



**ADDIS ABABA UNIVERSITY
SCHOOL OF COMMERCE
DEPARTMENT OF ACCOUNTING AND FINANCE**

A THESIS ON:

***“The Impact of the 2020 Ethiopian Currency
Notes Reform on Formal Financial
Participation”***

**A PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
MSc. IN CORPORATE FINANCE: SPECIALTY IN INVESTMENT
MANAGEMENT**

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**June 2025
Addis Ababa, Ethiopia**

DECLARATION

I hereby declare that this dissertation is my own original work and has not been submitted previously, in whole or in part, for any degree or diploma at any other university or institution. Any sources used, including secondary data, have been appropriately acknowledged and referenced. I understand that any violation of academic integrity and ethical standards may result in disciplinary action according to the university's regulations.

Regards,

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THESIS SUBMISSION APPROVAL FORM

This is to certify that the thesis entitled *“The Impact of the 2020 Ethiopian Currency Notes Reform on Formal Financial Participation”* has been carried out by **Mr. Fikreyesus Temesgen** under my supervision. This thesis is submitted for the fulfillment of the requirements for the **Master of Science in Corporate Finance (With Specialty in Investment Management)** program at Addis Ababa University. I confirm that the candidate has met the necessary academic requirements and recommend the thesis for submission and defense.

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**ADDIS ABABA UNIVERSITY
SCHOOL OF COMMERCE
DEPARTMENT OF ACCOUNTING AND FINANCE
CORPORATE FINANCE PROGRAM**

**The Impact of the 2020 Ethiopian Currency Notes
Reform on Formal Financial Participation**

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ACRONYMS and ABBREVIATIONS

CAGR: Compound Annual Growth Rate

DBT: Direct Benefit Transfers

DFS: Digital Financial Services

ESAAMLG: Eastern and Southern Africa Anti-Money Laundering Group

ETB: Ethiopian Birr

FATF: Financial Action Task Force

FFPI: Formal Financial Participation Index

GDP: Gross Domestic Product

GOE: Government of Ethiopia

INR: Indian Rupee

ITS: Interrupted Time Series Analysis

NBE: National Bank of Ethiopia

NPCI: National Payments Corporation of India

PMJDY: Pradhan Manthi Jan Dhan Yojana

OIPR: Oxford Initiative on Peace and Recovery

SMEs - Small and Medium-sized Enterprises

UN - United Nations

UPI: Unified Payments Interface

USD: United States Dollar

VIF: Variance Inflation Factor

ABSTRACT

This study investigates the impact of Ethiopia's 2020 currency notes reform on formal financial participation within the country's banking sector. Utilizing a quantitative research approach, the analysis leverages panel data from eleven commercial banks covering the period 2014/15 to 2023/24. The research employs both descriptive statistics and an Interrupted Time Series (ITS) econometric framework to assess immediate and sustained changes in key indicators that are bank deposits, active account ownership, and mobile banking adoption following the reform. The findings reveal a statistically significant immediate surge in formal financial participation, as measured by a composite index standardized from these multiple indicators, and a pronounced acceleration in its growth rate post-reform. Results highlight that, compared to similar reforms in India and Nigeria; Ethiopia's policy not only compelled short-term formalization but also fostered enduring behavioral shifts towards the formal financial system. The study further identifies a substitution effect between telecom-led mobile money platforms and traditional banking services, signaling the evolving dynamics of digital finance in Ethiopia. Policy recommendations emphasize the need for sustained public awareness, digital infrastructure investment, and regulatory frameworks that foster synergy between banks and non-bank financial service providers. Overall, the research demonstrates that well-designed currency reforms, when paired with supportive policies and robust implementation, can serve as effective catalysts for broadening formal financial participation and strengthening economic resilience in developing economies.

Keywords: *Bank deposits, banking sector Ethiopia, currency notes reform, digital finance, economic resilience, financial participation, formal financial system, Interrupted Time Series (ITS), mobile banking adoption*

CHAPTER ONE: INTRODUCTION

1.1. Background of the Study

Currency serves as a widely accepted medium of exchange, with fiat money representing a form of currency that lacks intrinsic value and typically issued by a country's governing entity. While multiple currencies may circulate simultaneously within an economy, authorities usually designate one as the official currency. Governments establish legal frameworks for currency use and may regulate other currencies within their jurisdiction (Hölscher, 2015).

When there is a macroeconomic challenges or inefficient financial system, the regulatory organ can address by implementing currency note reforms. These reforms may involve introducing new currencies, redenominating existing ones, or adopting foreign currencies. In addition to mitigating financial disruptions, such reforms can promote the society to advance to using the formal financial systems, particularly in developing economies with significant informal sectors (ibid).

The Ethiopian Birr has undergone significant transformations since its introduction in 1893 under Emperor Menelik II, replacing the Maria Theresa thaler as the primary currency of Ethiopia. The establishment of the Bank of Abyssinia in 1905, followed by its reorganization into the Bank of Ethiopia in 1931, facilitated the decimalization of the Birr, marking a key milestone in the modernization of the country's monetary system. However, during the Italian occupation in the 1930s, the Italian lira and subsequently the East African shilling temporarily replaced the Birr. Following the end of the occupation, the Birr became Ethiopia's legal tender and the National Bank of Ethiopia has been responsible for managing the currency, and overseeing its stability and modernization (NBE, 2025).

In 2020, Ethiopia undertook a historic currency change by replacing old banknotes (10-, 50-, and 100-Birr denominations) and introducing a new 200-Birr note. Citizens and businesses were required to deposit old notes into formal financial institutions, effectively encouraging a shift away from informal cash-based transactions to the formal banking sector. By addressing these challenges, the reform aimed to strengthen Ethiopia's financial system and enhance monetary management (NBE, 2020).

1.2. Problem Statement

Currency notes reform can play a crucial role in advancing formal financial participation by encouraging the transition from informal cash-based transactions to regulated financial services. In 2021, 76% of adults worldwide have an account, with 71% in developing economies, largely

driven by mobile money adoption. However, 1.4 billion adults remain unbanked, often due to reliance on informal cash-based systems (Demirgüç-Kunt et al., 2022).

Ethiopia, undergoing rapid economic transformation, has long struggled with low formal financial participation due to a limited outreach of the financial sector, heavy reliance on cash, and a poor digital financial landscape. Between 2015 and 2020, the total mobilized deposits reached ETB 881 Billion, growing at a compound annual rate of 17.2%, bank accounts increased to 23.4 million with an 11.4% CAGR and the mobile banking users stood at 1.9 Million. However, the National Bank of Ethiopia was unable to track economic activities outside the formal financial system effectively and unable to implement the appropriate monetary policy to bolster the economic growth (NBE, 2020; Hordofa, D.F., 2024).

Consequently, the Ethiopian government introduced a reform of its currency notes in 2020. While initial reports showed promising results in increasing bank deposits (NBE, 2021; Capital Newspaper, 2021), there remains a critical gap in understanding the reform's comprehensive impact on formal financial participation. Existing evaluations have concentrated on these transient deposit spikes or on headline counts of new accounts and mobile-banking users, without assessing whether such changes represent sustained improvements in formal participation. There remains no comprehensive, multi-year analysis of total sector-wide deposits, the persistence of active account ownership beyond initial openings, or the trajectory of mobile-banking adoption in Ethiopia's distinct institutional and infrastructural environment. The Ethiopian Economics Association initially predicted positive impacts on financial participation, but more recent data showing a 64.2% decline in deposits mobilized during 2021/22 raises questions about the reform's long-term effectiveness (Hordofa, 2024; NBE, 2022). Without rigorous assessment of these critical indicators, it is impossible to determine whether the currency notes reform has effectively achieved its goal of enhancing formal financial participation within Ethiopia's banking system (United Nations Ethiopia, 2020).

Global experiences with similar reforms provide valuable lessons. India's 2016 demonetization provides a striking example: within weeks, aggregate household deposits rose by INR 5.45 trillion, and over 50 million new accounts were opened under the Jan Dhan scheme (Chodorow-Reich et al. 2020; RBI 2017). However, once withdrawal limits eased, a large share of those deposits reverted to cash, and roughly 70 percent of new accounts lay dormant within six months (Parida 2020; Sane & Thomas 2019). Similarly, Nigeria's late-2022 currency redesign compelled mass deposits and spurred digital-payment adoption, but severe cash shortages, overloaded banks and inadequate rural infrastructure undermined its longer-term effectiveness (Okah et al. 2025; Adegoke 2022). These contrasting outcomes underscore that while reforms can trigger significant short-term inflows and digital uptake, their sustainability is ambiguous and highly context-dependent.

This study addresses that gap by applying an interrupted time-series framework to panel data from 2014/15 to 2023/24. It constructs a composite Financial Participation Index that integrates deposits, active accounts and mobile-banking usage and quantifies both the immediate level shift and the longer-term change in growth rate following the reform. By rigorously comparing Ethiopia's experience with the ambiguous global evidence from India and Nigeria, this research will clarify whether the 2020 currency-notes reform generated lasting enhancements in formal financial participation within Ethiopia's banking system.

1.3. Research questions

- To what extent does the currency notes reform impact the formal financial participation composite index before, immediately after, and in the period following the reform?
- What effect did the 2020 currency note reform have on the volume of deposits mobilized by banks in Ethiopia?
- How did the 2020 currency note reform influence the number of bank accounts held by Ethiopian households and businesses?
- What was the impact of the 2020 currency note reform on mobile banking adoption in Ethiopia?

1.4. Objectives of the study

The main objective of the study is

- to evaluate the 2020 Ethiopian currency notes reform's impact on formal financial participation.

