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The determinants of domestic saving in Kenya

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Abstract: The savings–growth nexus is widely acknowledged, both in policy and in the literature. But Kenya's numerous policy initiatives to encourage savings mobilization are yet to yield the expected outcomes. This paper identifies the key drivers of domestic saving in Kenya, exploiting fintech as an alternative channel for savings mobilization, and drawing lessons from the Kenyan experience so far. Using data from various sources, and employing an autoregressive distributive lag estimation model, we find that in the long run, private saving is positively and significantly influenced by the per capita income growth rate, inflation, and age dependency ratio, and negatively influenced by the public saving rate and terms of trade. National saving is positively and significantly influenced by the per capita income growth rate, inflation, and private sector credit growth rates in the long run. Wealth and deposit rates negatively influence national saving. Based on these findings, we recommend the following interventions to grow savings in Kenya: creating decent employment opportunities to enhance income growth; providing sustained financial development with a focus on savings mobilization; creating an enabling environment for the private sector; taking advantage of Kenya's young population; exploiting mobile money platforms to boost savings. Moreover, households show targeted saving behaviour where they accumulate financial savings and then transform them into savings in kind. Therefore, accounting for savings should go beyond the traditional focus on bank deposits and incorporate savings held in other forms. Households also use non-formal platforms for saving, and we suggest that existing barriers to formal saving platforms be removed to direct more saving into formal channels.

Key words: domestic saving, growth, policy, fintech, autoregressive distributive lag, Kenya

JEL classification: C32, E21, H5, O3

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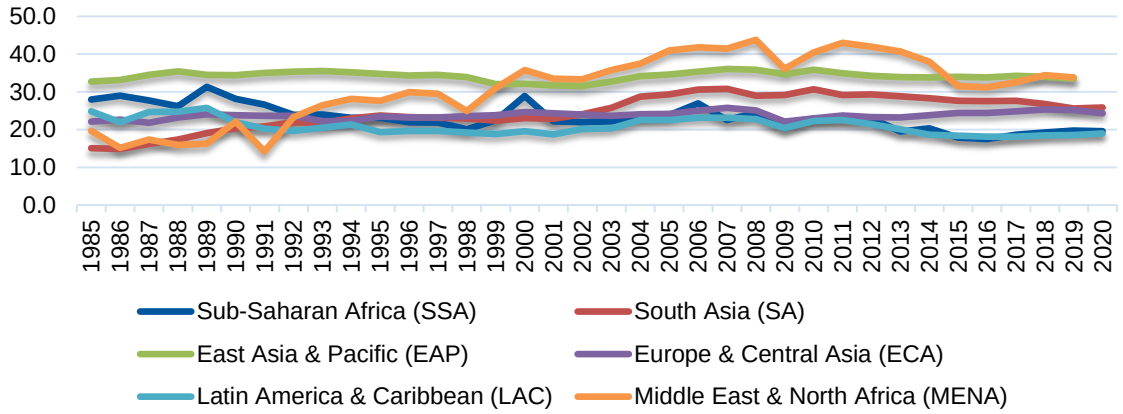
1 Introduction

The savings–growth nexus has been widely acknowledged. Empirical literature has established that a high saving rate is not only synonymous with long-run economic growth (Aghion et al. 2006) but also a trigger for more investment resulting from increased available funds (Ang and Sen 2011). A high national saving rate is therefore considered to be important for stimulating economic growth (Athukorala and Sen 2004). Globally, the role of savings mobilization has been buttressed by the United Nations' 2015 Addis Ababa Action Agenda on financing for development. Further, the African Union Agenda 2063 prioritizes the strengthening of domestic resource mobilization by building continental capital markets and financial institutions to enhance domestic savings (among other goals).

The sub-Saharan Africa (SSA) region is predominantly characterized by low domestic savings (Figure 1). The average saving rate in SSA in 2000–19 was 22 per cent, compared with higher rates in East Asia and the Pacific (34 per cent), South Asia (28 per cent), the Middle East and North Africa (37 per cent), and Europe and Central Asia (24 per cent). The gross domestic product (GDP) per capita growth rate for SSA in 2000–19 averaged 1.8 per cent, compared with higher levels witnessed in South Asia (4.6 per cent) and East Asia and the Pacific (4.4 per cent), and to some extent this explains the saving rate. However, although SSA's GDP per capita growth rate was higher than that of the Middle East and North Africa (1.6 per cent), the saving rate was lower. In addition, the average investment measured by the gross capital formation as a percentage of GDP for SSA in 2000–19 averaged 22 per cent, which was lower than South Asia (32 per cent), East Asia and the Pacific (34 per cent), and the Middle East and North Africa (27 per cent). Overall, the regions that posted impressive saving rates seem to have experienced higher GDP per capita and investments.

Figure 1: Global comparison of domestic saving (% of GDP)



Source: authors' illustration based on World Development Indicators for 1985–2020.

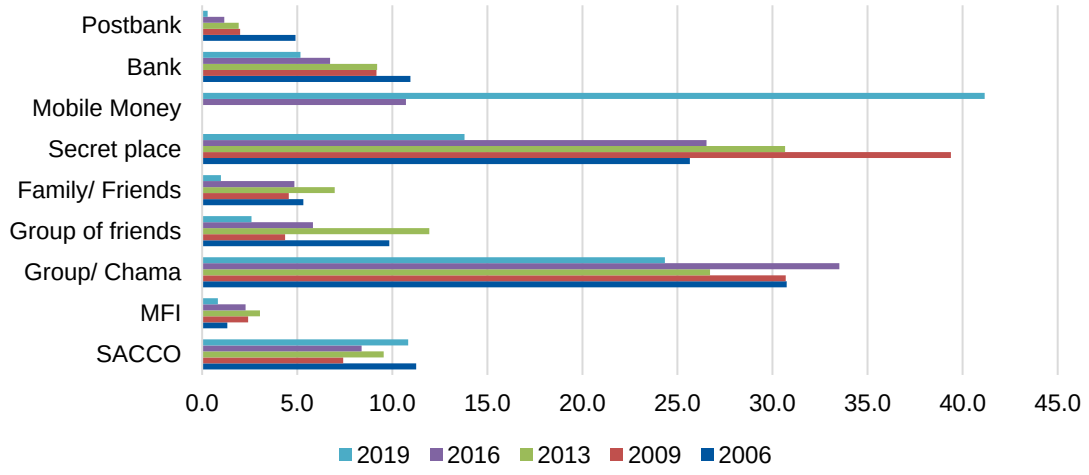
The saving rate in SSA declined from a high of 27 per cent in 2006 to 19.5 per cent in 2020, with fluctuations in-between. In the same period, the region posted a high of 3.7 per cent of GDP per capita growth in 2007, but a decline in growth of 4.5 per cent in 2020. This assessment lays bare the importance of mobilizing savings for growth in SSA in line with both global and regional aspirations.

In Kenya the government has prioritized savings mobilization in a bid to promote saving to adequately finance investment needs. This is well anchored in the long-term development

blueprint, the Kenya Vision 2030, and tracked periodically through its five-year Medium-Term Plans. Despite numerous policy initiatives to encourage savings mobilization in Kenya, performance has not been desirable. The Kenya Vision 2030 envisaged growth in gross national savings from 15.6 per cent of GDP in 2006–07 to about 26 per cent by 2012–13 and 29 per cent by 2030. Public savings were expected to rise from 1.6 per cent of GDP in 2006–07 to three per cent by 2012–13 and 3.8 per cent by 2030. Private savings were targeted to rise from 14 per cent of GDP in 2007–08 to 23 per cent in 2012–13 and 25.5 per cent in 2030.

At the micro level, the series of five FinAccess surveys reveals an increase in access to and usage of saving products in Kenya. As of 2019, 69.4 per cent of households had at least one member using some form of saving product, compared with 52 per cent in 2006. However, most however preferred informal saving channels, particularly chamas, secret hiding places, and groups of friends (Figure 2). The uptake of mobile money (fintech) as a financial innovation gained traction as an alternative channel for saving, increasing from 10.7 per cent in 2016 to 41.2 per cent in 2019. Generally, fintech interfaces finance with technology (Chang et al. 2020) and incorporates platforms that disrupt traditional financial services, such as mobile payments, money transfers, peer-to-peer lending, and robotic investment advice (Marr 2017).

Figure 2: Household saving platforms



Note: MFI: microfinance institution. SACCO: savings and credit co-operative.

Source: authors' illustration based on FinAccess data for 2006–19.

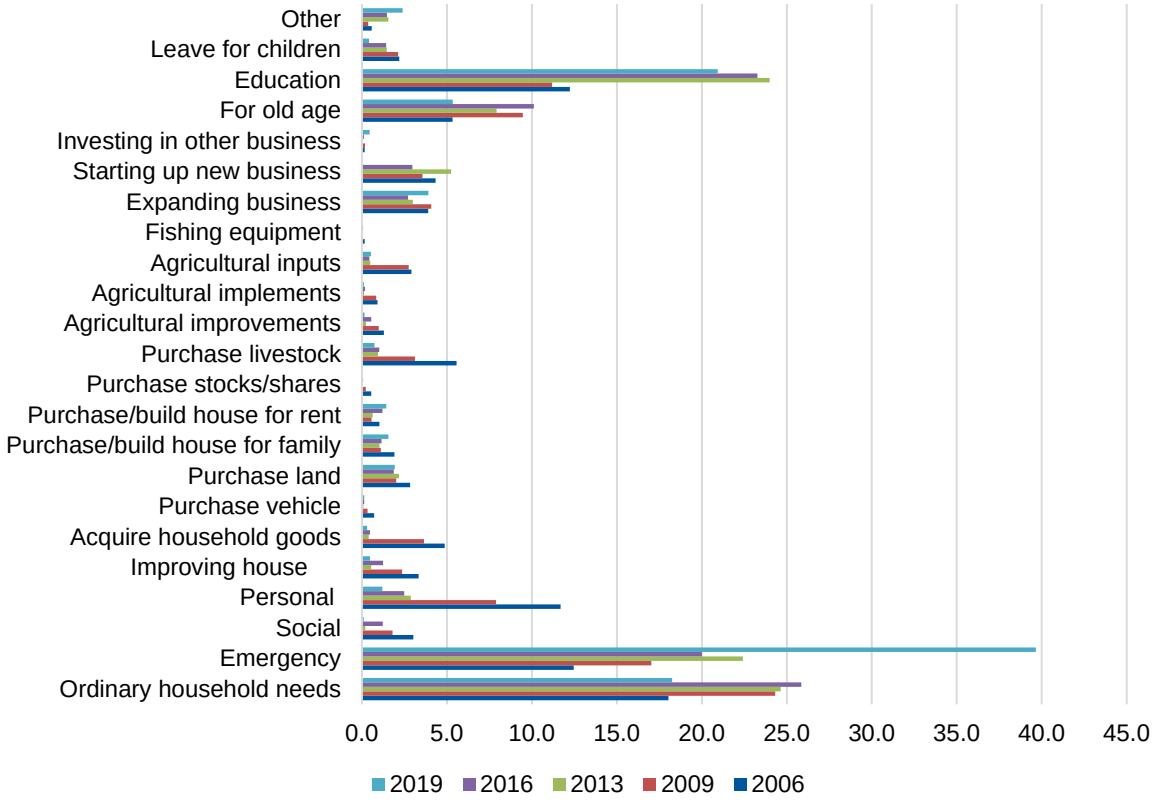
A deeper analysis of the income composition of Kenyan households according to FinAccess 2019 data shows that the majority fall into the low-income band of less than KES30,000 (US$248.6)[1] per month, meaning they are poor and have inadequate disposable income to save. This is corroborated by the Kenya Integrated Household Budget Survey (KIHBS) for 2015–16, which indicates that 80 per cent of households receive an average income of less than KES50,000 (US$414.3). Among those with KES30,000 (US$248.6) and below, the level of saving is 43.4 per cent; for those with above KES30,000, the level of saving is 56.6 per cent. This finding validates the Keynes absolute income hypothesis, which expects higher income levels to promote saving.

There are indications that the low reported saving rate in Kenya may be a result of unaccounted savings and the use of alternative forms, particularly saving in kind, which may not be monetized

[1] US dollar equivalent to KES120.7, mean indicative rate 30 September 2022.

in the calculation of total savings (Figure 3). According to FinAccess data for 2006–19, households save largely to meet ordinary household needs, for emergencies, for personal reasons such as the purchase of shoes and clothing, and to pay for the education of themselves or others. This demonstrates that households tend to be targeted savers. However, they also save to purchase livestock or land, and to buy or build housing for rent. This also implies that households accumulate targeted financial savings and then transform them into other forms (assets) rather than retaining them as deposits at banking institutions.

