>		<b>0.162*</b>	<b>0.297***</b>	<b>0.530*</b>	<b>0.505***</b>
		(0.109)	(0.125)	(0.163)	(0.093)

Notes: \*\*\* 1% \*\* 5% \* 10% level of significant. Income was not captured in 2006 Financial Access Survey

Table VII: Average differences between the treated and the control groups

		Bank	Sacco	MFI	Saving	Credit	Insurance	Mobile money	Informal
2006	Wealth	0.990* *	0.973**	1.009**	0.778**	0.332	1.570** *		0.389** *
		(0.128)	(0.136)	(0.290)	(0.106)	(0.096)	(0.183)		(0.097)
2009	Wealth	1.281**	0.507**	0.403	0.326* *	0.078	2.004* *	0.618**	-0.260*
		(0.153)	(0.199)	(0.328)	(0.113)	(0.108)	(0.278)	(0.152)	(0.144)
2012	Wealth	0.982* *	0.636*	0.325*	0.656* *	0.355* **	0.941**	1.043**	0.143**
		(0.071)	(0.098)	(0.165)	(0.059)	(0.067)	(0.065)	(0.081)	(0.062)
2015	Wealth	0.738* *	0.370**	0.463* *	0.304* *	0.141** *	0.664* *	0.524**	-0.092*
		(0.082)	(0.098)	(0.168)	(0.064)	(0.062)	(0.088)	(0.076)	(0.057)
2009	Income	0.347* *	0.219**	-0.092 **	0.016	-0.035	0.524* *	0.219**	-0.155* *
		(0.035)	(0.053)	(0.055)	(0.048)	(0.036)	(0.074)	(0.047)	(0.052)
2012	Income	0.376* *		0.251	0.657* *	0.273* *	0.881**	0.935**	0.109**
		(0.090)		(0.104)	(0.051)	(0.056)	(0.063)	(0.064)	(0.053)
2015	Income	0.862* *	0.413**	0.592**	0.436* *	0.290* *	0.652* *	0.664**	0.002
		(0.057)	(0.063)	(0.049)	(0.049)	(0.043)	(0.060)	(0.058)	(0.040)
2006	Expenditure	0	0.005**	0.000	0.002	0.003	0.000		0.004
		(0.004)	(0.004)	(0.001)	(0.004)	(0.003)	(0.001)		(0.003)
2009	Expenditure	0.818**	0.538***	0.611**	0.470* **	0.287* **	0.926* *	0.434**	0.079*
		(0.047)	(0.064)	(0.103)	(0.049)	(0.037)	(0.070)	(0.047)	(0.053)

Table VII: ...Continued

2012	Expenditure	1.036* *	0.861**	1.002**	0.900* **	0.633* **	0.955* *	1.038**	0.253**
		(0.055)	(0.081)	(0.126)	(0.058)	(0.058)	(0.067)	(0.065)	(0.055)
2015	Expenditure	0.635* *	0.456**	0.563** *	0.320* *	0.410* **	0.562* *	0.517**	-0.073
		(0.050)	(0.055)	(0.088)	(0.043)	(0.034)	(0.055)	(0.048)	(0.034)
Gini coefficients									
2006	Expenditure	0.057* *	0.063**	0.045	0.002	0.003	0.000		0.004
		(0.018)	(0.019)	(0.038)	(0.004)	(0.003)	(0.000) )	0.434	(0.003)
2009	Expenditure	0.169* *	0.108**	0.125**	0.470	0.287	0.926	(0.047)	0.079
		(0.009)	(0.013)	(0.021)	(0.049)	(0.037)	(0.070)	1.038	(0.053)
2012	Expenditure	0.174**	0.09**	0.182**	0.900	0.633	0.955	(0.065)	0.253
		(0.008)	(0.016)	(0.021)	(0.058)	(0.058)	(0.067)	0.517	(0.055)
2015	Expenditure	0.138** *	0.080***	0.107	0.320* *	0.410* **	0.562* **	(0.048)	-0.073* **
		(0.009)	(0.010)	(0.021) **	(0.043)	(0.034)	(0.055)	(12.30)**	(0.034)
2009	Income	0.071**	0.057**	0.031	-0.009	-0.008	0.104* **	0.044***	-0.022
		(0.008)	(0.013)	(0.022)	(0.009)	(0.007)	(0.016)	(0.009)	(0.010)
2012	Income	0.167	0.172***	0.087**	0.095* **	0.064* **	0.100* **	0.178**	0.016** *
		(0.008)	(0.013)	(0.021)	(0.006)	(0.008)	(0.006)	(0.010)	(0.007)
2015	Income	0.118**	0.084***	0.054* **	0.045* *	0.031* **	0.105* *	0.071**	-0.005
		(0.007)	(0.011)	(0.018)	(0.006)	(0.006)	(0.009)	(0.006)	(0.005)
2006	Wealth	0.134**	0.135***	0.133**	0.108* *	0.040* *	0.203* *		0.072*
		(0.018)	(0.019)	(0.040)	(0.014)	(0.014)	(0.025)		(0.016)
2009	Wealth	0.098* *	0.219***	0.055**	0.024* *	-0.002	0.107** *	0.073**	-0.021
		(0.012)	(0.015)	(0.025)	(0.011)	(0.009)	(0.017)	(0.011)	(0.013)

Table VII: ...Continued

2012	Wealth	0.195**	0.150***	0.120**	0.133* *	0.075* *	0.168* *	0.198**	0.041**
		(0.012)	(0.017)	(0.028)	(0.010)	(0.002)	(0.011)	(0.014)	(0.011)
2015	Wealth	0.111**	0.057**	0.052* *	0.045* *	0.021	0.099* *	0.079**	-0.011
		(0.013)	(0.017)	(0.026)	(0.010)	(0.010)	(0.013)	(0.012)	(0.009)

Notes: \*\*\* 1% \*\* 5% \* 10% level of significant. The treated group comprise of those who used banking, SACCOs, MFI, saving, credit, insurance, mobile money and informal financial services, while the untreated are those who did not use the respective financial services.

Figure V: Financial inclusion and income inequality