Specifically

- To quantify the pre, immediate and after the reform impact on the formal financial participation composite index.
- To examine the impact of the 2020 Ethiopian currency notes reform on mobilized deposits by comparing total deposit volumes in Ethiopia's banking sector before and after the reform.
- To evaluate the effect of the 2020 currency notes reform on formal account ownership by comparing the number of active bank accounts (including new account openings) in Ethiopia's formal banking sector before and after the reform.
- To assess the influence of the 2020 currency notes reform on mobile banking adoption by measuring changes in the number of mobile banking users in Ethiopia's formal financial sector before and after the reform.

1.5. Significance of the study

The significance of this study lies in its potential to provide valuable insights into the effectiveness of Ethiopia's 2020 currency notes reform in addressing key challenges related to formal financial participation. By examining the reform's impact on bank account openings, mobile banking adoption, and deposit mobilization, this research will contribute to a deeper understanding of the complex interplay between monetary policy and economic development. Notably, it is significant for the following different reasons.

Firstly, the study aims to analyze post-reform trends in bank account openings, mobile banking adoption, and deposit in formal financial systems. This analysis is crucial for assessing the reform's effectiveness in transitioning informal cash-based transactions to formal banking practices, especially in developing economies like Ethiopia. While existing analyses of the 2020 currency notes reform have focused on short-term outcomes, this study addresses critical gaps by exploring its sustained impact.

Secondly, by drawing lessons from global currency notes reforms, the study will provide actionable recommendations tailored to Ethiopia's unique socio-economic context. This will equip policymakers with evidence-based insights to design inclusive and effective monetary policies that enhance financial system resilience and support sustainable economic development.

1.6. Scope of the study

The study focuses on commercial banks that were operational prior to the currency notes reform, aiming to examine the diverse impacts of the reform. The research is centered on assessing the reform's contribution to formal financial participation by analyzing its effectiveness in driving bank account openings, the adoption of mobile banking, and mobilized deposits during the pre-reform, transitional, and post-reform phases.

To achieve a comprehensive understanding of the impact, the study adopts a quantitative methods approach using an econometrics model and trend analysis on key variables (e.g., trends in deposit, bank account openings and mobile banking adoption).

1.7. Limitations of the study

While this study aims to provide a comprehensive evaluation of the reform and its impact on formal financial participation, few limitations must be acknowledged. Firstly, the post reform

analysis is limited to the period from 2020/21 to the present, which may be insufficient for capturing the reform's long-term effects on formal financial participation. Secondly, the study will capture the data from commercial banks only that were operational full ten years before the currency reform. Finally, it focuses exclusively on the Ethiopian context and while lessons from global cases are considered, the findings may not be entirely generalizable to other countries.

Acknowledging these limitations ensures transparency and provides a framework for interpreting the results. Future research should aim to address these gaps by incorporating longitudinal data and extending the scope to include underrepresented populations.

1.8. Definition of terms

Currency: a medium of exchange, typically issued by a government or governing authority, used to facilitate transactions for goods and services within an economy. In this study, it specifically refers to the Birr and its role in Ethiopia's financial system.

Fiat Money: is a type of currency that has no intrinsic value and isn't backed by a physical commodity like gold or silver. Its value is derived from the trust and confidence of the public and is established as legal tender by government decree.

Legal Tender: It is the officially recognized currency that must be accepted for payment of debts and other financial obligations within a given jurisdiction.

Intrinsic value: refers to the inherent worth of an object, asset, or financial instrument, independent of external factors like market price, perception, or government backing.

Currency notes reform: it is a government-led process involving changes to a country's currency system to address macroeconomic challenges and stabilize monetary systems.

Formal Financial Participation: it is the process of transitioning individuals and businesses from informal, cash-based financial practices to participation in the formal financial sector using bank accounts, digital payment systems, and other regulated financial services.

Bank Account Openings: is the act of individuals or businesses creating accounts in formal financial institutions, such as banks, which is an essential step in formal financial inclusion.

Mobile Banking: is a financial service that allows individuals to perform banking transactions, such as deposits, withdrawals, and transfers, using mobile devices.

Deposit Mobilization: is the process of attracting savings from individuals or businesses into formal financial institutions, which enhances liquidity, promotes investment, and supports economic growth.

Informal Financial Sector: it is the unregulated financial activities and systems, often cash-based, that operate outside the formal banking and financial institutions.

Safe-haven Banking: refers to the practice of seeking out banks or financial institutions that are considered extremely stable and secure, especially during periods of economic or political turmoil, market volatility, or financial crisis.

Short-term impacts: are changes observed within a relatively brief period (e.g., up to one year) after the implementation of the currency notes reform.

Long-term trends: are sustained changes and patterns observed over an extended period (e.g., several years) following the currency notes reform.

Financial Literacy: is the knowledge and skills necessary to make informed financial decisions, including understanding banking services and managing money.

Financial deepening: refers to the process of expanding and diversifying the range of financial services available in an economy.

1.9. Organization of the paper

This research study is structured into five chapters, each designed to address distinct aspects of the investigation, thereby ensuring a logical and coherent presentation of the findings. Chapter One introduces the study by providing crucial background on the 2020 Ethiopian currency notes reform while outlining the research problem, objectives, significance, scope, and limitations. Chapter Two reviews relevant literature, identifying existing gaps that this research aims to fill. Chapter Three delineates the research methodology employed in the study. Chapter Four presents the results and analysis, offering insights derived from the data. Finally, Chapter Five concludes the study and provides recommendations based on the findings. The paper also includes a references section that lists all cited sources in accordance with Harvard citation style, as well as appendices that contain the STATA results pertinent to the analysis.

CHAPTER TWO: LITERATURE REVIEW

This chapter presents the theoretical and empirical foundations that support the study. It begins by reviewing relevant theories that explain the relationship between currency reform and formal financial participation, including monetary economics, development economics, rational choice, and behavioral economics. The chapter then explores global and local empirical studies on the effects of currency reforms, particularly focusing on experiences from Ethiopia, India, and Nigeria. By synthesizing theoretical insights and empirical evidence, the chapter establishes a conceptual framework that guides the analysis of how Ethiopia's 2020 currency notes reform may have influenced participation in the formal financial system.

2.1. Theoretical Review

2.1.1. Currency Notes Reform

Currency notes reform encompasses a range of measures aimed at modifying a nation's monetary system. This process may involve changes to the structure, value, or management of the currency, with the primary objectives being the stabilization of the economy, the restoration of public confidence, and the creation of a more efficient financial system (Hölscher, 2015).

Implementing changes to the currency system is often complex, requiring a comprehensive understanding of economic theories and public opinion. Experts point out that effective reform demands not just technical changes but also a solid framework for communication and public involvement. This is essential for promoting trust and ensuring stakeholders grasp the consequences of the modifications. As we examine the essential features of currency notes reform, it becomes clear that this undertaking plays a crucial role in shaping a country's economic strength and promoting a stable financial atmosphere. The process typically comprises three key elements i.e. currency redesign, currency replacement, and the processes of reform implementation (ibid).

National or regional monetary authorities may update or change the appearance, security features, and overall design of their currency notes and coins. This activity motivated by a variety of factors, including improving security, representing national identity, and responding to new technological advances. As societies grow, so must the mechanisms that support their economies, with currency design playing an important role in this process. It surely maintains primary functions as exchange medium, value store, unit of account, and standard of deferred payments through complex planning, technological participation, and consultations with governmental and financial institutions (Fasua T., 2023).

Currency replacement is a major monetary policy intervention in which existing banknotes are withdrawn and substituted with new ones to address issues such as counterfeiting, inflation, economic instability, and enhancing formal financial participation (Krishna & Leukhina, 2019). It

is often used to combat hyperinflation, as seen in Zimbabwe's 2009 adoption of the USD after the Zimbabwean dollar became worthless (Mahonye, 2015). Additionally, currency replacement linked to political transitions, as evidenced by Ethiopia's periodic currency transformations during each major political shift since the 1940s, including the 2020 reform (NBE, 2024).

The implementation of currency notes reform is a complex and dynamic process that requires careful planning, stakeholder engagement, logistical execution, and continuous evaluation to ensure success. Therefore, central banks must carefully design reforms that address challenges while fostering trust and cooperation among stakeholders. Additionally, transparent and proactive communication campaigns are crucial for educating the public, mitigating resistance, and ensuring a smooth transition. Furthermore, effective logistical strategies involve coordinating with financial institutions to phase out old notes and introduce new ones in a stable manner. Finally, post-reform monitoring and evaluation play a vital role in tracking the reform's impact and addressing any unforeseen issues. As a result, a holistic and well-coordinated approach is essential for promoting financial stability, public trust, and long-term economic resilience (Agarwal and Narayanan, 2017; Chodorow-Reich et al., 2020).

2.1.2. Formal Financial Participation

Formal financial participation is a transformative process that moves individuals, businesses, and institutions from informal, risky practices to established, regulated, and transparent financial systems. This process unlocks access to essential financial services like secure savings accounts, credit facilities, insurance products, and efficient payment systems. It fosters economic participation, resilience, and stability, enabling economies to reach their full potential and achieve sustainable growth. Currency notes reform can play a crucial role in this process by disrupting informal systems and incentivizing the adoption of regulated financial services (Gupta, S., & Agarwal, P., 2019).

I. Why formal financial participation?

Formal financial participation enhances economic efficiency by channeling savings into productive investments such as infrastructure, entrepreneurship, and innovation. Unlike informal financial systems, where capital remains underutilized, formal financial institutions provide structured mechanisms for resource allocation. Additionally, they lower transaction costs through digital payment systems and banking services, making financial transactions more efficient and fostering a competitive economy (ibid).

Formal financial participation drives long-term economic growth by mobilizing savings and facilitating investments in key sectors such as infrastructure, education, and healthcare. It provides credit access, particularly through mobile banking, which supports small and medium-sized enterprises (SMEs) and fosters job creation and innovation. Additionally, it indirectly

promotes social equity by expanding opportunities for marginalized groups, especially women and rural communities, empowering them through savings and investment options. This contributes to poverty reduction and overall social development, making formal financial participation essential for sustainable growth (IMF, 2025).