Figure 3: Reasons why households save



Source: authors' illustration based on FinAccess data for 2006–19.

Some households save for old age, in line with the life cycle model (LCM), but the incidence is low and inconsistent. The KIHBS 2015–16 data reveals that the incidence of those who receive a pension income is quite low at 17 per cent and largely concerns the civil service pension plan (92 per cent). The incidence of private and personal pension plans is small at 6.4 per cent and 0.9 per cent respectively. Further, the majority (86 per cent) of households receiving monthly a pension receive less than KES20,000 (US$165.7). While the traditional expectation has been for young people to take care of the old, meaning there has been no motivation to save for one's old age, the weakening of social ties is changing this. The government is already offering social protection for the old, with cash transfers to enable them to meet their basic needs.

Previous research regarding the determinants of saving in Kenya has found mixed results. Mwangi (2020) used the life cycle hypothesis (LCH) and permanent income hypothesis (PIH) to model saving behaviour in Kenya and established that the uptake of formal saving rose with the level of urbanization and formality of employment but declined with family size. To investigate the determinants of private saving in Kenya, Onwuasoeze and Kirori (2016) used Keynes's absolute income hypothesis and the ordinary least squares (OLS) estimation approach for short-run models to establish that high per capita income and financial deepening boosted saving. A high

dependency ratio and inflation were found to decrease saving. Ndirangu and Muturi (2015) used time series data for 1970–2013 and studied the determinants of gross domestic savings. Their study used LCH, PIH, and absolute income hypothesis theories and ascertained positive effects of GDP and inflation on gross domestic savings. Contrariwise, the age dependency ratio had negative effects on gross domestic savings. Further, using a sample of 359 households comprising farmers, teachers, and entrepreneurs in Nakuru district, Kibet et al. (2009) identified several micro-economic determinants of saving. Positive determinants of household saving included high incomes and high interest rates on deposits. By contrast, negative determinants of household saving were increased access to credit, a high dependency ratio, and high transport costs to a savings institution.

In examining financial sector reforms, savings, and economic development in Kenya, Odhiambo (2002) established strong support for McKinnon's complementarity hypothesis, where the coefficients of the savings rate (S/Y) in the money demand function and the lagged real money balances (M/P) in the savings function were found to be both positive and statistically significant at one per cent and five per cent respectively. While studying financial sector reforms and interest rate liberalization in Kenya, Ngugi and Kabubo (1998) determined that the intermediation of financial assets did not yield efficiency due to the widening interest rate spread and the non-achievement of positive real interest rates. In one of their early works on M-Pesa, Mbiti and Weil (2016) examined its impact on savings in Kenya and its viability as an alternative saving platform. Using the difference-in-difference estimation approach and a qualitative review of other studies, they found that M-Pesa was overwhelmingly used to transfer funds rather than for storage purposes. M-Pesa usage was also found to have decreased the usage of informal saving platforms and increased the banked proportion of the population.

At the regional level, Adewuyi et al. (2010) studied the determinants of saving in Economic Community of West African States (ECOWAS) countries. Applying the LCH and a fixed effects model to 14 of the 15 ECOWAS countries, their study established that life expectancy was positively correlated with saving—a manifestation of the situation in most African countries, where the majority of individuals continue to engage in income-generating activities until their death. Further, their results indicated that income per capita, interest rates, financial depth, inflation rates, and terms of trade had negative effects on saving. Their income per capita finding on saving was explained by potentially high levels of dissaving for consumption in the face of high poverty levels in ECOWAS countries. Elbadawi and Mwega (2000) sought to explain the dismal saving rate and analysed the determinants of private saving in SSA. Their study employed LCH and PIH theories and Granger causality and found that a rise in the saving rate Granger-caused an increase in investment in the SSA region. Their results also indicated that the private saving rate in SSA lagged behind that in other regions (most notably high-performing Asian economies) due to SSA's lower per capita income, high young-age dependency ratio, and high dependence on aid. On financial sector liberalization in Anglophone Africa, Ndung'u (1997) carried out a survey of the literature to highlight issues in financial sector reform and their impact on financial development, saving, investment, and growth. The study concluded that financial liberalization did not lead to drastic improvements in the saving rates of SSA countries. After liberalization, investment rates fell in most SSA countries, and the real discount rate was negative and falling—hence the inability to mobilize long-term savings and investments, which are positively correlated with economic growth. This situation applied to Kenya.

Single-country studies have been carried out to establish the macro-economic determinants of saving. Ahmed et al. (2015) studied the determinants of saving in Pakistan by employing an autoregressive moving average model using time series data for 1993–2013. The results indicated that the inflation rate, real interest rates, and government expenditures negatively affected saving in Pakistan. Using time series data for 1991–2012, Ogbokor and Samahiya (2014) used a Johansen

cointegration test and vector error correction model to ascertain macro-economic determinants of saving in Namibia. Their findings established a long-run relationship between saving and the independent variables. Inflation and income positively and significantly influenced saving, while the population growth rate had a negative effect on saving. Ang and Sen (2011) sought to enrich the existing literature by providing further evidence regarding how financial sector reforms and expected pension benefits affected the evolution of private saving in the high-growth economies of India and Malaysia, which were both considered countries with high rates of private saving. Their study used the extended LCM and time series data for the period 1960–2005; the findings were in line with the LCM, with private saving significantly determined by income growth and demographic structure. A long-run steady-state relationship was found between private saving and its determinants in both countries. Further, financial liberalization had a negative impact on saving performance in the private sector, implying that the relaxation of financial restraints had a detrimental effect on growth in the economies of both India and Malaysia. The study also found that compulsory saving in the form of provident and pension funds appeared to encourage private saving in India, but the reverse was found in Malaysia. Further evidence was provided by Athukorala and Sen (2004), who examined the determinants of the private saving rate in India during 1954–98 and applied the LCM to explain changes in private saving over time. The study outcomes indicated that the real interest rate, growth and level of per capita income, spread of banking facilities, and (mild) rate of inflation influenced domestic saving positively. Terms of trade changes and inward remittances by expatriate Indians were found to have a negative impact on the saving rate. The study also recognized the role of fiscal policy in increasing total saving in the economy, with the private sector considering public saving to be an imperfect substitute for private saving.

In light of the foregoing discussion, our research sought to enrich the existing literature by focusing on the following areas: (a) the key drivers of domestic saving rates in Kenya; (b) whether alternative approaches such as fintech might provide new solutions to increase domestic savings; (c) lessons that could be drawn from the experience in Kenya so far. To meet these objectives, we first undertook a literature review on the savings ecosystem in independent Kenya; second, we painted a picture of patterns and trends in domestic savings; third, we undertook an empirical analysis of the determinants of private saving in Kenya. The rest of this paper is organized into four sections. The next section provides the policy context for savings mobilization in Kenya. Section 3 discusses patterns and trends in domestic saving. Section 4 provides an analysis of the determinants of domestic saving in Kenya, both discussing our econometric methodology and providing our results. Section 5 concludes the paper.

2 The policy context

2.1 Policy evolution

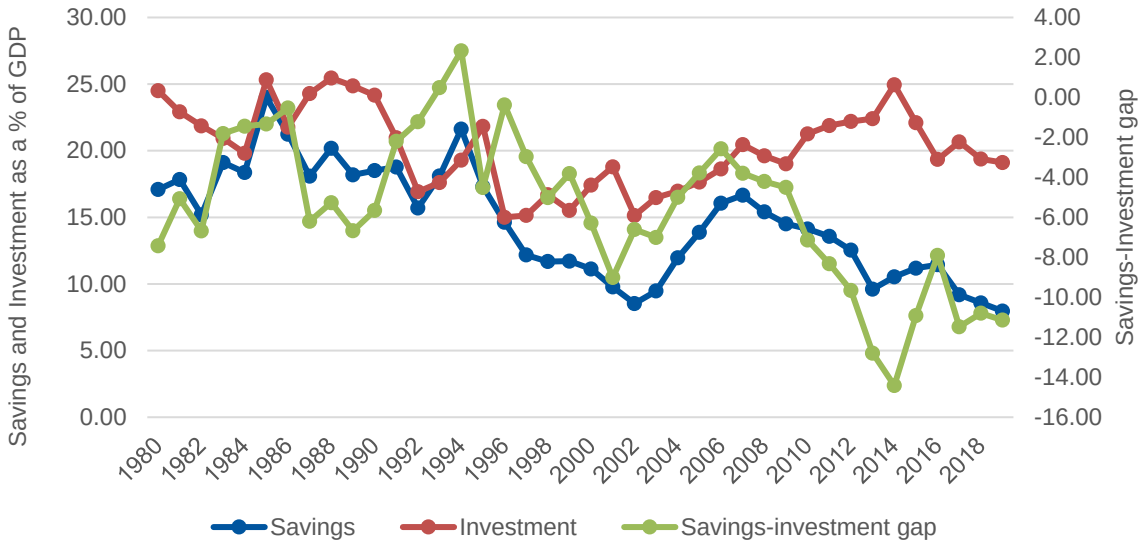
Since independence, the government of Kenya has prioritized the mobilization of domestic savings to finance growth adequately and appropriately. Although the policy environment for savings mobilization in Kenya has remained consistent, a gap has persisted in the ability to mobilize adequate savings, which is critical to fund the country's investment needs. The evolution of interest rates has seen both controlled and uncontrolled regimes in Kenya, ultimately resulting in full liberalization. Mixed results have also been recorded on saving rates in particular, with decreases and increases in the early years following liberalization. Below we discuss the key policy areas.

Government drive to promote savings mobilization to finance investment and growth

The first National Development Plan (1964–70) identified domestic savings mobilization as critical for financing investment. Further, Sessional Paper 10 of 1965, on African socialism and its application to planning in Kenya, recognized the importance of domestic saving for spurring growth, and proposed the promotion and retention of domestic saving at reasonable levels by exploiting both voluntary and involuntary saving. In the third National Development Plan (1974–78), the government noted that attempts to mobilize savings from low-income people were still far from satisfactory. As a result, the widening gap between saving and investment was making it difficult to meet development goals. In the fourth National Development Plan (1979–83), the government encouraged those who could afford it to save a portion of their income for use in old age, financing national development, and setting aside something for a rainy day. Sessional Paper 1 of 1986, which was developed against a backdrop of high inflation rates and slowed economic growth, advocated increased savings mobilization as well as investment for renewed growth. In the eighth development plan cycle (1997–2001), domestic saving was identified as inadequate to spur industrialization. The Economic Recovery Strategy (ERS) of 2003–07 prioritized the enhancement of public saving by reducing public consumption to ensure resources were available for domestic capital formation. The Kenya Vision 2030 further sought to promote high levels of saving to finance investment needs.

Generally, a favourable savings-investment gap indicates that more savings are being mobilized for investment purposes and vice versa. The savings-investment gap in Kenya has widened over time, with the biggest gap recorded in 2014 (Figure 4). The average savings-investment gap between 1980 and 2019 was 5.57 per cent. Prior to interest liberalization (1980–91), the savings-investment gap averaged 4.19 per cent. This slightly improved during the early phase of interest rate liberalization (1992–2002) with an average of 3.36 per cent. Thereafter, it worsened during the implementation of both the ERS (2003–07) and Vision 2030 (2008–19), at 4.43 per cent and 9.44 per cent respectively. The widening gap during the Vision 2030 period may be attributed to the ambitious investment programmes that were being implemented to expand the capacity for sustainable inclusive growth.

Figure 4: Savings-investment gap



Source: authors' illustration based on World Development Indicators for 1980–2018.

Channels for savings mobilization

Several channels have been identified over time to mobilize savings. For example, Sessional Paper 10 of 1965 noted the need to boost voluntary saving through platforms such as (a) unit trusts and savings bonds tailored to future consumer needs, such as education, housing, and medical bills, (b) development of the money market, (c) growing interest in stock market participation, and (d) development of indigenous commercial banks.