A key advantage of formal financial systems is their regulatory oversight, which enhances transparency and mitigates risks such as fraud, money laundering, and financial instability. Unlike informal financial activities, which lack accountability, formal financial institutions ensure compliance with legal and ethical standards. They also offer risk management tools like insurance and diversified investment options, helping individuals and businesses protect themselves against economic shocks. Moreover, financial participation strengthens institutional governance by promoting transparency and accountability. Regulated financial institutions help reduce corruption and increase public trust, while central banks can effectively implement monetary policies to stabilize the economy. These mechanisms ensure a well-functioning financial system where transactions are monitored, supporting macroeconomic management (ESAAMLG, 2018).

II. Indicators to formal financial participation

The financial sector plays a critical role in shaping economic landscapes by enhancing efficiency, promoting stability, and fostering inclusion. Key indicators such as the total value of deposits in financial institutions, the number of active bank accounts and the adoption of mobile banking provide valuable insights into the health and accessibility of financial systems (Demirgüç-Kunt et al., 2022). These metrics not only reflect the level of public trust in financial institutions but also demonstrate the capacity of economies to mobilize resources for productive use.

As countries advance towards greater financial participation, understanding these indicators becomes essential for policymakers, businesses, and researchers alike. They reveal the extent to which individuals and enterprises engage with formal financial systems, highlighting opportunities for improvement and growth. This discussion will explore each of these three key indicators, examining their significance in fostering economic development and promoting a more inclusive financial environment (ibid).

A) Deposits in the Formal Financial Sector

Among the indicators of formal financial participation, deposit accounts hold a foundational role. Placing funds in a deposit account with a regulated financial institution represents a basic yet significant step towards integrating into the formal financial system. Deposits are funds that customers entrust to a bank, with the understanding that these funds will be repaid either on demand or after a specified period. This act of depositing money not only provides a safe haven for individuals' funds but also forms the bedrock of the banking system itself (Osaloni & Efuntade, 2023).

Deposits in formal financial institutions serve as a robust measure of economic trust and participation. At its core, a deposit represents funds entrusted by individuals, households, and businesses to regulated banks. This action is more than a mere transaction because it reflects a deep-seated confidence in the regulatory frameworks and governance that secure these institutions. When people choose to place their money in banks rather than leaving it in informal settings, they affirm their belief in a stable system that safeguards their assets, and this confidence encourages them to participate actively in the formal financial system (ibid).

The volume of these deposits acts as a vital indicator of the overall health of the financial sector. A high deposit base signals that citizens and enterprises exhibit economic maturity and fiscal prudence by engaging with formal financial mechanisms. Banks, in turn, use these funds to extend credit to various sectors, thereby fueling small business ventures, supporting large infrastructure projects, and nurturing innovative startups. This credit expansion drives economic growth because it liberates resources for investment and ultimately spurs job creation and increased productivity. Thus, the size and growth of deposit figures not only reflect individual savings but also represent the collective capacity of the financial system to mobilize resources and promote sustained economic development (Epstein, 2018).

Furthermore, deposits are a significant indicator of financial participation. The transition from informal savings methods, such as storing money at home or relying on unregulated money lenders, to formal deposits marks a critical shift in financial behavior. This change is often spurred by policies and initiatives designed to boost financial literacy and facilitate access to banking services, thereby encouraging active involvement in the formal financial system. As more citizens make this shift, increased deposit levels serve as evidence of broader participation within a secure and regulated framework. By focusing on formal financial participation rather than solely on financial inclusion, the emphasis is placed on both access and the active engagement of individuals in their daily financial activities, which ultimately strengthens the overall financial ecosystem by reducing vulnerabilities and increasing transaction transparency (Chaudhuri, 2017).

B) Number of Bank Accounts

The number of bank accounts in financial institutions is a direct and observable indicator of access to formal financial services. When individuals and businesses hold bank accounts, it signifies their ability to participate in the formal financial sector, utilizing essential services such as depositing and withdrawing money, making transfers, and processing payments. In many developing economies, a sizeable portion of the population remains outside the banking system, relying instead on informal means to manage their finances. Monitoring the number of bank accounts, therefore, allows policymakers and researchers to assess how widely banking services are available and how effectively they are reaching those previously excluded. A rise in the number of accounts often signals that the reach of the banking sector is expanding, thus

broadening the base of financial participation and bringing more people into the realm of regulated financial activity (Demirgüç-Kunt et al., 2022).

Owning a bank account is not only important in itself but also serves as the initial step toward further engagement with the formal financial system. Once an individual opens an account, they become eligible for a broader range of financial products and services, such as credit, insurance, investment options, and digital transaction platforms. This is particularly significant for groups that have historically faced barriers to accessing these services. For instance, obtaining credit or a loan is frequently contingent on having a bank account, as it provides the necessary channel for disbursing funds and collecting repayments. Similarly, many government benefit programs are now delivered via direct deposit, incentivizing recipients to maintain active accounts and potentially explore other banking services. Thus, the number of bank accounts is not merely a static figure; it represents the gateway to a deeper and more meaningful participation in the formal financial system (ibid).

As more people open and actively use bank accounts, there is a noticeable shift away from informal, cash-based transactions toward more formalized, transparent, and regulated financial activity. In economies where banking penetration is low, people often transact through cash or unregulated informal networks, which can be risky, costly, and lack consumer protections. These informal transactions not only expose individuals to financial vulnerabilities but also hinder governments' ability to track economic activity, collect taxes, and implement effective monetary policy. By encouraging the use of bank accounts, financial activity becomes more traceable and secure, reducing the prevalence of the informal sector and supporting overall economic stability and growth (Gupta, S., & Agarwal, P., 2019).

Beyond facilitating transactions, the widespread ownership of bank accounts plays a transformative role in empowering individuals, particularly those from marginalized or vulnerable groups such as women and rural residents. A bank account offers a safe place to store money, reducing the risks of theft or loss that come with keeping cash at home. It also allows people to receive salaries, remittances, and government payments directly, enhancing their autonomy and control over financial resources. Access to formal banking services enables individuals to plan for the future, save for emergencies, and invest in opportunities such as education or entrepreneurship. In this way, the number of bank accounts serves as a proxy for the level of economic empowerment and security within a population, highlighting the deeper social and developmental impact of financial participation (ibid).

From a policy standpoint, tracking the number of bank accounts provides a practical and quantifiable means of measuring the effectiveness of financial participation initiatives. Governments and international organizations routinely use this data to monitor trends, set benchmarks, and evaluate progress toward participation goals. It helps identify regions or population segments where access to banking remains limited, allowing for targeted

interventions such as financial literacy programs, simplified account opening procedures, or the introduction of mobile banking solutions. As financial participation has become a global development priority, monitoring the number of bank accounts also supports the achievement of broader objectives, such as the United Nations' Sustainable Development Goals, by reducing inequality and promoting inclusive economic growth (Demirgüç-Kunt et al., 2022).

C) Mobile Banking Adoption

Mobile banking adoption, as measured by the number of users, has become a central metric for evaluating formal financial participation in contemporary economies. The expansion of mobile technology has transformed the way individuals interact with financial institutions, especially in regions where traditional banking infrastructure is difficult to access. When people adopt mobile banking, they are effectively entering the formal financial system, moving away from informal, cash-based transactions that are often unregulated and less secure. The number of mobile banking users provides a clear indication of how many individuals are engaging with regulated financial services, which is a fundamental aspect of financial participation. This shift is particularly important because formal financial participation is closely linked to broader economic development, improved access to credit, and the ability to save and invest securely (Atreyee et al., 2024).

The relationship between mobile banking adoption and formal financial participation is especially pronounced in regions with historically low levels of financial inclusion. In many parts of sub-Saharan Africa and South Asia, for example, mobile banking has enabled millions of people to access formal financial services for the first time, bypassing the need for physical bank branches. This democratization of financial access has had far-reaching effects, empowering individuals to save securely, invest in education or small businesses, and respond more effectively to financial shocks. As a result, tracking the number of mobile banking users and the volume of their transactions provides a dynamic and real-time measure of progress toward broader financial participation goals (Alemu et al., 2021).

By monitoring the breadth (number of users) of mobile banking, policymakers, financial institutions, and development organizations can gain a detailed understanding of the evolving landscape of financial participation, identify gaps in access and design targeted interventions to promote equitable and sustainable economic growth. The ongoing expansion of mobile banking thus not only reflects technological progress but also serves as a catalyst for greater financial empowerment and resilience across diverse populations (Demirgüç-Kunt et al., 2022; Alemu et al., 2021).

2.1.3. Currency notes reform and formal financial participation

Policy makers intend to reform the existing currency for integrating the informal channel of the financial activities such as unregulated lending, savings, and investment practices in to the formal system. This participation is critical for enhancing financial inclusion, improving economic stability, and fostering sustainable development (Mukherjee et al., 2019). In academic discussions, the relationship between currency reform and formal financial participation can be understood through the lenses of multiple theoretical perspectives. This review examines key frameworks from monetary economics, development economics, rational choice theory, and behavioral economics, exploring how each contributes to an understanding of the mechanisms and effects of currency notes reform on formal financial participation.

A) Monetary Economics Theory

Monetary economics provides a foundational framework for understanding the role of a stable and trusted currency in facilitating economic transactions. Within this field, the stability of the currency and the credibility of monetary institutions are crucial to fostering formal financial participation. The theoretical argument posits that public trust in the currency is essential; if economic agents perceive the currency as reliable, they are more inclined to use formal financial institutions. Conversely, if a currency is perceived as unstable or prone to devaluation, individuals may turn to informal mechanisms for safeguarding their wealth (Mishkin, 2021).

Currency notes reform, from a monetary economics perspective, is considered as a means to reinforce this public trust. The introduction of a new currency with an enhanced security features, improved design elements, and/or integration with digital systems signals a commitment to monetary stability and institutional rigor. Such reforms can reduce the risks associated with counterfeiting and reduce the uncertainty that often leads to the fragmentation of financial activities. In theory, when introducing a new currency in a context of robust monetary policy and strong institutional oversight, the resulting increase in confidence can facilitate a smoother transition from informal practices to regulated financial participation (Walsh, 2017).

An integral aspect of this framework is the role of digital integration. Modern monetary systems increasingly incorporate digital features that extend beyond the physical attributes of banknotes. Digital enhancements, such as embedded security features and electronic verification methods, contribute to reducing transaction costs and streamlining financial processes. These digital elements, when integrated into a currency reform initiative, not only modernize the physical currency but also support the infrastructure needed for efficient financial transactions. As economic agents experience lower transaction costs and heightened security, their reliance on informal financial channels diminishes. Consequently, monetary policy transmission can be improved because a larger portion of the population engages with formal

financial institutions, allowing for more effective implementation of interest rate adjustments and other policy tools (Atreyee et al., 2024).

The institutional theory, as it relates to monetary economics, reinforces the notion that formal institutions comprising legal frameworks, regulatory bodies, and centralized monetary authorities plays a decisive role in structuring financial behavior. In this context, currency notes reform is not merely a technical exercise rather it is also an institutional intervention designed to realign and strengthen the financial system's underlying architecture. When implementing reforms within a framework of strong institutions, they have the potential to bridge the gap between informal and formal economic activities. The theoretical premise here is that formal institutional structures, when robust and transparent, foster an environment in which economic agents feel secure in engaging with formal channels. This trust and structural clarity contribute significantly to the effective transmission of monetary policy, thereby reinforcing the overall stability of the financial system (Chaudhuri, 2017).

Furthermore, monetary economics suggests that the reform of currency notes can serve as a signal of improved fiscal and monetary governance. In the realm of academic discourse, such signals are critical for influencing expectations. When the public observes that a government is committed to reforming its currency, this action can modify long-held expectations regarding inflation, currency devaluation, and economic volatility. In this manner, currency reform is considered to have a forward-looking impact on economic behavior, as agents adjust their strategies in anticipation of a more stable monetary environment. The interplay between trust, institutional strength, and digital innovation within monetary economics ultimately serves as the basis for understanding how currency notes reform can pave the way for enhanced formal financial participation (Walsh, 2017).

B) Development Economics Theory

From the perspective of development economics, currency notes reform are a transformative process that drives both financial deepening and broadening. Financial deepening is associated with the development of more sophisticated financial markets that can accommodate an increasing variety of products and services. In this framework, the reformation of currency is a catalyst for creating a more complicated and capable financial system, one that is better equipped to mobilize savings, allocate credit, and support investment activities (Todaro, 2015).

Financial broadening, on the other hand, is concerned with extending the reach of financial services to a larger segment of the population. Development economists argue that when informal financial practices predominate, significant portions of society remain excluded from the benefits of regulated economic activity. In this light, currency notes reform is a mechanism for democratizing access to financial services. By modernizing the monetary system, reform initiatives are expected to reduce the barriers that prevent marginalized or underserved populations from participating in the formal financial sector (Demirgüç-Kunt et al., 2022).

The theoretical arguments within development economics emphasize that the process of modernization is essential for achieving economic growth. Modernization theory, as applied to financial systems, posits that transitioning from informal to formal financial systems is a necessary step in the evolution of an economy. This perspective suggests that the introduction of a new currency can facilitate this transition by creating a monetary environment that is more efficient, transparent, and accessible. Thus, the modernization process is pivotal in shifting economic behavior away from traditional, informal practices toward a system characterized by regulated, formal interactions (Banerjee, 2019).

However, the discourse within development economics is not uniform. Dependency theory offers a critical counterpoint by arguing that the underdevelopment of financial systems in certain regions is linked to historical patterns of economic dependency and exploitation. This perspective asserts that informal financial practices can sometimes represent a form of resistance to externally imposed economic models. In this view, currency notes reform must be understood not only as a technical or institutional modification but also as an assertion of economic sovereignty. The theory contends that by establishing a stable, independent national currency, a country can reduce its vulnerability to external financial pressures and create a more self-reliant economic system. Thus, within the development economics framework, currency reform is simultaneously a tool for modernizing financial practices and a means of asserting autonomy in the face of global economic forces (Epstein, 2018).

In academic discussions of development economics, the interplay between financial deepening and broadening is essential for sustainable economic progress. The reform of currency notes contributes to both dimensions by enhancing the quality of financial services and extending their reach to previously excluded segments of the population. The transformation of the monetary system, therefore, is not an end in itself but a necessary sign to broader economic and social development. By fostering an environment in which formal financial participation is the norm, currency reform is seen as a critical component in the creation of a more inclusive and resilient economic structure.

C) Rational Choice Theory

Rational choice theory offers a microeconomic perspective on the decision-making processes that drive formal financial participation. This theoretical framework assumes that individuals act in a manner that maximizes their utility, basing their choices on a careful evaluation of the costs and benefits associated with different options. Contextually, rational choice theory posits that economic agents will decide to engage with the formal financial system if the benefits such as enhanced security, lower transaction costs, and improved access to financial services outweighs the costs associated with remaining within informal channels (Ehrbeck et al., 2018).

The process of currency reform is an intervention that recalibrates the incentives inherent in the financial system. By reducing the costs and risks associated with formal financial transactions, a

new currency can make regulated financial services more attractive. This shift in the cost-benefit calculus is crucial; when the benefits of formal participation become evident, individuals are theoretically inclined to abandon informal practices. The rationale is that a well-designed currency reform should lower the friction costs associated with transitioning to formal financial institutions (Tirole, 2017).

Moreover, rational choice theory emphasizes that the incentives and disincentives embedded in the financial system play a critical role in shaping behavior. In this view, currency notes reform is a mechanism that not only reduces the direct costs of formal financial participation but also imposes indirect costs on remaining in the informal sector. The resulting equilibrium, from a rational perspective, is one in which the formal system becomes the preferred channel for economic transactions. The theoretical strength of rational choice theory lies in its ability to distill the complex economic interactions into a series of individual decisions, each motivated by the pursuit of maximum utility. Currency reform, by altering the parameters of these decisions, is expected to generate a significant shift toward formalization (Ehrbeck et al., 2018).

Furthermore, the interplay between rational decision-making and institutional contexts is central to this analysis. Although rational choice theory assumes that individuals act in a fully informed and utility-maximizing manner, these decisions are made within the constraints of the institutional environment. The quality of formal institutions can either reinforce or undermine the incentives for formal participation. In this regard, currency notes reform can interact with existing institutional frameworks to create a more favorable environment for rational decision-making. When institutional quality is high, the benefits of formal participation are more apparent, thereby amplifying the effects of the reform. This integration of rational choice considerations with institutional analysis provides a detailed understanding of how individual behavior aggregates into broader trends of formal financial engagement (Frahm, 2019).

D) Behavioral Economics Theory

Behavioral economics challenges the traditional assumptions of full rationality inherent in classical economic models by incorporating insights from psychology into the analysis of financial decision-making. This approach recognizes that economic agents are subject to cognitive biases and heuristics that can systematically distort their perceptions of risk, value, and utility. In the realm of currency notes reform, behavioral economics is particularly relevant for understanding how psychological factors influence the adoption of a new monetary system (Thaler, 2015).

One of the key insights from behavioral economics is the concept of money illusion, which describes the tendency of individuals to focus on the nominal rather than the real value of money. In a reform setting, measures such as redenomination or redesign of currency can trigger money illusion, leading individuals to misinterpret changes in their purchasing power. This cognitive bias may cause resistance to reform, even when the actual economic benefits are

substantial. The theoretical contribution of behavioral economics is to highlight that the success of currency notes reform depends not only on the objective merits of the new currency but also on the way in which these changes are perceived and internalized by the public (Sumner, 2021).

Another key concept is loss aversion, which suggests that the psychological pain associated with losses is disproportionately greater than the pleasure derived from equivalent gains. When introducing a new currency, individuals may disproportionately weigh the potential losses associated with transition costs or perceived risks. Such bias can lead to hesitancy in adopting formal financial practices, as the immediate psychological impact of change overshadows longer-term benefits. In this sense, currency reform initiatives must account for the behavioral tendency to overvalue current holdings and underappreciate future gains, thereby influencing the rate at which achieving a formal financial participation (Cartwright, 2018).

Framing effects further complicate the behavioral landscape. The manner in which currency reform is communicated that is the language used, the context provided, and the emphasis on certain attributes can significantly shape public perceptions. If reform is presented in a way that highlights stability, security, and the promise of an improved monetary future, it may overcome inherent biases and promote a smoother transition to formal financial participation. Conversely, if the reform is framed in terms of potential risks or uncertainties, it may exacerbate existing fears and reinforce reliance on informal financial practices. Behavioral economics underscores the importance of understanding these framing effects as central to interpreting the public's response to currency reform (ibid).

Social norms and trust also play a critical role within the behavioral framework. Informal financial practices are often deeply embedded in the social fabric of communities, where trust, reciprocity, and long-standing traditions influence everyday economic interactions. When introducing a new currency, it must not only be technologically advanced and secure but also resonate with the established social norms. The successful integration of a new monetary system requires that it be perceived as both modern and respectful of traditional values. In this context, behavioral economics posits that social proof can be a decisive factor in its widespread acceptance. Thus, the psychological dimensions of trust and social conformity become pivotal in determining whether currency reform will lead to an increase in formal financial participation (Cartwright, 2018; Bawuah, 2025).

The integration of behavioral insights with rational and institutional perspectives provides a comprehensive framework for analyzing the effects of currency notes reform. Behavioral economics reveals that beyond the technical merits of a reform, the cognitive and social responses of economic agents are crucial determinants of its success. By accounting for these psychological factors, respective authorities can develop a more detailed understanding of how reforms are received and internalized, which in turn influences the overall shift from informal to formal financial activity.