In the National Development Plan of 1964–70, the key channels identified for savings included the establishment of the National Social Security Fund and the National Bank of Kenya Limited, and assisting co-operatives to establish the Co-operative Bank of Kenya Limited. The Post Office Savings Bank and the Cereals and Sugar Finance Corporation were also established to provide saving facilities. Further, the banking sector was encouraged to spur savings mobilization by removing bottlenecks related to minimum deposits and inconvenient locations (third National Development Plan, 1974–78). The government likewise sought to enhance the public's confidence to participate in the Nairobi Stock Exchange as an avenue for mobilizing long-term capital (ERS, 2003–07).

The government also encouraged all savings institutions (commercial banks, credit societies, building and loan societies, co-operatives, and pension funds) to rapidly extend their services into rural areas (fourth National Development Plan, 1979–83). Following in the footsteps of savings institutions that had expanded their services into rural areas, the Post Office Savings Bank was to leverage its large network of offices across the country to provide opportunities for private saving, as stipulated in the fifth National Development Plan (1984–88).

To enhance intermediation, under the sixth National Development Plan (1989–93), the Capital Markets Authority was expected to foster an orderly capital market through which enhanced financial intermediation could take place. This would be further facilitated by an effective stock exchange system in which the market for long-term savings and loans could be developed and broadened.

In Vision 2030, the channels identified to promote high levels of savings included deepening the penetration of banking services, particularly in rural areas, to help drive increased domestic saving, and strengthening capital markets to mobilize both equity and debt (through long-term bonds) to finance infrastructure funding. Additionally, a deepened financial market was identified as vital for raising institutional capital through pension funds, as well as expanding bond and equity markets. The first Medium-Term Plan (2008–12) proposed the reorganization of the national social security and pension system, the insurance and banking sectors, savings and credit co-operatives (SACCOs), and capital markets, with a view to facilitating higher savings. Further, the second Medium-Term Plan (2013–17) emphasized the deepening of capital markets for long-term savings through the implementation of the ten-year Capital Markets Master Plan (2014–23) and the exploitation of Kenya's established lead in digital finance.

The third Medium-Term Plan (2018–22) envisaged that the financial sector would mobilize and increase savings to finance Kenya's Big Four development agenda. The channels to be employed included: the creation of new government debt-based products; implementation of the Hybrid Bond Market Project; expansion of the M-Akiba savings product; consolidation of outstanding bonds and issuing of large benchmark bonds; increasing liquidity and lengthening of the yield curve; expansion of the maturity period of Treasury bonds; implementation of the Government Securities Market Makers initiatives; and development of new trading platforms, including Internet banking and an electronic trading platform.

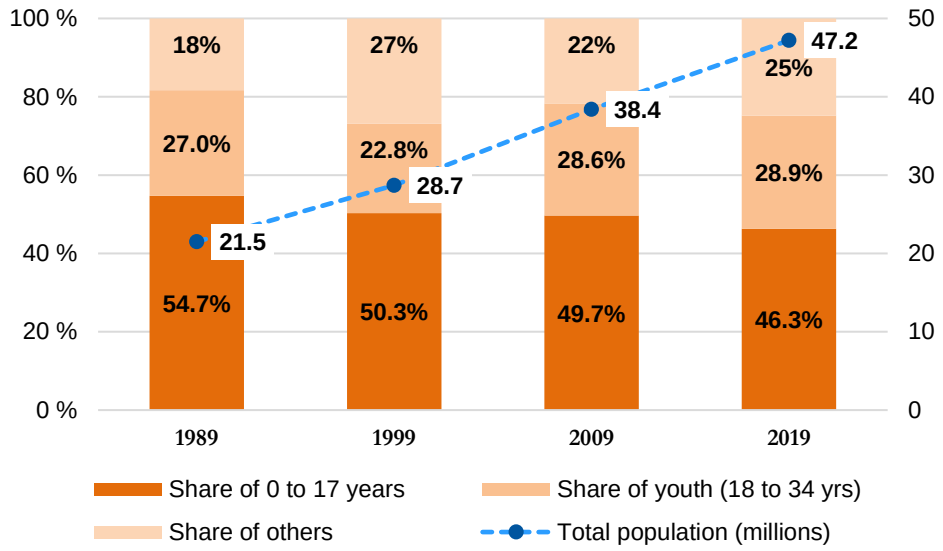
Kenya has a well-established financial sector that consists of banking, insurance, capital markets, and pension funds. There are also quasi-banking institutions and services provided by SACCOs, microfinance services, building societies, development finance institutions, and informal financial services such as table-banking. With developments in the telephony sector, innovations such as mobile money are also providing financial solutions in the form of credit, money transfers, and saving. These offer a wide range of savings products that can be utilized to facilitate savings mobilization.

According to various reports by the Central Bank of Kenya, the banking sector was characterized by considerable levels of liquidity distress during the reform process, resulting in some banks being placed under statutory management. For example, in the mid-1980s and 1990s, poor banking sector performance was recorded, occasioned by mismanagement, self-serving insider practices, slow recoveries due to an ineffective court system, inadequate legal powers vested in the regulator, and sluggish performance of the economy. In the 21st century, while banking sector performance has generally been desirable, the structure has been typified by mergers, liquidations, and statutory management. Consequently, the number of commercial banks declined from 51 in 2000 to 38 in 2021. The banking sector enjoyed a lot of structural stability between 2009 and 2015, with the number of commercial banks remaining at 43.

Population growth and savings mobilization

According to the LCH, population structure is important in explaining people's saving behaviour. Sessional Paper 10 of 1965 emphasized family planning as a key factor to reduce the population growth rate, which was hindering saving for development. Further, the sixth National Development Plan (1989–93) identified the growing and dependent population as a posing threat to savings mobilization by diverting resources towards consumption rather than savings or investment. The 2019 Kenya Population and Housing Census demonstrated that the majority of the population are youth (Figure 5), who are in their most productive years and have the potential to mobilize savings for future use when they start dissaving.

Figure 5: Population age structure

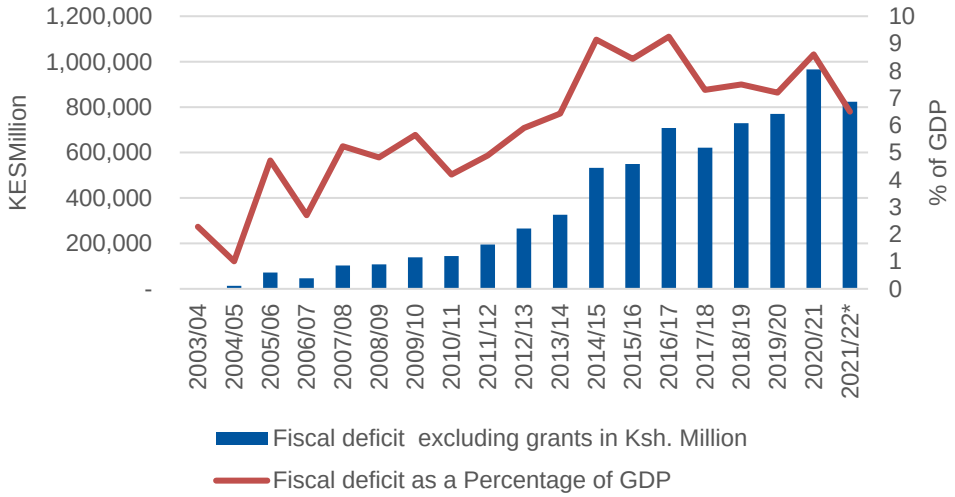


Source: authors' illustration based on data from Kenya Population and Housing Census reports.

Fiscal policy and savings mobilization

Sessional Paper 1 of 1986 suggested the need to restructure fiscal policy to achieve various outcomes, including increased government saving through reducing expenditure, public debt management, and budget rationalization with more spending on immediate productive activities. The threat to savings mobilization remained, particularly with the widening budget deficit (Figure 6). Further, the ERS (2003–07) identified the enhancement of tax incentives as key to encourage more saving through pension schemes by removing the maximum allowable tax deductibility of contributions. The incentives included making withdrawals at and after retirement tax-free, thereby encouraging contributors to opt out of pension schemes after the attainment of retirement age. Thanks to further reforms to pension schemes, the initial lump sum of KES600,000 (US$4,971) upon withdrawal of benefits and the KES25,000 (US$207.1) monthly pension received from such schemes are tax-free (Kenya Revenue Authority 2022). Other incentives to save concern insurance and mortgage relief and home ownership savings plans.

Figure 6: Recent fiscal deficit trends in Kenya



Source: authors' illustration based on data from Kenyan National Treasury's quarterly economic and budgetary reviews.

Evolution of interest rate policies in Kenya

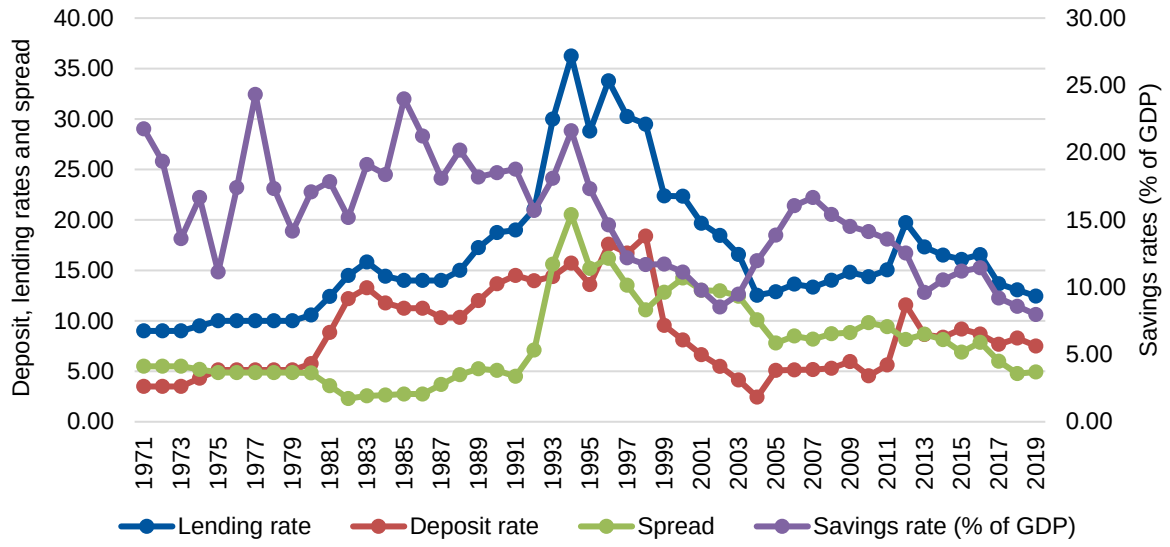
Kenya has undergone various interest rate regimes since independence. In Sessional Paper 10 of 1965, there were suggestions that the Kenyan Central Bank could control the operation of commercial banks operating under a controlled interest rate regime. Therefore, in the 1960s and 1970s, Kenya maintained an inactive interest rate policy, with the government simply fixing minimum savings rates for deposit-taking institutions and lending rates for commercial banks, non-bank financial institutions, and building societies. With the oil price shock of the mid-1970s, which created macro-economic imbalances, there was a need for a flexible interest rate regime that allowed the movement of nominal interest rates proportionate to inflation rates for positive real returns to be realized.

Positive interest rates were identified as an incentive for savings mobilization that should therefore always be kept above the inflation rate (fifth National Development Plan, 1984–88). In Sessional Paper 1 of 1986, the emphasis was on a flexible interest rate regime: with returns on government securities being market-determined, commercial banks' lending and deposit rates would be pegged to returns on government securities. The National Development Plan of 1989–93 therefore sought

to encourage domestic saving through real interest rates and improved financial intermediation. Interest rates were fully liberalized in 1991, and the trends in interest are reported in Figure 7.

The first attempt to reverse the interest rate policy was through an amendment to the Central Bank Act in 2000. However, this was not practical and therefore not implemented. The second attempt was through an interest rate capping bill in 2015, which received assent in August 2016 and became effective in September 2016. This was revoked in November 2019, when the court ruled interest rate capping unlawful.

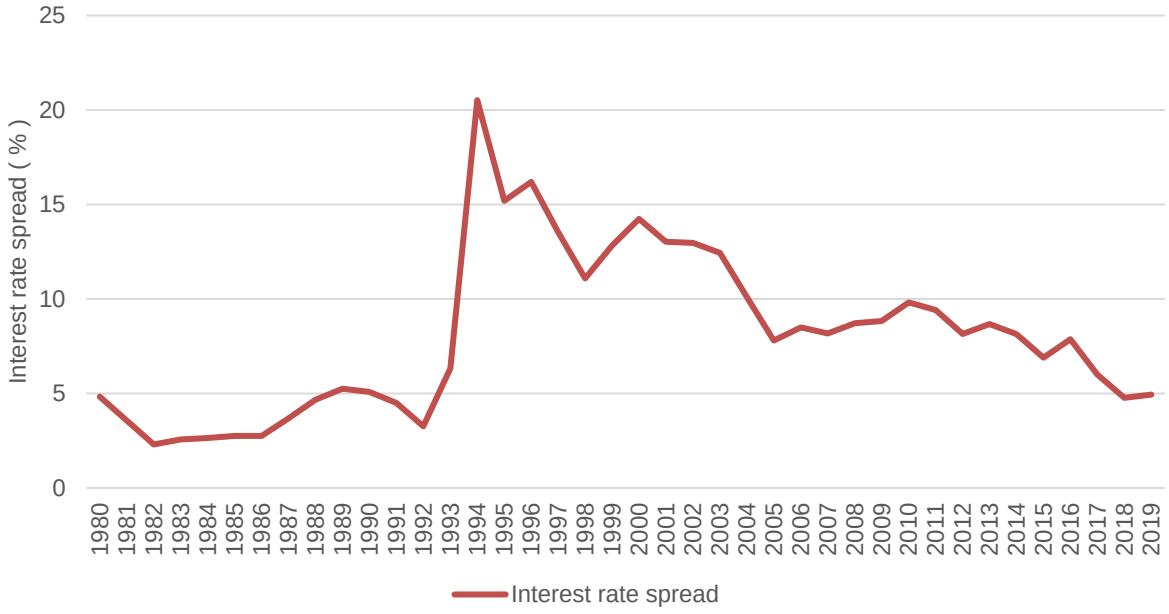
Figure 7: Deposit, lending, and saving rates



Note: deposit and lending rates comprised of bank rates.

Source: authors' illustration based on international financial statistics, World Development Indicators, and KIPPRA data compendium.

Figure 8: Trends in interest rate margins in Kenya



Source: authors' illustration based on data from Central Bank of Kenya.

Regarding the interest rate margin (i.e. the gap between deposit rates and lending rates), the expectation was that liberalization would encourage effective competition and savings mobilization, which would increase the resources available for investment and reduce the cost of lending. Consequently, the interest rate spreads would narrow after liberalization. Figure 8 paints a different picture, with the highest spread registered in 1994 at 20.52 per cent. The pre-liberalization spread averaged 3.71 per cent in the period 1980–91, while during the reform period it averaged 12.65 per cent (1992–2002). However, the spread contracted thereafter, averaging 9.40 per cent (2003–07) and 7.68 per cent (2008–19).

Terms of trade

There have been mixed signals regarding terms of trade performance in Kenya, particularly during the reform period in the financial sector. Theoretically, when there is more capital outflow from a country than inflow, then terms of trade are worsening and will have a negative impact on savings mobilization, and vice versa. Some improvements were registered, with terms of trade averaging 100.42 in 1992–2002 compared with 82.01 in 1980–91. This declined to 89.76 in 2003–07 and then improved again to 95.89 in 2008–19. Generally, improved average terms of trade were registered at 95.89 with the implementation of Vision 2030 in 2008–19.

2.2 Patterns and trends in domestic savings

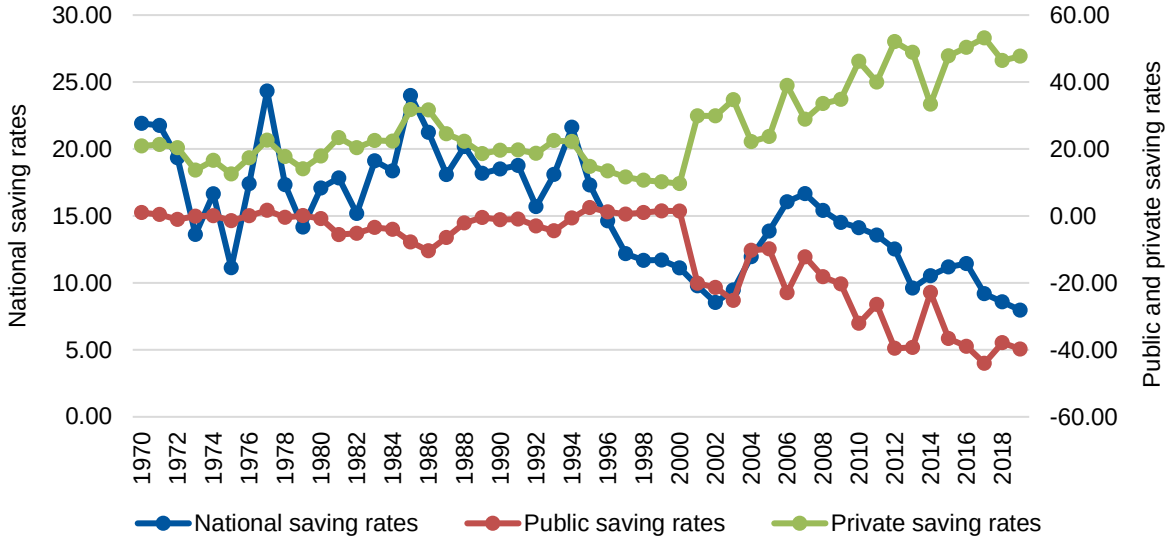
The performance of national saving rates in Kenya has been mixed. As indicated in Figure 9, saving rates were extremely volatile in the 1970s, with Kenya's highest rate ever registered at 24.32 per cent in 1977. The average saving rate between 1970 and 1979 was 17.76 per cent. This was the period before the implementation of reforms under the structural adjustment programmes. The saving rate in the 1980s was particularly stable, recording a high of 24 per cent in 1985 and a low of 15.18 per cent in 1982. The saving rate improved to an average of 18.88 per cent in 1989–91. This may be attributed to the structural adjustment programmes implemented in the 1980s, just before the interest rate liberalization. Following the full liberalization of interest rates in 1991, the savings rate increased, peaking at 21.62 per cent in 1994. Thereafter, the saving rate spiralled downwards, with a low of 8.53 per cent being recorded in 2002. The saving rate declined to an average of 13.78 per cent between 1992 and 2007. During this period a full interest rate liberalization was carried out, but the country was yet to define its long-term development blueprint.

With the advent of a new political direction in 2002, which ushered in reform through the ERS and later Vision 2030, there was optimism about the economy, resulting in positive signals regarding the saving rate. The saving rate rose to a high of 16.66 per cent in 2007. However, this was dampened in 2008 due to the post-election crisis in Kenya as well as the global financial crisis. The average saving rate during the implementation of Vision 2030 (2008–19) declined to 11.56 per cent. In general, saving rates in 1970–79, 1980–91, 1992–2007, and 2008–19 averaged 17.76 per cent, 18.88 per cent, 13.78 per cent, and 11.56 per cent respectively—below the Vision 2030 target of 29 per cent.

Regarding private saving, the performance was positive except in the 1990s. The average private saving rate between 1970 and 1979 was 17.73 per cent, increasing to 22.89 per cent between 1980 and 1991 (the structural adjustment programme period, before interest rate liberalization). During the period 1992–2002, however, the average private saving rate declined to 17.6 per cent. The periods of 2003–07 (the ERS period) and 2008–19 (the Vision 2030 implementation period) saw improved performance, with mean private saving rates of 29.7 per cent and 44.54 per cent respectively. The increased contribution of private saving, especially in the last two decades, can be attributed to the enhanced policy environment, which focused on enabling the private sector

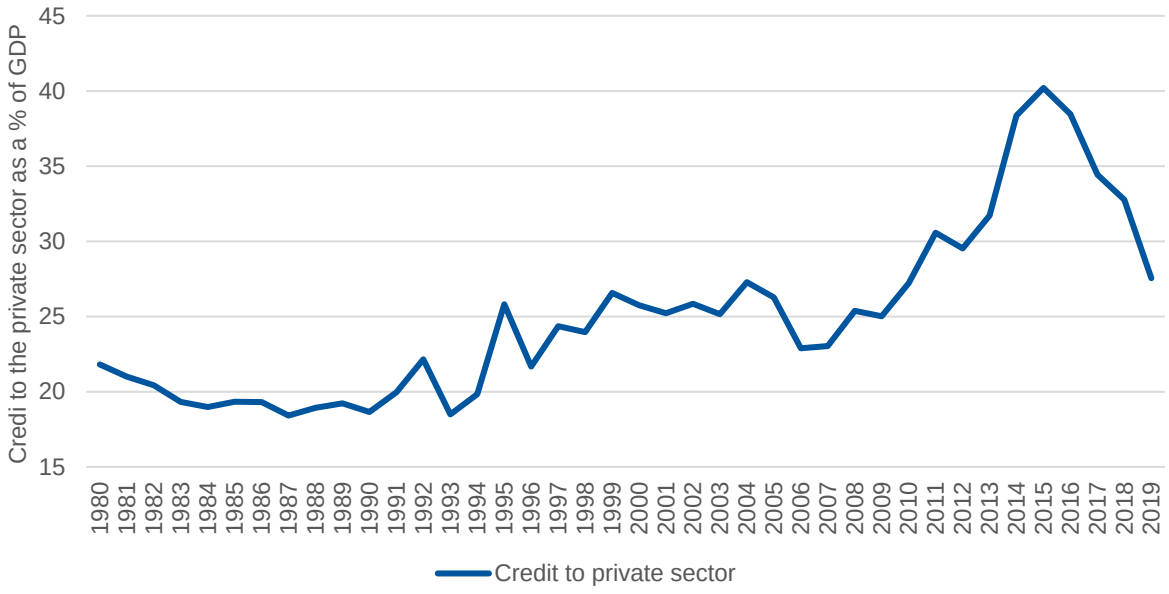
to thrive. In general, the average private saving rate before Vision 2030 (1970–2007) was 20.9 per cent. During the implementation of Vision 2030 (2008–19), the average private saving rate was 44.54 per cent—higher than the Vision 2030 target of 25.5 per cent.

Figure 9: National, private, and public saving in Kenya



Source: authors' illustration based on World Development Indicators (2001–19) and KIPPRA data compendium (1970–2000).

Figure 10: Trends of credit to private sector in Kenya



Source: authors' illustration based on data from Central Bank of Kenya and World Development Indicators.

Public saving has generally been negative and declining, with the periods 1970–79, 1980–91, and 1992–2002 posting averages of 0.04 per cent, -4.01 per cent, and -3.75 per cent respectively. Further declines in average public saving were recorded in 2003–07 (-16.1 per cent) and 2008–19 (-32.98 per cent). The gap between private and public saving seems to be widening, leading to depressed gross savings, a trend that needs to be reversed for adequate resource mobilization to take place. The mean public saving rates in 1970–2007 and 2008–19 were -16.1 per cent and -32.98 per cent respectively, far below the Vision 2030 target of 3.8 per cent. The decline in public saving

reflects the burgeoning public deficit, which also has an overall effect on the national saving rate trajectory.

The interest rate liberalization saw increased access to credit by the private sector, evidenced by growth in credit to the private sector over time (Figure 10). Average credit to the private sector as a percentage of GDP grew from 19.62 per cent in 1980–91 to 23.61 per cent in 1992–2002. Similar trends occurred in 2003–07 and 2008–19, with average private credit growth rates of 24.93 per cent and 31.77 per cent respectively. More credit to the private sector was witnessed in 2008–19 (31.77 per cent) compared with 1980–2007 (22.13 per cent).

3 Determinants of domestic savings

This section follows the theoretical framework and empirical model set out by Athukorala and Sen (2004). A basic LCM is considered to be synonymous with developments in consumption theory and structural features that are common in developing countries.

3.1 Analytical framework

The LCM is premised on the accumulation of savings for retirement. In the model, a consumption or saving behaviour by a representative agent is assumed to maximize the present value of lifetime utility, subject to budget constraint. The budget constraint is equal to current net worth plus the present value of expected labour income over the agent's remaining working life. A key assumption of the model is that consumption during a particular period is dependent on expectations of lifetime income. It also takes cognizance of the fact that income tends to fluctuate over the lifetime of an individual, meaning saving behaviour is determined by the person's stage in the life cycle. According to Modigliani (1986), individuals show smooth consumption over their lifetimes; consequently, they are net savers during their working years and dissavers during retirement. At the national level, the major determinants of saving rates are the rate of growth of per capita income and the age structure of the population (Athukorala and Sen 2004).