2.2. Empirical Literature

2.2.1. The 2020 Ethiopian Currency notes reform

On September 14 2020, the Ethiopian government initiated a significant currency notes reform, replacing the existing 10, 50, and 100 Birr banknotes with newly designed ones and introducing a new 200 Birr denomination. The new series of banknotes featured enhanced security features and incorporated designs reflecting Ethiopia's natural and historical heritage, as well as its aspirations for industrialization and modern agriculture. This move aimed to disrupt the circulation of old notes that were potentially linked to illicit activities and were more susceptible to counterfeiting. Besides, the introduction of the 200 Birr note was intended to make transactions easier and reduce the need for individuals to carry large volumes of cash, particularly in an environment where the purchasing power of the Birr had been eroded by inflation (Renew Capital, 2020).

The 2020 currency notes reform was not an isolated policy measure but rather an integral component of the Ethiopian government's broader Homegrown Economic Reform Program. This ambitious program was designed with the overarching goals of stabilizing the Ethiopian economy and fostering sustained economic growth in the long term (GOE, 2020).

A) Objectives of the reform

The Ethiopian government articulated several key objectives underpinning the 2020 currency notes reform. Firstly, a primary motivation was to combat illicit financial activities, including money laundering, counterfeiting, and the hoarding of cash outside the formal banking system. The prevalence of these practices was perceived as a significant impediment to the effective functioning of the economy. The government argued that the existing banknotes, having circulated for an extended period, were susceptible to counterfeiting and were frequently used in illegal transactions. By introducing new banknotes with enhanced security features, the authorities aimed to disrupt these illicit flows and bring them within the purview of the formal financial system. This objective aligns with the broader global concern regarding the integrity of financial systems and the need to combat financial crimes, as highlighted by international organizations like the Financial Action Task Force (FATF).

Secondly, the reform aimed to curb inflation by demonetizing old banknotes and requiring individuals and businesses to exchange them for new ones within a limited timeframe. It was intended to absorb excess liquidity in the economy, particularly cash held outside the banking sector. The goal was to reduce the money supply and mitigate inflationary pressures, based on the quantity theory of money, which suggests a direct relationship between the money supply and price level.

Thirdly, the government aimed to improve the use of the formal financial system by requiring individuals to exchange old banknotes at banks. This would encourage them to open bank accounts and engage with formal financial institutions, contributing to the expansion of the deposit base, facilitating credit intermediation, and promoting the adoption of electronic payment systems. This aligns with the global agenda of fostering financial inclusion for economic development and poverty reduction.

Finally, the reform aimed to address the issue of hoarding. The government believed that a substantial amount of cash was being hoarded outside the banking system, depriving the economy of valuable resources. By demonetizing the old banknotes, the authorities sought to bring this hoarded cash back into circulation and channel it towards productive investments. This objective is linked to the concept of the velocity of money, which measures the rate at which money changes hands in the economy. Hoarding reduces the velocity of money, thereby hindering economic activity.

B) Implementation of the reform

The implementation of Ethiopia's 2020 currency notes reform was a carefully planned process aimed at ensuring a smooth transition while addressing economic and security concerns. The National Bank of Ethiopia officially introduced the newly printed currency notes into circulation on September 21, 2020, following a government announcement. To facilitate the transition, a three-month exchange period was established, allowing individuals and businesses ample time to replace old banknotes with new ones. During this period, both old and new currencies circulated concurrently to minimize disruptions to economic activities. However, due to logistical challenges, particularly in rural areas with limited banking access, the government extended the deadline to December 14, 2020, before the old notes were officially demonetized and ceased to be legal tender (NBE, 2020; United Nations Ethiopia, 2020).

To support the rollout, the Ethiopian government allocated ETB 3.7 billion (approximately \$101 million USD) for the printing and distribution of the new currency notes. Additionally, the government imposed cash withdrawal limits to control liquidity and prevent illicit financial activities. Initially, individuals were allowed to withdraw up to 1.5 million Birr, while daily withdrawal limits were set at 100,000 Birr. However, further directives revised these limits, allowing individuals to withdraw ETB 200,000 per day and businesses ETB 300,000 per day, with corresponding monthly ceilings of ETB 1 million and ETB 2.5 million, respectively (ibid).

Moreover, the government introduced strict regulations on asset transactions, requiring proof of payment through bank transfer slips for the registration of movable and non-movable asset purchases. In addition, to prevent illicit fund laundering, all giveaways of assets were temporarily restricted. Recognizing the security implications of such a large-scale currency reform, the government established a federal command post to oversee the process, with regional command posts ensuring smooth implementation. However, the deployment of

security forces to monitor compliance raised concerns about potential human rights violations and the excessive use of force (Chauffour & Gobezie, 2019).

Furthermore, in response to counterfeiting threats, the new currency notes were designed with enhanced security features, including watermarks, security threads, and holographic images, to deter fraudulent activities. To ensure public awareness and cooperation, the government launched a nationwide communication campaign using multiple platforms such as television, radio, newspapers, and public meetings to educate citizens on the new banknotes, the exchange process, and the reform's objectives. The banking sector also played a critical role in facilitating the reform by managing the exchange of old notes, expanding financial access, and assisting individuals and businesses in opening new bank accounts. To support this effort, banks were encouraged to expand their branch networks and enhance service delivery by extending the service hours including Sunday, particularly in underserved areas (Gebrehiwot, 2022).

Additionally, the economic impact of the reform was closely monitored by the NBE, which systematically collected data on money supply, inflation, and financial stability to assess the effectiveness of the transition. The government also conducted surveys and consultations with businesses and individuals to evaluate challenges faced during the implementation and make necessary adjustments. Despite the challenges encountered, the currency reform was a significant step toward strengthening Ethiopia's financial system, combating counterfeiting, and curbing illicit financial activities while promoting financial inclusion (Diana, 2023).

2.2.2. Currency notes reform and Formal Financial Participation

When designed effectively, currency notes reform can accelerate financial participation by pushing individuals and businesses to transition their cash holdings into formal banking channels. By requiring old currency to be exchanged through financial institutions, reforms can increase account ownership, encourage digital payments, and improve financial transparency. It also implies that the success of mobile money in Sub-Saharan Africa, where 33% of adults use mobile accounts, demonstrates how policy-driven financial shifts can expand access and deepen the usage of financial services (Demirgüç-Kunt et al., 2022).

India's 2016 demonetization serves as a pivotal case study for understanding the effects of currency notes reform on financial participation, particularly in terms of bank account penetration, mobile banking adoption, and digital transactions. One of the primary objectives of India's demonetization was to enhance financial participation by increasing bank account penetration, particularly through the Pradhan Mantri Jan Dhan Yojana (PMJDY) scheme. This scheme is an initiative launched in 2014 to ensure universal access to financial services for all citizens, especially the underprivileged (IMoF, 2014).

The immediate consequence of the demonetization policy was a dramatic surge in deposits within India's formal banking institutions, as individuals and entities were necessitated to deposit invalidated currency. Within weeks following the policy's implementation, aggregate household deposits were estimated to have increased by 5.45 trillion rupees, reflecting a substantial mobilization of physical cash into the banking system. This influx provided banks with a considerable boost in liquidity, marking a clear positive impact on the volume of funds within the formal financial sector in the short term (Chodorow-Reich et al., 2020).

However, the sustainability of this deposit surge proved to be limited. Subsequent to the easing of withdrawal restrictions, which commenced in January 2017, a significant proportion of these deposits was withdrawn, frequently reverting to informal cash holdings. This reversal indicated that a substantial portion of the initial inflow constituted a temporary response driven by policy compulsion rather than a permanent alteration in saving behavior, thereby highlighting a negative aspect concerning the policy's impact on deposit persistence (Chodorow-Reich et al., 2020). The initial deposit surge, while substantial in magnitude, did not fully translate into a proportional long-term increase in sustained formal savings across all segments of the population.

The persistence of deposited funds exhibited considerable variation, influenced by factors such as financial literacy and prior banking relationships. Studies indicated that in districts characterized by higher levels of financial literacy, households demonstrated a markedly greater propensity to retain a larger share of their demonetization-related deposits over the subsequent months (Qazi et al., 2018). For instance, residents possessing above-average knowledge of banking operations were found to retain approximately 35% more of their deposits six months post-demonetization in comparison to their less literate counterparts. Similarly, states with stronger pre-existing bank account penetration and financial inclusion initiatives demonstrated higher deposit stickiness (Atreyee et al., 2024). This contrasts with areas lacking these foundational elements, where deposits were more likely to be withdrawn, indicating an uneven positive impact on deposit retention.

Trust in the government's motives underlying the reform also influenced deposit retention; households that perceived the policy as genuinely targeting illicit wealth were more inclined to leave larger sums in their accounts, whereas skepticism correlated with quicker withdrawals. Clear communication facilitated the conversion of some forced inflows into more lasting formal savings (Baxi et al., 2018). While the immediate impact was a massive deposit surge, the long-term effect on sustained deposits was more modest and regionally varied, positively influenced by financial literacy, existing banking relationships, and public trust, contributing to a higher baseline of deposits within the formal system compared to the pre-demonetization era (Chodorow-Reich et al., 2020; Qazi et al., 2018; Baxi et al., 2018).

Specifically, basic savings accounts established under the PMJDY recorded a pronounced one-off deposit increase immediately following demonetization, largely representing compelled deposits of invalidated notes rather than the emergence of new saving habits (Gupta & Gupta, 2018; Parida, 2020). Approximately 70% of these accounts exhibited negligible activity within six months, underscoring that deposit spikes alone were insufficient to guarantee long-term formal savings growth in the absence of complementary measures.