Regarding the per capita income growth rate (GY), the LCM predicts that an increase in GY increases the aggregate saving rate because it increases the lifetime resources of those who are younger compared with those who are older. In line with this, introducing an additional wealth variable (W) into the model may lead to unclear findings with respect to the relationship between saving and per capita income growth. Young people can be expected have low income in the present but to possess more wealth in future. In that case, they may be forced to borrow now in order to finance and fill the gap in consumption. It is therefore possible that the aggregate saving rate may decrease among youth compared with the elderly, despite their high lifetime wealth. With regard to the age structure, the LCM postulates that an increase in the population growth rate ($GPOP$) caused by an increase in age-specific fertility rates increases the number of savers relative to the number of dissavers. An economy with faster population growth is expected to show a higher aggregate saving rate, and one with slower population growth to show a lower aggregate saving rate. Taking demographic structure into account, Modigliani and Brumberg (1954) introduced the aspect of dependency and argued that a higher age dependency (ADR) in the population tends to reduce the saving rate. Other variables considered to influence the saving rate in the model and according to existing literature include the real interest rate (DIR), inflation rate (INF), terms of trade (TOT), and measures of financial development (FIN). The argument around the real interest rate applicable to bank deposits is two-pronged, making its relationship with the saving/consumption axis uncertain. First, a higher interest rate causes a substitution effect by increasing the current price of consumption relative to the future price, and hence is an incentive

to increase saving. Second, an income effect can be detected in the model if a household is a net lender. Therefore, an increase in the interest rate in this instance increases lifetime income, increases consumption, and decreases saving. The prevailing interest rate regime becomes critical, including for example any attempt to reverse interest rate liberalization by introducing interest rate capping (*IRC*). Further, shocks to the financial sector, such the global financial crisis (*CRIS*), may have an impact on saving behaviour by creating uncertainty regarding returns.

The effect of inflation on saving is also considered, with indications that if consumers attempt to maintain a target level of wealth or liquid assets relative to income, saving will rise with inflation. Additionally, inflation brings about uncertainty regarding future income streams and can lead to higher saving on precautionary grounds, especially in developing countries, whose income prospects are very uncertain (Athukorala and Sen 2004).

When external terms of trade are considered, the effect on the saving rate can be suggested on several fronts. One view is offered by Harberger (1950) and Laursen and Metzler (1950), who argue that a reduction in the price of domestically produced goods relative to the price of foreign goods reduces real incomes and in turn savings. A second view is based on whether changes to the terms of trade are temporary or permanent (Frankel and Razin 1992; Obstfeld 1982; Svensson and Razin 1982). That said, a temporary deterioration in terms of trade may lead to a reduction in saving due to increased expenditure measured in terms of domestic goods, as consumers try to offset the decrease in purchasing power of domestic goods to keep real expenditure constant (Athukorala and Sen 2004). In contrast, a deterioration in terms of trade that is perceived to be permanent will lead to increased saving in the current period for households to maintain their real standard of living in the future.

The effects of financial intermediation on the promotion of private saving can be proxied by several indicators, including per capita bank density, credit to the private sector, interest rates on deposits, and turnover ratio. An increase in the number of bank branches (per capita bank density) has a two-pronged effect. First, Lewis (1955) observes that the saving rate is increased if the nearest financial institutions are brought nearer to individuals as opposed to when they are some distance away. The shorter the distance to the nearest bank branch, the higher the affinity with increased saving. This establishes a negative relationship between bank density and household financial saving. On the other hand, it may also be important to consider the degree of substitution between the propensity to save and the household asset allocation portfolio, which may make the relationship ambiguous (Athukorala and Sen 2004). With regard to credit to the private sector and private saving, evidence indicates that there is a positive relationship between the two (Onwuasoeze and Kirori 2016). This paper uses credit to the private sector (*CPS*) to measure financial sector development. Other factors considered include financial innovations such as fintech, which provide alternative savings channels including mobile money (*MM*).

3.2 Empirical specification

The empirical specification considers private and national saving rates, indicated in equations [1] and [2].

$$SPRV = f[GY, GPOP, W, LY, INF, SPB, TOT, CPS, DIR, ADR, MM, IRC, CRIS] \quad [1]$$

$$SNAT = f[GY, GPOP, W, LY, INF, TOT, CPS, DIR, ADR, MM, IRC, CRIS] \quad [2]$$

$SPRV$ and $SNAT$ are private and gross national saving rates. SPB is the public saving rate. GY and LY are the growth and log level of per capita income respectively. W is wealth, which is proxied

by M2/GDP; DIR is the real deposit interest rate (bank deposit rate minus inflation); $GPOP$ is population growth[2]; INF is the inflation rate; TOT is terms of trade; CPS is a measure of financial development (credit to the private sector). ADR represents the age dependency ratio. MM, IRC, and $CRIS$ are dummies representing fintech development, interest rate capping period, and global financial crisis respectively. Table A1 in the Appendix summarizes the variables and their notations.

We applied the autoregressive distributive lag (ARDL) econometric approach proposed by Peseran et al. (2001). ARDL is preferred as the best econometric approach by comparison with others in scenarios where the variables are stationary at I(0) or integrated of order I(1). In addition, considering our objectives, it is also a better model to capture the short- and long-run effects of independent variables on saving rates. Duasa (2007) observed that the ARDL approach was suitable for generating short- and long-run elasticities for a small sample size at the same time, following the OLS approach for cointegration between variables. Considering that ARDL allows flexibility about the order of integration of the variables, Frimpong and Oteng (2006) note that it is suitable for the independent variable in a model that is I(0), I(1), or mutually cointegrated. To establish the relationship between the dependent and independent variables, the generalized ARDL (p, q) model with k explanatory variables is specified as follows:

$$Y_t = \gamma_0 + \beta_1 Y_{t-1} + \cdots + \beta_p Y_{t-p} + \alpha_0 X_t + \alpha_1 X_{t-1} + \cdots + \alpha_q X_{t-q} + \varepsilon_t \quad [3]$$

Y_t is the private saving rate. X_t is a $(K \times 1)$ independent variable (see equation [1]). γ is the constant term, and ε_t is the error term with standard $i.i.d$ properties. The dependent variable is explained by lags of itself, as well as current and lagged values of the independent variables. The number of lags of the dependent variable (the autoregressive component) is included up to lag order p, while the number of lags of independent variables is included up to order q.[3] Compressing equation [3] yields:

$$Y_t = \gamma_0 + \sum_{i=1}^{p} \beta_i \, Y_{t-i} + \sum_{i=0}^{q} \alpha_i' X_{t-i} + \varepsilon_t \quad [4]$$

where the notations are defined as indicated above, and β and α are coefficients to be estimated. Instead of using a first difference OLS (by construction), differencing the variables results in a loss of long-term information embodied in the data. The ARDL allows for a mixture of long-run and short-run estimates through an unrestricted error correction model[4] of the form:

$$\Delta Y_t = \gamma_0 + \sum_{i=1}^{p} \delta_i \Delta Y_{t-i} + \sum_{i=0}^{q} \delta_i \Delta X_{t-i} + \lambda(Y_t - \theta X_t) + \varepsilon_t \quad [5]$$

$\lambda = (1 - \sum_{i=1}^{p} \delta_i)$ shows the speed of adjustment in long-run equilibrium after a shock in the short run. The expression in brackets is the long-run relationship between variables, and $\theta = \frac{(\sum_{i=0}^{q} \pi_i)}{(1 - \sum_{i=1}^{p} \delta_i)}$ is the long-run parameter. If $\lambda = 0$, then there is evidence of a long-run relationship between private saving and its determinants. The parameter is expected to be significantly negative

[2] The analysis alternates $GPOP$ with ADR to show the effect of dependency.

[3] The lags are determined by information criteria. The default in Stata is the Bayesian information criterion, but Stata also allows the selection of the Akaike information criterion.

[4] For this ARDL to be reparametrized as an error correction model, there must be cointegration (existence of a long-term equilibrium between variables). The cointegration test draws on the ARDL bounds approach of Pesaran et al. (2001).

under the prior assumption that following a deviation, the variables will return to their long-run equilibrium (cointegration).

3.3 Data sources and descriptive statistics

Data sources

Our study uses annual time series data for the period 1980–2019. Data on national, public, and private saving rates between 1980 and 2000 was sourced and computed from the time series analytical data compendium of the Kenya Institute for Public Policy Research and Analysis (KIPPRA 2002). This compendium was compiled to fill a gap in good and consistent data for use in research and policy analysis. It sourced, compiled, harmonized, and explained the data to help researchers better interpret the data in collaboration with the Kenya National Bureau of Statistics (then the Central Bureau of Statistics) and other organizations. Data on national, public, and private saving rates between 2001 and 2019 was obtained from the World Development Indicators. Data on GDP, per capita income, M2, real interest rates, population, inflation, terms of trade, and credit to the private sector was also sourced from the World Development Indicators. Other data on lending and deposit rates in Kenya was sourced from the Central Bank of Kenya and International Financial Statistics. The data analysis was carried out using Stata 13 and EViews 11.

Descriptive statistics

Table A2 in the Appendix presents the descriptive statistics for the variables in our analysis. The mean gross national saving rate between 1980 and 2019 was 14.64 per cent. As expected, the public saving rate averaged -14.14 per cent, while the private saving rate was 28.78 per cent during the same period. Per capita income grew by 11.11 per cent on average, while wealth averaged 36 per cent during the 1980–2019 period. Further, the mean real interest rate was -2.08 per cent, population growth was 3.05 per cent, inflation 11.8 per cent, terms of trade 92.21, and credit to the private sector as a percentage of GDP was 25.02. The average real deposit interest rate was 9.72 per cent, while the mean dependency ratio was 93.55, implying high dependency on those who were working.

Table A3 in the Appendix presents the correlation matrix. Generally, high correlations are registered among the majority of the variables.[5] Public saving rates are positively correlated with national saving rates (r=0.61). Private saving rates are negatively and highly correlated with public saving (r=0.97). Wealth is negatively correlated with the national saving rate (r=0.66), while population growth is positively associated with the national saving rate (r=0.8) and public saving (r=0.66) and negatively linked to wealth (r=0.83). Inflation rates are highly and negatively associated with real interest rates (r=0.88). More high negative associations are registered between credit to the private sector and the national saving rate (r=0.73), the public saving rate (r=0.75), and population growth (r=0.77). On the other hand, credit to the private sector is positively associated with the private saving rate (r=0.64) and wealth (r=0.76). The age dependency ratio is positively associated with the national saving rate (r=0.79), the public saving rate (r=0.78), and population growth (r=0.97). It has a negative association with the private saving rate (r=0.66), wealth (r=0.81), and credit to the private sector (r=0.83).

[5] According to Gujarati (2003), a pairwise correlation of more that $|0.8|$ indicates a serious problem of multicollinearity in the data set, and this will lead to inconsistent inferences of the F-statistic and t-values.

Stationarity test

Non-stationarity is a common problem with time series data sets and should be corrected using appropriate methodologies to avoid spurious results. The augmented Dickey-Fuller test is commonly used to establish the presence of unit roots (non-stationarity). We apply this method in our analysis (Table 1). The augmented Dickey-Fuller tests the null hypothesis of unit roots (non-stationarity), and the decision rule is to reject the null if the calculated p-value is less than the chosen level of significance. Our results show that the population growth rate, real interest rate, and inflation rate are stationary (integrated of order zero) at the five per cent level of significance. However, the rest of the variables become stationary after first differencing at the five per cent level of significance. Considering that the variables are either I(0) or I(1), an ARDL model is preferred.

Table 1: Stationarity test results

Variable	Test statistic	p-value
SNAT	-2.386	0.387
DSNAT	-4.181	0.005
SPRV	-2.110	0.541
DSPRV	-4.629	0.001
TOT	-2.212	0.483
DTOT	-4.032	0.008
CPS	-2.815	0.191
DCPS	-4.607	0.001
ADR	-3.299	0.002
SPB	-2.358	0.402
DSPB	-5.636	0.000
GPOP	-7.436	0.000
GY	-3.173	0.090
DGY	-6.794	0.000
LY	-2.185	0.498
DLY	-4.658	0.001
W	-1.802	0.704
DW	-3.868	0.000
INF	-3.586	0.001
DIR	-2.246	0.464
DDIR	-4.283	0.000

Source: authors' calculations.

Heteroscedasticity and serial correlation tests

Our results show that there is no heteroscedasticity in any of the models at the five per cent significance level (Appendix Table A4). Serial correlation was investigated using the Breusch-Godfrey test. The null hypothesis was rejected for all the models at the five per cent significance level, confirming serial correlation.

Cointegration test

The bounds test is the appropriate test for cointegration when the ARDL model is employed (Pesaran et al. 2001). The bounds test generates an F-statistic that is compared with critical value bounds, which vary with the chosen level of significance and the number of independent variables. Table 2 shows the bounds test results: K is the number of independent variables, where I0 and I1 are upper and lower bound critical values respectively. The decision rule is to reject the null hypothesis—absence of cointegration—if the F-statistic is greater than the upper critical bound for the chosen level of significance, and to fail to reject the null hypothesis if the F-statistic is lower than the lower critical bound for the chosen level of significance. If the F-statistic lies between the upper and lower bound critical values for a chosen level of significance, no conclusion can be drawn about cointegration, and further analysis and alternative tests of cointegration should be employed.

Table 2: Cointegration test for national and private saving rates

	Private saving model		National saving model	
Test statistic	Value	K	Value	K
F-statistic	3.8503	7	3.8567	7
	Critical value bounds			
Significance	I0 bound	I1 bound	I0 bound	I1 bound
10%	2.03	3.13	1.92	2.89
5%	2.32	3.50	2.17	3.21
2.5%	2.60	3.84	2.4.	3.51
1%	2.96	4.26	2.73	3.9

Source: authors' calculations.

For the cointegration test for private saving, the F-statistic (3.85) is greater than the upper bound critical value at the five per cent level of significance, implying the presence of cointegration. For the cointegration test for national saving, the F-statistic (3.86) is greater than the upper bound critical value at the five per cent level of significance, implying the presence of cointegration.

The cointegrating coefficients are shown in Appendix Table A5. The results indicate that the private saving rate in the current period is positively and significantly influenced by the per capita income growth rate and age dependency ratio in the current period. Further, the private saving rate is negatively and significantly influenced by the public saving rate, terms of trade, and wealth in the current period, and by the interest rate on deposits in both the current and previous periods. As indicated by the cointegrating vector of -0.99, 99 per cent of the disequilibrium is dissipated in the current period, while 0.01 per cent of it is carried over to the next period. The cointegrating coefficients are shown in Appendix Table A6. We have established cointegration at the one per cent level of significance. The model also has a statistically significant cointegrating vector of -0.63, implying that 63 per cent of the disequilibrium is dissipated in the current period, while the rest is carried over to the next period.

4 Estimation method

4.1 Private saving model estimation results

Private saving long-run estimation results

The optimal lag length was chosen using the VAR lag selection criteria. The optimal lag length is two (see Appendix Table A7); the results are presented in Table 3. As already established through the bounds test, there is a long-run association between the private saving rate and its key determinants, including the per capita income growth rate, inflation rate, age dependency ratio, public saving rate, and terms of trade. Consistent with LCM predictions, a one per cent increase in per capita income growth leads to a 0.54 percentage point increase in the private saving rate in the long run. Further, a one per cent increase in the age dependency ratio seems to bring about a 0.28 percentage point increase in the private saving rate in the long run. The inflation rate has a positive effect on the private saving rate, with a one per cent increase in INF showing that private saving increases by 0.14 percentage points. A one per cent increase in the public saving rate is associated with a 1.1 percentage decline in the private saving rate in the long run. The findings for terms of trade indicate a strong negative association with private saving, which is an indication that private agents increase saving when faced with a future decline in terms of trade (Athukorala and Sen 2004). A one per cent deterioration in terms of trade brings about a 0.18 percentage point increase in the private saving rate in the long run.

Table 3: Long-run private saving coefficients

Variable	Coefficient
SPB	-1.1134*** (0.0412)
TOT	-0.1777*** (0.0534)
W	-4.8851 (17.4167)
INF	0.1401** (0.0630)
GY	0.5363*** (0.0870)
DIR	-0.1578 (0.1279)
ADR	0.2864*** (0.0814)
C	-1.5774 (12.7723)

Note: *, **, and *** indicate 10%, 5%, and 1% levels of significance respectively. Standard errors are in parentheses.

Source: authors' calculations.

Private saving short-run results

Table 4 presents the short-run results from the private saving rate estimation. In support of the long-run findings, a one per cent increase in per capita income growth leads to an increase of 0.13 percentage points in the private saving rate in the short run. In addition, a one per cent increase in SPB is shown to cause a 1.12 per cent decline in private saving in the short run. Equally, a one per cent deterioration of TOT causes a 0.17 percentage point increase in private saving in the short run. With regard to wealth and deposit interest rates, a one per cent increase causes declines of 40.91 and 0.56 percentage points respectively in private saving in the short run.

Table 4: Private saving ARDL results

Variable	Coefficient
SPRV (-1)	0.2894 (0.1936)
SPRV (-2)	-0.2769 (0.1858)
SPB	-1.1169*** (0.0536)
SPB (-1)	0.3351* (0.1882)
SPB (-2)	-0.3177* (0.1820)
TOT	-0.1755*** (0.0554)
W	-40.9120** (16.0114)
W (-1)	62.1152** (27.1859)
W (-2)	-26.0273 (24.5583
INF	-0.0645 (0.0467)
INF (-1)	0.2029*** (0.0419)
GY	0.1342* (0.0708)
GY (-1)	0.3005*** (0.0861)
GY (-2)	0.0949 (0.0554)
DIR	-0.5650*** (0.1728)
DIR (-1)	-0.1721 (0.1652)
DIR (-2)	0.5813*** (0.1808)
ADR	0.2828 (0.0911)
C	-1.5577 (12.5654)

Note: *, **, and *** indicate 10%, 5%, and 1% levels of significance respectively. Standard errors are in parentheses.

Source: authors' calculations.

Private saving stability test

To establish model stability, we use a cumulative sum control chart (CUSUM) test. The conclusion is that the model is deemed stable and correctly specified, since the CUSUM lies within the five per cent critical line (Figure A1 in the Appendix).

Extended private savings model

To explore whether alternative approaches such as fintech might provide new solutions to increase domestic saving and to factor in the global financial crisis, we introduce dummy variables for the existence of mobile money and to capture shocks to private saving through the global financial crisis. The results of the extended private saving rate model appear in Appendix Tables A8, A9, A10, and A11.

The cointegrating results are reported in Tables A7 and A8 in the Appendix. In the short run, the private saving rate is influenced by private sector credit as a percentage of GDP, terms of trade, mobile money, wealth, and public saving. In the long run, the private saving rate is positively influenced by the per capita income growth rate and the public saving rate. However, this model has a lower speed of adjustment, as indicated by the cointegrating vector of -0.55, indicating that 55 per cent of the disequilibrium is dissipated in the current period while the rest is carried over to the next period.

The findings for the long- and short-run extended model are consistent with the LCM (Appendix Tables A10 and A11). The mobile money variable has a negative sign, which shows that the level of private saving is lower with mobile money compared with the period without mobile money. Further, the period with the global financial crisis has a lower private saving rate compared with the period before. Generally, Kenya has experienced an increase in the private saving rate, which can be attributed to a persistent and consistent policy environment that supports savings mobilization (seen in our review of National Development Plans and policy documents), a policy focus on creating an enabling environment for the private sector to thrive (particularly during the last two decades), and increased usage of savings products by households over time (seen in the FinAccess surveys) (Figure 2). Furthermore, in a region typified by frequent conflict, Kenya has generally been characterized by political calm. This has positive implications for private saving thanks to the good and stable business environment, which also influences decision-making for the future, including saving. Other reasons include the higher incidence of saving among high-income cohorts (seen in the KIHBS 2015–16 data), a largely youthful populace that has higher potential for savings mobilization (Figure 5), and interest rate liberalization, which allowed the private sector to experience increased access to credit (Figure 8).

Overall, our empirical estimation establishes a long-run association between the private saving rate and its key determinants. In the long run, the private saving rate is positively and significantly influenced by the per capita income growth rate, inflation, and the age dependency ratio; it is negatively influenced by the public saving rate and terms of trade. The two models indicate that in the short run, the private saving rate in the current period is positively influenced by the per capita income growth rate, the age dependency ratio, and private sector credit. Further, both models indicate the negative effect on private saving of public saving, terms of trade, wealth, mobile money, and returns on deposits in the short run.

These findings are in line with LCM predictions, with private saving significantly influenced by the income growth rate and demographic structure. Empirically, our findings agree with arguments made by Ang and Sen (2011), and with Athukorala and Sen (2004), Kibet et al. (2009), and Onwuasoeze and Kirori (2016) regarding the perspective on income. The positive relationship

between inflation and private saving is also supported by previous literature, including Athukorala and Sen (2004) and Ogbokor and Samahiya (2014). The positive association between credit to the private sector and private saving concurs with Onwuasoeze and Kirori (2016), with an indication that financial development boosts saving. The negative association of public saving with efforts to mobilize private savings is in harmony with Athukorala and Sen (2004), while our terms of trade findings concur with Athukorala and Sen (2004) and Adewuyi et al. (2010).

Our results regarding mobile money provide an indication that fintech may not necessarily be a channel to increase domestic saving. This may be because mobile money has been more embraced for transactional and credit purposes. This corroborates Mbiti and Weil (2016), who observed that M-Pesa was largely used to transfer funds rather than for storage purposes. It is therefore critical to explore how to use mobile money to store value. Our findings on wealth support our earlier assertion that households may be holding savings in forms (assets) other than bank deposits, while our finding regarding returns on deposits corroborates Ndung'u (1997).

4.2 National saving model estimation results

Long- and short-run national saving results

In the long run, the terms of trade and inflation rate influence saving rates (Table 5). Our results show that a one per cent decline in terms of trade leads to a 0.14 increase in the national saving rate in the long run. Additionally, a one per cent increase in the inflation rate causes a 0.2 percentage point increase in the national saving rate in the long run.

In the short run, wealth negatively influences national saving (Table 6). A one per cent increase in wealth causes a 64 percentage point decline in national saving in the short run.

The model was found to be stable and correctly specified, since the CUSUM lies within the five per cent critical line (Appendix Figure A2).

Table 5: Long-run national saving coefficients

Variable	Coefficient
TOT	-0.1383* (0.0793)
W	-29.0970 (26.2809)
INF	0.1975* (0.1018)
GY	0.1625 (0.1097)
DIR	-0.2808 (0.1878)
CPS	-0.0672 (0.1866)
ADR	0.1240 (0.1098)
C	26.3220 (18.8572)

Note: *, **, and *** indicate 10%, 5%, and 1% levels of significance respectively. Standard errors are in parentheses.

Source: authors' calculations.

Table 6: Short-run national saving results

Variable	Coefficient
SNAT (-1)	0.3701**
	(0.1562)
SNAT (-2)	-0.3072
	(0.2400)
TOT	-0.0100
	(0.0541)
TOT (-1)	0.0082
	(0.0559)
TOT (-2)	-0.0854*
	(0.0467)
W	-64.7123***
	(18.0596)
W (-1)	46.3832**
	(22.2268)
INF	0.0006
	(0.0425)
INF (-1)	0.1238***
	(0.0441)
GY	0.0492
	(0.0690)
GY (-1)	0.0532
	(0.0454)
DIR	-0.1769
	(0.1101)
CPS	0.2564
	(0.1651)
CPS (-1)	-0.2988*
	(0.1714)
ADR	0.0781
	(0.0708)
C	16.5810
	(12.3090)

Note: *, **, and *** indicate 10%, 5%, and 1% levels of significance respectively. Standard errors are in parentheses.

Source: authors' calculations.

Extended national saving model

The results of the model with mobile money and the financial crisis are presented in the Appendix in Figure A3 and Tables A12, A13, A14, and A15. The regression results for both the long- and short-run models are similar to the model estimated without the extension. If we focus on mobile money, the results are positive, implying that the national saving rate is higher in the period with mobile money than in the period before. This is not consistent with the private saving rate model. It is possible that mobile money transactions generate revenue for the government through taxation, which might explain the positive national saving rate.