Demonetization significantly accelerated the expansion of formal bank account ownership across India, thereby building upon the foundation established by the PMJDY scheme. The necessity to deposit or exchange invalidated currency created an urgent demand for bank accounts (Chodorow-Reich et al., 2020). Within the five months subsequent to the policy announcement, over 50 million new accounts were opened under the Jan Dhan scheme, representing nearly a doubling of the prior quarterly average for new accounts (RBI, 2017). This constituted a massive positive impact on financial access, rapidly bringing millions of previously unbanked individuals into the formal financial fold. The policy effectively leveraged both the immediate need to handle invalidated currency and the broader shift towards digital payments to drive this widespread increase in account ownership.

Despite this dramatic increase in the number of accounts, a significant negative aspect was the high prevalence of dormant accounts among those newly opened. While financial access expanded considerably, active inclusion lagged. A substantial proportion of new accounts remained underutilized (Mukherjee et al., 2019). Administrative records indicated that approximately 30% of demonetization-era accounts held zero balances, and roughly 45% recorded no transactions in the year following their opening. This low level of activity contrasted sharply with the initial success in increasing account numbers, suggesting that account opening was often a compliance measure rather than a transition towards integrated financial management.

The prevalence of dormant accounts underscored the principle that access alone is insufficient for meaningful engagement with the financial system. Ethnographic interviews revealed that many new account holders lacked a basic operational understanding of banking, representing a negative consequence of rapid inclusion without adequate supportive measures processes (Roy & Das, 2018). However, subsequent efforts aimed at addressing this dormancy, such as the expansion of direct benefit transfers (DBT) into Jan Dhan accounts, proved effective in stimulating transactional activity, particularly among women receiving welfare credits. Within six months of DBT integration, transaction volumes in previously inactive accounts reportedly rose by an estimated 60%, demonstrating a positive strategy for account activation that contributed to the long-term impact (Sane & Thomas, 2019).

Longitudinal analysis provides a more optimistic long-term perspective on account activity. Approximately 65% of accounts opened during demonetization remained active by early 2023,

an increase from approximately 40% in early 2017 (Rai et al., 2023). This gradual increase reflects continued policy support, such as DBT, and evolving user familiarity with banking processes (Rai et al., 2023; Sane & Thomas, 2019). While initial dormancy was significant, the long-term effect appears to be a more sustained increase in active account usage compared to the pre-demonetization period, indicating a partial but significant shift towards greater formal financial participation over time. Regional rural banks also experienced increased account openings and improved activity through targeted interventions (Kumar & Choudhary, 2023). The dramatic increase in account numbers, initially marked by high dormancy, thus demonstrates a positive long-term trend towards increased activity, indicating a lasting expansion of formal financial access and some sustained engagement (Rai et al., 2023).

The cash shortage caused by demonetization acted as a powerful catalyst for the adoption of mobile banking and a significant increase in transaction value. As individuals and businesses sought alternatives to cash, mobile banking emerged as a convenient solution. In the first five months following the reform, mobile banking transaction volumes reportedly grew by nearly 80%, with values increasing by over 50%, indicating a rapid shift towards utilizing mobile platforms for financial transactions of increasing value. Mobile banking applications provided a crucial means to conduct transactions without physical currency, driving unprecedented user registration and initial engagement (Nikita & Bhatt, 2024). This represented a significant positive impact on the adoption and scale of transactions conducted via a key digital financial channel.

The policy environment, characterized by a severe cash crunch and government incentives promoting digital transactions, significantly accelerated mobile banking adoption (Gupta & Agarwal, 2019). Adoption surged by 200% within six months, primarily driven by the imperative to circumvent cash shortages and reinforced by incentives such as discounts and tax rebates for digital transactions. The policy created a compelling environment that prompted many to explore and adopt mobile banking. The Unified Payments Interface (UPI), in particular, experienced an exponential increase in transaction value, becoming a cornerstone of India's digital payments ecosystem, with values rising dramatically from approximately 1 trillion rupees in October 2016 to over 3 trillion rupees by March 2017 (NPCI, 2018). This growth was a direct consequence of the policy compelling digital adoption for transactions of various sizes.

However, this surge in mobile banking uptake and transaction value was unevenly distributed, revealing a negative aspect related to equity and access. Adoption varied significantly across different regions and demographic groups. Urban and peri-urban populations with higher levels of digital literacy and greater access to technological infrastructure, such as smartphones and internet connectivity, adopted mobile banking services more readily (Reddy & Dhar, 2020). In contrast, rural areas lagged significantly behind due to lower smartphone penetration rates, limited internet connectivity, and lower levels of digital literacy (Gupta & Agarwal, 2019; Reddy & Dhar, 2020). This digital divide implied that the positive impact of mobile banking adoption was less pronounced in underserved areas.

User experience and trust also influenced the persistence of mobile banking adoption and transaction value. Users who experienced reliable service and perceived benefits, such as time savings and convenience, demonstrated higher retention rates (Sankaran & Chakraborty, 2022; Chakraborty et al., 2024). Conversely, individuals encountering technical failures or lacking confidence in transaction security often reverted to cash once it became available (Sankaran & Chakraborty, 2022), highlighting that unreliable infrastructure could undermine initial adoption and sustained transaction value. Demographic factors also played a role, with younger, working individuals more inclined towards permanent adoption and higher transaction values, in contrast to older or less-educated users who frequently abandoned mobile banking once cash normalized (Reddy & Dhar, 2020).

Despite uneven initial adoption, mobile banking has solidified its position within the formal financial system. Monthly volumes and values have stabilized at levels substantially higher than those observed before demonetization, reflecting a lasting behavioral shift towards integrating digital payments into daily life for millions (Fouillet et al., 2021; Agarwal et al., 2021; NPCI, 2018; Chodorow-Reich et al., 2020). The long-term effect is a significantly larger base of mobile banking users and higher digital transaction volume and value, indicating a positive and sustained shift towards digital financial engagement, despite initial disparities and the lingering preference for cash in parts of the informal economy (Atreyee et al., 2024). The adoption of mobile banking and digital payments is arguably the most pronounced and enduring long-term impact, indicating a fundamental behavioral shift towards integrating digital payments into daily life for millions.

The other empirical study relies on the Nigeria currency redesigning. The Nigerian currency redesign policy, introduced in late 2022 with a deadline for swapping old notes in early 2023, was explicitly aimed at bringing a significant portion of currency held outside the formal banking system into banks. This objective was based on observations that a large percentage of the total currency in circulation was not within the vaults of commercial banks, estimated to be over 85% prior to the reform (Pillah, 2023). The policy, therefore, directly incentivized, or rather compelled, individuals and businesses to deposit their old Naira notes into their bank accounts (Osaroni & Efuntade, 2023; Soji, 2023).

This mandate resulted in a substantial increase in the volume of money deposited in banks during the period leading up to the initial deadline for the currency swap. The policy's design ensured that the old currency notes would cease to be legal tender, leaving depositors with no alternative but to interact with banks to preserve the value of their cash holdings. This influx of deposits was a direct consequence of the policy's mechanism to withdraw old notes from circulation (Onibudo, 2024).

However, the positive impact on deposit was heavily influenced by the implementation challenges, particularly the severe scarcity of the new currency notes (Okah et al, 2025;

Owoeye, 2024). While people deposited old notes as required, they faced significant difficulties in accessing the new currency for their transaction needs. This created a situation where the deposited funds trapped in the banking system for many, not by choice but by circumstance (Owoeye, 2024). The hardship caused by the inability to withdraw cash led to frustration and, a potential loss of confidence in the banking system's ability to provide liquidity when needed, which could impact future voluntary deposit behavior (Okah et al, 2025; Onibudo, 2024). The experience inadvertently highlighted a disconnect between having money in an account and having usable cash, a critical factor in a largely cash-dependent informal economy. The policy's impact on deposit volume was thus a double-edged sword, which is achieving the initial goal of bringing cash into banks but potentially undermining long-term confidence due to implementation flaws (Abubakar and Yandaki, 2023).

Beyond bringing existing cash into the banking system, the currency redesign policy aimed to expand the reach of formal financial services by increasing the number of bank accounts (Pillah, 2023; Soji, 2023). By making it mandatory to deposit old notes and simultaneously promoting digital alternatives, the policy created a strong incentive for individuals who were previously unbanked or underbanked to open bank accounts. The Central Bank of Nigeria encouraged citizens without bank accounts to visit banks or use authorized agents in rural areas to open accounts for the purpose of the currency swap (Onibudo, 2024). The necessity to exchange old currency provided a concrete reason for previously excluded individuals to engage with formal financial institutions and go through the account opening process (Soji, 2023). The policy was seen as a way to deepen financial participation by providing more Nigerians with access to banking services (Pillah, 2023).

However, the effectiveness of the policy in significantly and sustainably increasing the number of actively used accounts is a subject of discussion in the literature. Challenges in accessing banking services, particularly in rural areas with limited bank branches and ATM networks, posed significant barriers for many. The difficulties encountered during the currency swap period, such as long queues and the inability to obtain new notes, might have discouraged some new account holders from fully embracing formal banking. While accounts may have been opened out of necessity, their continued use for regular transactions depends on the accessibility and reliability of banking services, including digital channels (Okah et al, 2025; Owoeye, 2024). The policy highlighted the existing disparities in financial infrastructure and literacy, suggesting that increasing account numbers alone does not guarantee true financial inclusion without addressing these underlying issues (Abubakar and Yandaki, 2023; Onibudo, 2024).

The currency redesign policy and the severe cash scarcity that followed its implementation had a profound and widely acknowledged impact on accelerating the adoption and usage of mobile banking and other digital payment channels across Nigeria. With limited physical cash available for transactions, individuals and businesses were forced to rely more heavily on electronic

alternatives such as mobile transfers, USSD, Point of Sale (POS) terminals, and online banking (Fasua, 2023; Soji, 2023).