In conclusion, the per capita income growth rate, inflation, and private sector credit encourage national saving. Wealth and return on deposit rates negatively influence the national saving rate. Terms of trade provides mixed results, encouraging national saving in the short run while

discouraging it in the long run. The results generally corroborate the findings of the private saving[6] estimation, with the partial exception of terms of trade.

5 Conclusions and policy implications

5.1 Conclusions

Despite numerous policy initiatives to encourage savings mobilization in Kenya, the performance has not been desirable. We sought first to establish the key drivers of domestic saving rates in Kenya. Our second aim was to explore whether alternative approaches such as fintech might provide new solutions to increase domestic saving. Lastly, we sought to document the lessons learnt from the saving experience so far in Kenya. We achieved this through a review of the literature on the saving environment in independent Kenya. We next outlined the patterns and trends in domestic saving, followed by an empirical analysis of the determinants of private saving in Kenya. Generally, our key findings suggest the following:

- Savings mobilization has retained its policy importance to promote the country's development agenda as envisaged in the development plans from independence to today's Kenya Vison 2030.
- Private saving is primarily influenced by the income growth rate and demographic structure in Kenya, supporting the LCM hypothesis.
- Savings are held in forms other than bank deposits.
- While Kenya has made great strides in the development of fintech, particularly mobile money, the same cannot be said of its use to provide solutions for savings mobilization.

5.2 Policy implications

In line with the foregoing, we suggest the following interventions to grow savings in Kenya:

- Savings mobilization is key to achieving the development agenda. Efforts to encourage growth in income, such as the creation of decent employment, and to manage the erosion of real value will go a long way to spur savings mobilization in Kenya.
- Measures to enhance financial development need to be sustained with a focus on savings mobilization.
- There must be a continued focus on creating an enabling environment for the private sector to thrive. This focus has pointed towards positive signals regarding private savings mobilization, particularly in the last two decades.
- A persistent policy environment that insists on savings mobilization, with tangible closely monitored outcomes, should be maintained in the medium to long term if it is to yield the desired results.
- Policy initiatives that seek to decrease the fiscal deficit should be prioritized to boost public saving, which in turn will have an effect on overall national saving.
- Accounting for savings might go beyond the traditional focus on bank deposits and incorporate savings held in other forms (assets).
- While initial evidence indicates that fintech developments such as mobile money are mainly used for transactions, there is a window of opportunity that can be exploited to

[6] The data indicates that private saving comprises the largest component of national saving in Kenya.

encourage saving through the platform. The fact that mobile money has been largely embraced for transactional and credit purposes means that households may become sensitized to use it for savings mobilization. It is also important to note that the development of mobile money is still in its nascent stage in Kenya, and the necessary data to sustain a rigorous time series analysis is therefore unavailable.

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Appendix

Table A1: Description of variables

Variable	Notation	Derivation
Private saving rate	SPR	Private savings as % GDP
Gross national saving rate	SNAT	Gross national savings as % GDP
Public saving rate	SPB	Public savings as % GDP
Income per capita growth rate	GY	Annual income per capita growth rate (%)
Log of income per capita	LY	Log of income per capita
Wealth	W	M2/GDP (%)
Real deposit interest rates	DIR	Nominal deposit interest rate minus inflation (%)
Population growth rate	GPOP	Annual population growth rate (%)
Age dependency ratio	ADR	Percentage of working-age population
Inflation rate	INF	Inflation for consumer prices (annual %)
Terms of trade	TOT	Terms of trade index, measured as (price of exports/price of imports)*100
Financial development	CPS	Domestic credit to private sector (% GDP), used as proxy for financial development
Fintech development	MM	Dummy variable coded as 1 (period 2011–19, when mobile money was prevalent) and 0 (period 1980–2010, when mobile money was absent)
Financial crisis	CRIS	Dummy variable coded as 1 (for years 2007 and 2008, during global financial crisis) and 0 (other years)
Interest rate cap	IRC	Dummy variable coded as 1 (for years 2017, 2018, and 2019, when interest rate capping was in place) and 0 (other years)

Source: authors' compilation.

Table A2: Descriptive statistics

Variable	Obs.	Mean	Std dev.	Min.	Max.
SNAT	40	14.64	4.10	7.97	24.00
SPB	40	-14.14	14.87	-44.00	2.52
SPRV	40	28.78	12.77	9.66	53.19
GY	40	11.11	7.20	-1.23	43.63
LY	40	10.14	1.25	8.10	12.13
W	40	36	5	27	43
GPOP	40	3.05	0.50	2.30	3.94
INF	40	11.80	8.53	1.55	45.98
TOT	40	92.21	10.43	70.15	114.02
CPS	40	25.02	5.81	18.42	40.20
DIR	40	9.72	4.05	2.43	18.40
ADR	40	93.55	13.32	71.28	112.74

Source: authors' calculations.

Table A3: Correlation matrix

	SNAT	SPB	SPRV	GY	LY	W	GPOP	INF	TOT	CPS	DIR	ADR
SNAT	1											
SPB	0.61	1										
SPRV	-0.39	-0.97	1									
GY	0.27	0.12	-0.06	1								
LY	-0.76	-0.80	0.68	-0.01	1							
W	-0.66	-0.53	0.41	0.04	0.80	1						
GPOP	0.80	0.66	-0.52	0.02	-0.96	-0.83	1					
INF	0.43	0.34	-0.26	0.34	-0.32	-0.18	0.29	1				
TOT	-0.49	-0.18	0.06	0.16	0.48	0.55	-0.56	-0.22	1			
CPS	-0.73	-0.75	0.64	-0.14	0.84	0.76	-0.77	-0.42	0.44	1		
DIR	0.38	0.52	-0.48	0.31	-0.41	-0.25	0.36	0.29	0.09	-0.38	1	
ADR	0.79	0.78	-0.66	0.03	-0.99	-0.81	0.97	0.32	-0.50	-0.83	0.47	1

Source: authors' calculations.

Table A4: Heteroscedasticity and serial correlation tests

Test	Private savings model Obs. R-squared	Extended private savings model Obs. R-squared	National savings model Obs. R-squared	Extended national savings model Obs. R-squared	Conclusion
Heteroscedasticity test	25.1578 Prob. chi square (19)=0.1554	27.7718 Prob. chi square (21)=0.1467	8.2963 Prob. chi square (13)=0.8238	17.0737 Prob. chi square (16)=0.3808	All models are homoscedastic
Breusch-Godfrey serial correlation LM test	12.8846*** Prob. chi square (2)=0.0016	36.8379*** Prob. chi square (2)=0.0000	32.2907*** Prob. chi square (2)=0.0000	33.6250*** Prob. chi square (2)=0.0000	All models have serial correlation

Note: *, **, *** denote rejection of the null hypothesis at 10%, 5%, and 1% levels of significance respectively.

Source: authors' calculations.

Table A5: Cointegrating coefficients for private savings model

Variable	Coefficient	Std error	t-statistic	Prob.
D (SPRV (-1))	0.2769	0.1858	1.4905	0.1525
D (SPB)	-1.1169	0.0536	-20.8201	0.0000
D (SPB (-1))	0.3177	0.1820	1.7455	0.0970
D(TOT)	-0.1755	0.0554	-3.1657	0.0051
D(W)	-40.9120	16.0114	-2.5552	0.0193
D (W (-1))	26.0273	24.5583	1.0598	0.3025
D(INF)	-0.0645	0.0467	-1.3819	0.1830
D(GY)	0.1342	0.0708	1.8957	0.0733
D (GY (-1))	-0.0949	0.0554	-1.7142	0.1028
D(DIR)	-0.5650	0.1728	-3.2698	0.0040
D (DIR (-1))	-0.5813	0.1808	-3.2151	0.0046
D(ADR)	0.2828	0.0911	3.1029	0.0059
CointEq(-1)	-0.9875	0.2257	-4.3757	0.0003

Note: CointEq=SPRV - (-1.1134*SPB -0.1777*TOT -4.8851*W + 0.1401*INF + 0.5363*GY -0.1578*DIR + 0.2864*ADR____ -1.5774).

Source: authors' calculations.

Table A6: Cointegration coefficients for national savings model

Variable	Coefficient	Std error	t-statistic	Prob.
D(TOT)	-0.0100	0.0541	-0.1842	0.8555
D (TOT (-1))	0.0854	0.0467	1.8275	0.0806
D(W)	-64.7123	18.0596	-3.5833	0.0016
D(INF)	0.0006	0.0425	0.0140	0.9890
D(GY)	0.0492	0.0690	0.7132	0.4829
D(DIR)	-0.1769	0.1101	-1.6064	0.1218
D(CPS)	0.2564	0.1651	1.5535	0.1340
D(ADR____)	0.0781	0.0708	1.1028	0.2815
CointEq(-1)	-0.6299	0.1562	-4.0338	0.0005

Note: CointEq=SNAT - (-0.1383*TOT-29.0970*W + 0.1975*INF + 0.1625*GY -0.2808*DIR -0.0672*CPS + 0.1240*ADR____ + 26.3220).

Source: authors' calculations.

Table A7: Optimal lag length selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-692.6225	NA	20.7182	37.0854	37.6025	37.2694
1	-170.9785	686.3737	6.82e-08	17.2094	23.9321	19.6013
2	262.2643	296.4293*	2.76e-13*	1.9861*	14.9144*	6.5859*

Note: * indicates lag order selected by criterion. LR: sequential modified LR test statistic (each test at 5% level). FPE: final prediction error. AIC: Akaike information criterion. SC: Schwarz information criterion. HQ: Hannan-Quinn information criterion.

Source: authors' calculations.

Table A8: Cointegration test for private savings model with mobile money and financial crisis variables

Test statistic	Value	K
F-statistic	8.4162	10
Critical value bounds		
Significance	I0 bound	I1 bound
10%	1.83	2.94
5%	2.06	3.24
2.5%	2.28	3.5
1%	2.54	4.86

Source: authors' calculations.

Table A9: Cointegrating coefficients for private savings model with mobile money and financial crisis variables

Variable	Coefficient	Std error	t-statistic	Prob.
D(SPRV(-1))	0.2207	0.2183	1.0111	0.3337
D(TOT)	-0.2079	0.1024	-2.0292	0.0673
D(TOT(-1))	-0.0905	0.0593	-1.5256	0.1553
D(W)	-134.3022	29.0171	-4.6284	0.0007
D(CPS)	0.6151	0.2445	2.5158	0.0287
D(CPS(-1))	0.7097	0.3557	1.9951	0.0714
D(GY)	-0.0138	0.0642	-0.2155	0.8333
D(INF)	0.0792	0.0556	1.4246	0.1820
D(MM)	-7.0626	3.2560	-2.1691	0.0529
D(SPB)	-1.3136	0.0819	-16.0450	0.0000
D(SPB(-1))	0.3434	0.2278	1.5078	0.1598
D(CRIS)	-3.5765	2.0586	-1.7374	0.1102
D(DIR)	-0.1400	0.1999	-0.7006	0.4981
D(DIR(-1))	-0.6426	0.2246	-2.8615	0.0155
D(ADR____)	-0.0342	0.1160	-0.2951	0.7734
CointEq(-1)	-0.5592	0.2228	-2.5096	0.0290

Note: CointEq=SPRV - (-0.2153*TOT -88.4550*W -0.2428*CPS + 0.5804*GY + 0.5984*INF -23.5795*MM - 2.0103*SPB -17.4963*CRIS + 0.9001 *DIR -0.0612*ADR____ + 46.9032).

Source: authors' calculations.

Table A10: Long-run coefficients for private savings model with mobile money and financial crisis variables

Variable	Coefficient	Std error	t-statistic	Prob.
TOT	-0.2153	0.1738	-1.2385	0.2413
W	-88.4550	77.9082	-1.1354	0.2804
CPS	-0.2428	0.3104	-0.7822	0.4506
GY	0.5804	0.2064	2.8122	0.0169
INF	0.5984	0.3356	1.7834	0.1021
MM	-23.5795	14.3907	-1.6385	0.1296
SPB	-2.0103	0.5224	-3.8478	0.0027
CRIS	-17.4963	13.7365	-1.2737	0.2290
DIR	0.9001	0.6088	1.4786	0.1673
ADR	-0.0612	0.2239	-0.2734	0.7896
C	46.9032	38.8320	1.2078	0.2524

Source: authors' calculations.

Table A11: Short-run coefficients for private savings model with mobile money and financial crisis variables

Variable	Coefficient	Std error	t-statistic	Prob.*
SPRV(-1)	0.6615	0.2055	3.2183	0.0082
SPRV(-2)	-0.2207	0.2183	-1.0111	0.3337
TOT	-0.2079	0.1024	-2.0292	0.0673
TOT(-1)	-0.0030	0.0552	-0.0548	0.9573
TOT(-2)	0.0905	0.0593	1.5256	0.1553
W	-134.3022	29.0171	-4.6284	0.0007
W(-1)	84.8356	25.7706	3.2920	0.0072
CPS	0.6151	0.2445	2.5158	0.0287
CPS(-1)	-0.0412	0.2390	-0.1723	0.8663
CPS(-2)	-0.7097	0.3557	-1.9951	0.0714
GY	-0.0138	0.0642	-0.2155	0.8333
GY(-1)	0.3384	0.0815	4.1515	0.0016
INF	0.0792	0.0556	1.4246	0.1820
INF(-1)	0.2554	0.0539	4.7406	0.0006
MM	-7.0626	3.2560	-2.1691	0.0529
SPB	-1.3136	0.0819	-16.0450	0.0000
SPB(-1)	0.5328	0.1971	2.7031	0.0205
SPB(-2)	-0.3434	0.2278	-1.5078	0.1598
CRIS	-3.5765	2.0586	-1.7374	0.1102
DIR	-0.1400	0.1999	-0.7006	0.4981
DIR(-1)	0.0008	0.1639	0.0046	0.9964
DIR(-2)	0.6426	0.2246	2.8615	0.0155
ADR____	-0.0342	0.1160	-0.2951	0.7734
C	26.2296	16.8086	1.5605	0.1469

Note: p-values and any subsequent tests do not account for model selection. R-squared 0.9978. Mean dependent var. 29.2108. Adjusted R-squared 0.9925. S.D. dependent var. 12.9463. S.E. of regression 1.1196. Akaike info criterion 3.2452. Sum squared resid. 13.7881. Schwarz criterion 4.4087. Log likelihood-34.6579. Hannan-Quinn criter. 3.6591. F-statistic 189.8628. Durbin-Watson stat. 3.1580. Prob(F-statistic) 0.0000.

Source: authors' calculations.

Table A12: Cointegration test for national savings model with inclusion of mobile money and financial crisis variables

Test statistic	Value	K
F-statistic	4.3567	9
Critical value bounds		
Significance	I0 bound	I1 bound
10%	1.88	2.99
5%	2.14	3.3
2.5%	2.37	3.6
1%	2.65	3.97

Source: authors' calculations.

Table A13: Cointegration results for national savings model with inclusion of mobile money and financial crisis variables

Variable	Coefficient	Std error	t-statistic	Prob.
D(TOT)	0.0407	0.0588	0.6919	0.4974
D(TOT(-1))	0.0908	0.0487	1.8658	0.0776
D(W)	-83.1183	20.7286	-4.0098	0.0007
D(MM)	1.8053	1.6740	1.0785	0.2943
D(INF)	0.0182	0.0466	0.3911	0.7001
D(GY)	0.0537	0.0718	0.7476	0.4638
D(DIR)	-0.3477	0.1411	-2.4643	0.0234
D(CRIS)	0.9686	1.6762	0.5778	0.5702
D(CPS)	0.3073	0.1702	1.8049	0.0870
D(CPS(-1))	0.3519	0.2081	1.6910	0.1072
D(ADR)	0.0221	0.0960	0.2306	0.8201
CointEq(-1)	-0.6962	0.2072	-3.3593	0.0033

Note: CointEq=SNAT - (-0.0347*TOT -68.5524*W + 2.5932*MM + 0.2582*INF + 0.2031*GY -0.4995*DIR -3.4382*CRIS -0.3296*CPS + 0.0318 *ADR____ + 46.4106).

Source: authors' calculations.

Table A14: Long-run coefficients for national savings model with inclusion of mobile money and financial crisis variables

Variable	Coefficient	Std error	t-statistic	Prob.
TOT	-0.0347	0.0848	-0.4092	0.6870
W	-68.5524	30.8701	-2.2207	0.0387
MM	2.5932	2.0521	1.2637	0.2216
INF	0.2582	0.1230	2.0989	0.0494
GY	0.2031	0.1026	1.9798	0.0624
DIR	-0.4995	0.2123	-2.3530	0.0295
CRIS	-3.4382	3.8259	-0.8987	0.3801
CPS	-0.3296	0.2167	-1.5213	0.1447
ADR	0.0318	0.1334	0.2384	0.8141
C	46.4106	24.2014	1.9177	0.0703

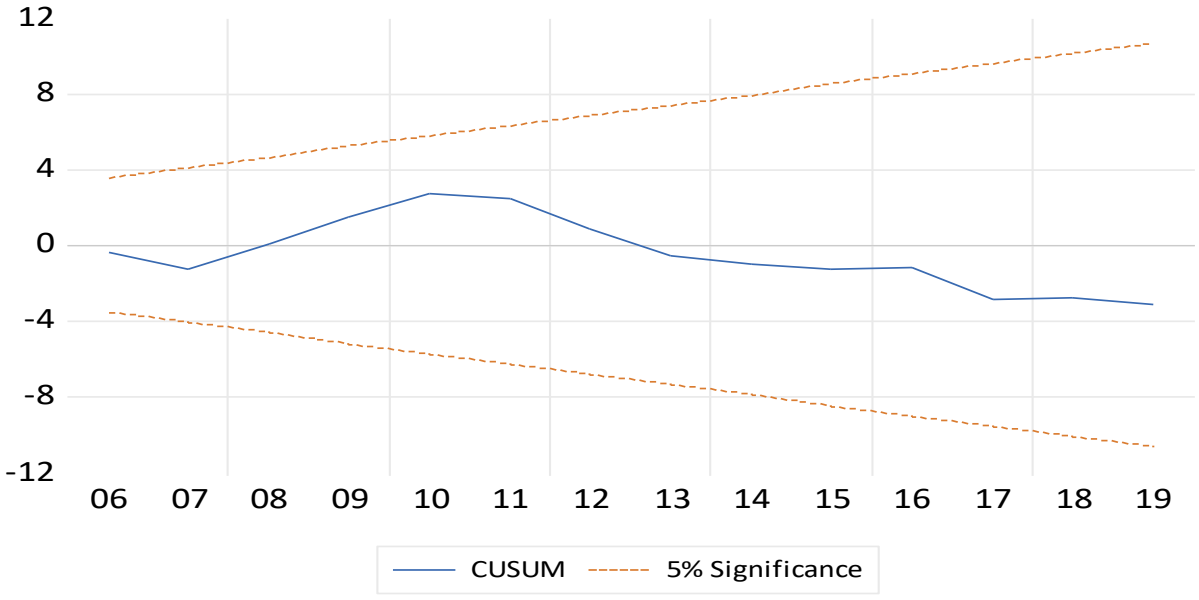
Source: authors' calculations.

Table A15: National savings model with inclusion of mobile money and financial crisis variables

Variable	Coefficient	Std error	t-statistic	Prob.*
SNAT(-1)	0.3038	0.2072	1.4660	0.1590
SNAT(-2)	-0.2273	0.4633	-0.4906	0.6369
TOT(-1)	0.0260	0.0607	0.4285	0.6731
TOT(-2)	-0.0908	0.0487	-1.8658	0.0776
W	-83.1183	20.7286	-4.0098	0.0007
W(-1)	35.3931	24.8008	1.4271	0.1698
MM	1.8053	1.6740	1.0785	0.2943
INF	0.0182	0.0466	0.3911	0.7001
INF(-1)	0.1615	0.0455	3.5488	0.0021
GY	0.0537	0.0718	0.7476	0.4638
GY(-1)	0.0877	0.0564	1.5546	0.1365
DIR	-0.3477	0.1411	-2.4643	0.0234
CRIS	0.9686	1.6762	0.5778	0.5702
CPS	0.3073	0.1702	1.8049	0.0870
CPS(-1)	-0.1848	0.2310	-0.7999	0.4336
CPS(-2)	-0.3519	0.2081	-1.6910	0.1072
ADR	0.0221	0.0960	0.2306	0.8201
C	32.3103	14.4341	2.2385	0.0374

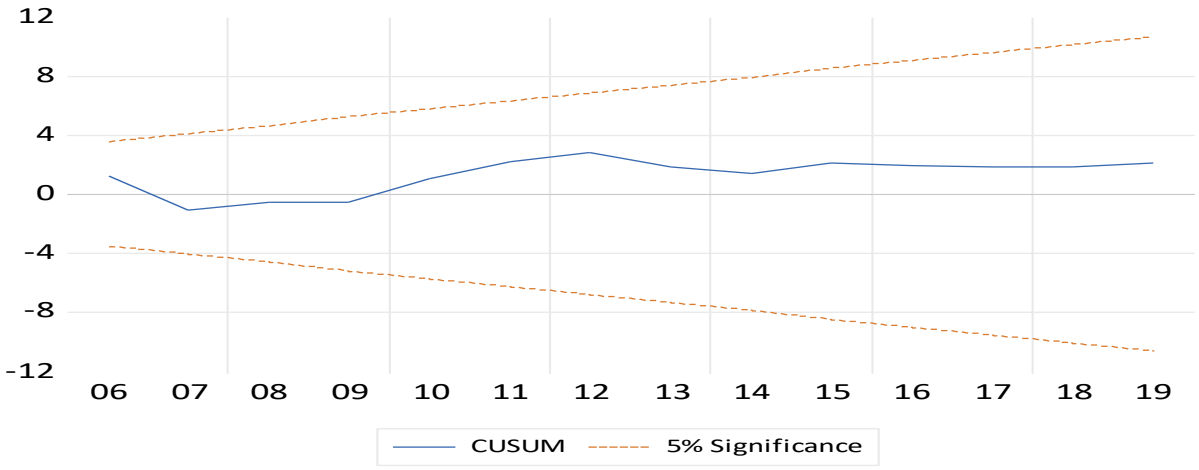
Source: authors' calculations.

Figure A1: Private savings model stability test



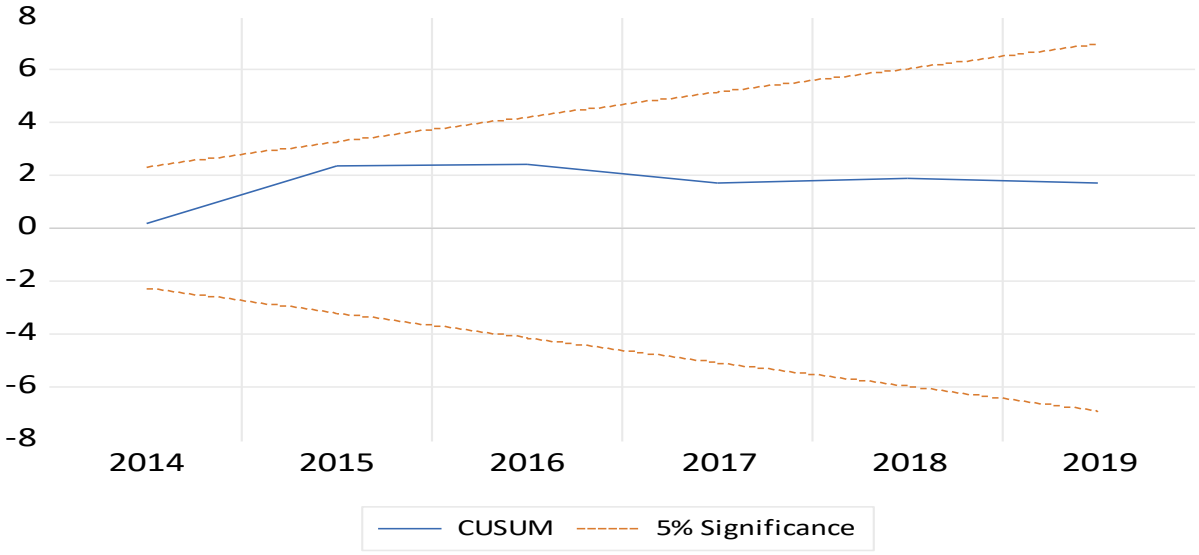
Source: authors' calculations.

Figure A2: National savings model stability test



Source: authors' calculations.

Figure A3: National savings model stability test with inclusion of mobile money and financial crisis variables



Source: authors' calculations.