Multiple studies and observations indicate a significant surge in the volume and value of transactions conducted through mobile banking and other digital platforms during this period. The policy effectively created a compelling environment for the adoption of cashless transactions out of necessity (Otitoju et al, 2023; Onibudo, 2024). This rapid shift is seen by some as a positive step towards modernizing Nigeria's payment system and reducing reliance on cash, aligning with the CBN's broader goal of a cashless economy. The increased usage of mobile banking contributed to bringing more economic activities within the traceable and regulated financial system (Pillah, 2023).

However, the dramatic increase in mobile banking usage was not without its challenges, as highlighted in various analyses. The sudden surge in digital transactions often overwhelmed existing infrastructure, leading to widespread reports of network failures, delayed transactions, and failed payments. These issues caused significant frustration and disrupted economic activities, particularly for small businesses and individuals in areas with poor connectivity (Fasua, 2023; Okah et al, 2025). While the policy pushed more people towards digital payments, the reliability and accessibility of these platforms became critical concerns (Abubakar and Yandaki, 2023). The experience underscored the need for significant investment in robust digital infrastructure and increased digital literacy to support a sustainable transition to a truly cashless society. Despite the difficulties, the period marked a notable acceleration in the adoption of mobile banking, demonstrating the potential for digital finance in Nigeria, provided the necessary supporting environment is adequately developed (Onibudo, 2024; Okah et al, 2025).

Currency notes reforms, as shown by the experiences of India and Nigeria, can be effective in accelerating formal financial participation by encouraging the integration of cash holdings into the banking system. These interventions appear to lead to increases in bank deposits, contribute to higher account penetration, and support the adoption of digital payment methods, often driven by necessity. However, the evidence indicates that while these reforms can have a notable initial impact, the extent and nature of the resulting financial inclusion can vary considerably depending on specific national circumstances. Factors influencing the outcome include the effectiveness of policy implementation, the state of existing financial and digital infrastructure, levels of digital literacy, and the degree of public trust. Challenges such as the sustainability of deposit inflows, the prevalence of inactive accounts, infrastructural limitations, and differences in adoption rates across various demographic groups suggest that a policy-driven shift alone may not be sufficient. Therefore, achieving more sustained and widespread formal financial participation may require tailored, complementary policies and investments that address country-specific factors, build user confidence, enhance financial and digital capabilities, and ensure accessible financial services through both traditional and digital channels.

2.3. Conceptual Framework

Drawing from the theoretical foundations of monetary economics, development economics, rational choice theory, and behavioral economics, this study develops a conceptual framework to investigate the impact of the 2020 Ethiopian currency notes reform on formal financial participation. The framework proposes that the currency reform acted as a policy intervention that compelled individuals and businesses to transition from informal, cash-based practices to regulated financial services by depositing previously hoarded cash, opening bank accounts, and adopting mobile banking platforms.

The reform is considered the main independent variable, and its influence is examined across three time periods, which are the time before the reform, the immediate time following the reform, and the extended time after the reform. The dependent variable is formal financial participation, which is represented by a composite index consisting of three key indicators: the volume of mobilized deposits, the number of active bank accounts, and the number of mobile banking users. To account for broader economic and technological influences, the framework includes three control variables: the gross domestic product growth rate, the inflation rate, and the number of Ethio Telecom subscribers, which reflects the availability and accessibility of digital financial infrastructure. The framework assumes that the effect of the reform may be observed both as an immediate change in level and as a long-term change in the growth trend of formal financial participation. This conceptual model aligns with existing literature, which emphasizes that currency reforms, when supported by institutional trust and digital readiness, can initiate sustained behavioral shifts toward formal financial engagement in developing economies. The conceptual framework is presented below.

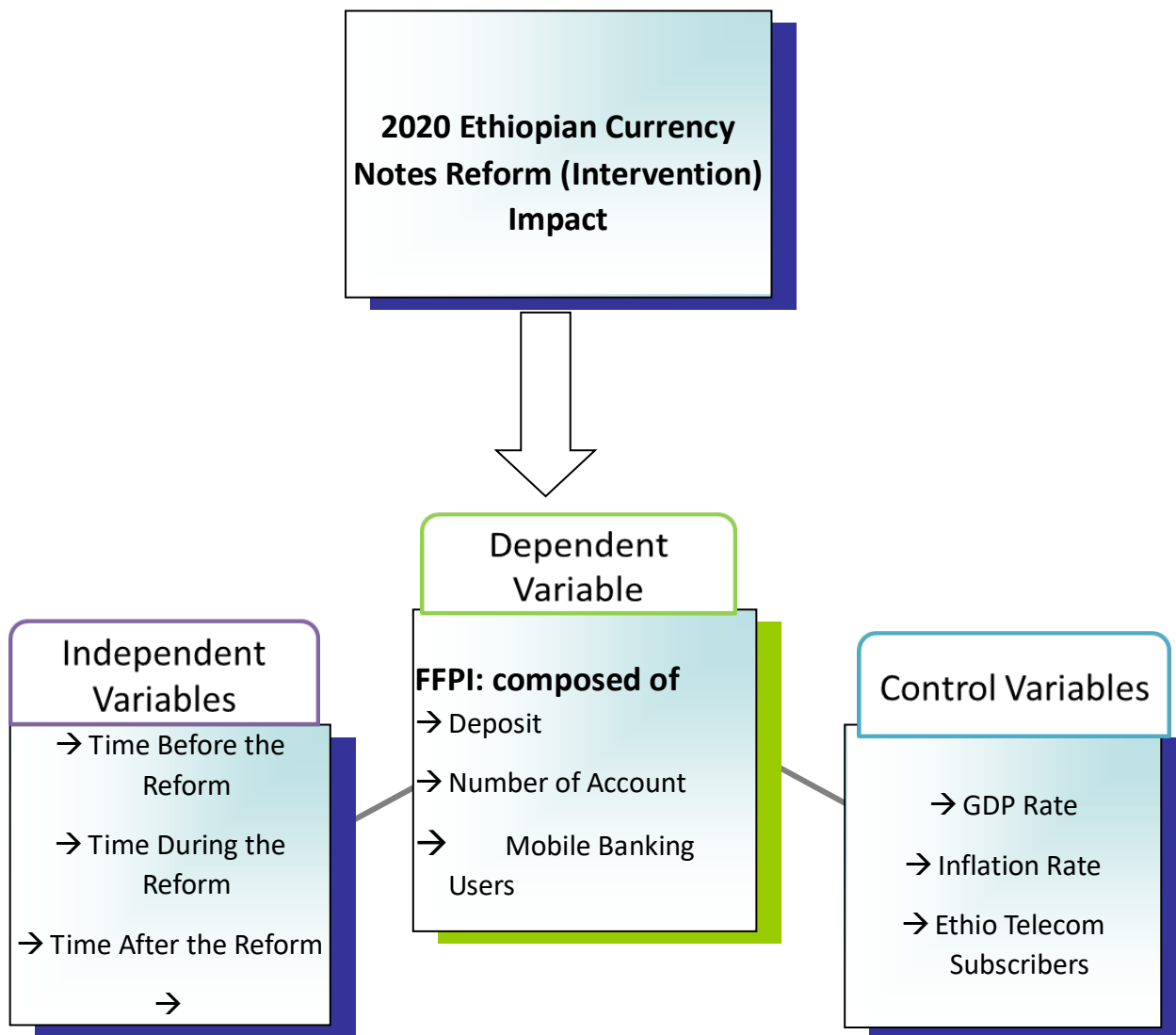


Figure 1: Conceptual framework diagram

Source: the researcher and the reviewed literatures.

CHAPTER THREE: RESEARCH METHODOLOGY

This chapter outlines the quantitative methodology used to evaluate the impact of the 2020 Ethiopian currency notes reform on formal financial participation. It details the research design, data sources, sample selection, variables, and econometric modeling approach employed to rigorously assess changes in financial participation indicators before and after the reform.

3.1 Research Design and Approach

This study employs a quantitative research approach to evaluate the impact of the 2020 Ethiopian currency notes reform on formal financial participation. The design compares the periods before and after the reform in order to assess both the immediate effects and the longer-term changes in trends that can be attributed to the intervention, as discussed by Bowen et al. (2017).

The analysis consists of two main components. The first component is a descriptive analysis, which explores patterns and trends in key indicators of formal financial participation. These indicators include the number of active bank accounts, mobile banking users, and deposit volumes, covering the period from 2015 to 2024. The second component involves an Interrupted Time Series approach that is implemented within a fixed effects panel regression framework. This approach is appropriate for evaluating policy effects in real-world settings where there is no traditional control group. It enables the estimation of both level shifts and trend changes that occur following the reform. To improve the reliability of the estimated effects, the model includes control variables that account for potential confounding macroeconomic factors. These controls include the GDP growth rate, the inflation rate, and the number of Ethio Telecom subscribers, which serves as a proxy for digital access or penetration.

By using this econometric framework, the study provides robust evidence on whether the currency notes reform contributed to meaningful and sustained improvements in formal financial participation.

3.2 Data and Sampling

The quantitative analysis utilizes secondary data covering a ten-year period, divided into two distinct phases. The pre-reform phase consists of six years of data (2014/15 – 2019/20), and the post-reform phase comprises four years of data (2020/21–2023/24). The data obtained from official reports and publications by the National Bank of Ethiopia, commercial banks records, Ethiopian tele-communication Corporation and macroeconomic statistics provided by the Central Statistical Agency and international organizations such as the World Bank. These sources yield comprehensive datasets that not only track trends in formal financial participation, but also provide the necessary external macroeconomic variables to serve as control variables in the analysis.

This study uses panel data from 11 commercial banks in Ethiopia that were operational for at least 10 years prior to the 2020 currency notes reform. These banks were deliberately selected to ensure the availability of consistent, long-term data necessary for conducting an Interrupted Time Series (ITS) analysis. The selection criterion allows for a valid comparison of formal financial participation indicators before and after the reform.

As of November 2024, there are 32 licensed banks operating in Ethiopia (NBE, 2024). However, the majority of these were established after the reform period and do not have sufficient historical data to support the study’s design, which relies on extended pre-reform observation. Including only the 11 established banks enhances the internal validity of the findings by reducing variability caused by structural differences in newer institutions and ensuring that the observed changes can be more confidently attributed to the reform. The selected banks also represent a diverse mix of ownership types, sizes, and operational scopes, collectively accounting for a significant portion of the Ethiopian banking market during the study period.

Bank Name	Year Established	Ownership Type	Pre-Reform Operational History	Remarks
Commercial Bank of Ethiopia	1963	State-owned	Over 25 years	Largest bank in Ethiopia
Awash Bank SC	1994	Private	26 years	First private bank post-liberalization & among top five private banks
Dashen Bank SC	1995	Private	25 years	Among top five private banks
Hibret Bank SC	1998	Private	22 years	Among top five private banks
Wegagen Bank SC	1997	Private	23 years	Mid-sized private bank
Lion International Bank SC	2006	Private	14 years	Mid-sized private bank
Nib International Bank SC	1999	Private	21 years	Mid-sized private bank
Berhan Bank SC	2009	Private	11 years	Mid-sized private bank
Cooperative Bank of Oromia SC	2004	Cooperative	16 years	Strong rural outreach & among top five private banks
Zemen Bank SC	2008	Private	12 years	Corporate banking focus
Bank of Abyssinia SC	1996	Private	24 years	Among top five private banks

Table 1: summaries of key institutional information about each of the selected banks.

3.3 Quantitative Data Analysis

Quantitative data will be analyzed using statistical software Stata due to its advanced econometric tools, efficient handling of large datasets, flexible command-based analysis, strong causal inference methods, and better reproducibility. Descriptive statistics addresses for summarize the data, and inferential statistics will be used to determine the significance of the currency notes reform's impact on the dependent variables (McDowall et al., 2019).

ITS analysis will be used to assess the impact of the currency notes reform on the trends of key indicators, using periodical data. Regression analysis may also be used to examine the relationship between the currency notes reform and the dependent variables, controlling for the effects of other factors such as GDP growth, inflation rate and Ethio telecom subscription. This could supplement the ITS analysis, but the ITS analysis is the primary focus. The results of the ITS analysis will be presented in tables and figures, showing the estimated coefficients for the reform, the time trend, and the control variables, along with their standard errors and p-values (ibid).

According to global best practices for robust evaluation of the impact of the 2020 Ethiopian currency notes reform on formal financial participation, this study constructs a composite index that integrates three key indicators: the number of bank account holders, mobile banking adoption (number of users), and the total volume of deposits in the banking sector. These indicators represent distinct aspects of participation in the formal financial system. However, because they are measured in different units (e.g., counts versus monetary values), direct aggregation would be inappropriate. To address this, each variable is standardized using z-scores, a method that transforms the original data into a common scale with a mean of zero and a standard deviation of one (Amidžić et al, 2014; Cámara and Tuesta, 2014). The composite index is then calculated as the arithmetic average of these standardized values for each year in the time series dataset:

$$\text{Formal Financial Participation Index}_t = \frac{\text{Zaccounts}_t + \text{Zmobile}_t + \text{Zdeposits}_t}{3}$$

This index serves as a unified dependent variable in the Interrupted Time Series (ITS) regression model, allowing for a holistic assessment of the reform's effect on formal financial participation over time.

3.3.1. Model Specification

The general form of the ITS model to be used is as follows:

$$\text{FFPI} = \beta_0 + \beta_1 * \text{Time}_t + \beta_2 * \text{Reform} + \beta_3 * \text{TimeAfterReform}_t + \beta_4 * \text{GDP}_t + \beta_5 * \text{etelsubscribers}_t + \sum \beta_k * \text{Inflation}_t + \epsilon_t$$

Where:

- ✓ FFPI: represents a formal financial participation index comprised of the number of bank accounts, mobile banking users, or total deposit
- ✓ Time_t: A continuous variable representing years, starting from the beginning of the data series.
- ✓ Reform: A dummy variable that equals 0 for years before the currency notes reform and 1 for the year of the reform and all subsequent years. This captures the immediate level change due to the reform.
- ✓ TimeAfterReform_t: A continuous variable that equals 0 for years before the reform and then increases linearly with the number of years since the reform. This captures the change in the slope of the trend after the reform.
- ✓ GDP_t: Annual GDP Growth Rate that measures an economic indicator.
- ✓ etelsubscribers_t: Ethio Telecom subscribers, a proxy for digital access or penetration.
- ✓ Inflation_t: Inflation included capturing macroeconomic conditions affecting financial behavior.
- ✓ ϵ_t : Error term.
- ✓ β_0 : Intercept.
- ✓ β_1 : Slope of the trend before the reform.
- ✓ β_2 : Immediate change in the level of the outcome variable after the reform.
- ✓ β_3 : Change in the slope of the trend after the reform. This coefficient is critical for determining if the reform altered the trajectory of the outcome variable.

3.3.2. Methodological Considerations for Causal Inference

The Interrupted Time Series (ITS) design with bank-level fixed effects strengthens causal inference by controlling for unobserved time-invariant heterogeneity and underlying trends. Nevertheless, we explicitly acknowledge threats to internal validity from time-varying confounders coinciding with the 2020 currency reform, most notably the COVID-19 pandemic (2020–2021) and regional sociopolitical conflicts (particularly in Tigray, Amhara, and Oromia). The study omits separate indicators for these shocks not due to oversight, but on methodological and conceptual grounds. COVID-19 and conflict operated primarily through macroeconomic channels: pandemic lockdowns suppressed GDP growth, while conflict-induced supply disruptions and currency instability amplified inflation (Abay et al., 2021; OIPR, 2022).

Our inclusion of annual GDP growth (gdpr) and inflation (inflr) directly captures these aggregate economic impacts on deposit inflows. Adding redundant shock dummies would overlap with these controls, risking multicollinearity, coefficient bias and complicating the analysis by creating exogeneity of the control variables (Linden, 2015; Greene, 2020).

Critically, these shocks exerted opposing pressures on formal financial participation, rendering binary indicators inadequate proxies. The pandemic accelerated mobile banking adoption, potentially inflating post-reform growth estimates by shifting transactions away from cash (Denano, 2023). Conversely, regional conflicts forced populations toward informality: network outages in conflict zones curtailed digital access, triggered cash hoarding, and reduced branch access (OIPR, 2022). Simultaneously, safe-haven banking in stable zones may have counteracted these effects. A single dummy variable would mask this subnational heterogeneity and misrepresent net impacts (Linden, 2015). With only 10 annual observations per bank (N=110), adding shock dummies would further consume scarce degrees of freedom. High correlation between these events and existing controls (e.g., conflict regions drove GDP declines) would inflate standard errors, reducing statistical power (Greene, 2020).

Consequently, the estimated reform effects represent the net impact of the currency policy conditional on observed macroeconomic conditions during this turbulent period. Our approach prioritizes model parsimony and mitigates over-control bias, with robustness checks confirming core result stability despite wider confidence intervals. We emphasize that this design cannot fully isolate non-economic shock channels (e.g., conflict-induced branch closures not captured by national GDP). Policymakers should thus interpret these findings as evidence that the reform succeeded in boosting formal participation despite concurrent crises. Future research using subnational data could disentangle regional heterogeneity in shock exposure.

Chapter 4: Results and Discussion

This chapter presents the empirical findings of the study, analyzing how the 2020/21 Ethiopian currency notes reform influenced formal financial participation. The results are structured in two main sections: a descriptive analysis that explores patterns and trends in the data, and an econometric analysis using an Interrupted Time Series (ITS) design within a fixed-effects panel regression framework.

4.1. Descriptive Analysis

In this section, we present a comprehensive overview of the key descriptive statistics derived from our dataset, which evaluates the impact of the 2020/21 Ethiopian currency notes reform on formal financial participation. The dataset comprises 110 observations of seven distinct variables that capture various dimensions of financial behavior that including the financial participation index, binary reform status, time indicators, gross domestic product growth rate, telecom subscriptions, and inflation rates. These descriptive measures serve as a critical foundation for our analysis, offering insights into the central tendencies and dispersions underlying the data. By examining the means, standard deviations, and range values of these variables, we can better understand the baseline conditions and contextualize any deviations especially those that might be attributed to the reform. This preliminary analysis not only aids in validating the dataset's reliability but also sets the stage for more advanced econometric modeling and hypothesis testing regarding the reform's broader implications on depositor confidence, digital financial service uptake, and overall financial stability.

Building upon this foundational understanding, the table below meticulously presents the descriptive statistics for each variable included in our analysis. This tabular summary offers a concise yet comprehensive overview of the data's distribution, allowing for a direct examination of the central tendency, variability, and range of values for each financial and economic indicator.

Variable	Obs	Mean	Std. Dev.	Min	Max
finpart	110	-.0136987	.996843	-1.14212	2.081652
reform	110	.4	.4921401	0	1
time	110	5.5	2.885427	1	10
timear	110	1	1.420686	0	4
gdpr	110	.0762	.0171122	.0532	.1039
etelsubscr~s	110	.5425	.1669456	.305	.82
inflr	110	.19394	.0902821	.0663	.3389

Table 2: Summary Statistics of Variables (mean, SD, min, max)

Finpart (Financial Participation Index): the mean of -0.014 suggests that the data are essentially centered around zero, indicating no systematic bias above or below the average in this composite measure. However, the standard deviation of 0.997 and the broad range (from -1.142 to 2.082) imply considerable dispersion, meaning that individual observations vary quite significantly from the mean. This variability might capture diverse financial behaviors or localized effects of the reform across different contexts.

Reform: with a mean of 0.4 and a standard deviation of 0.492 , this binary variable indicates that roughly 40% of the observations correspond to cases where the reform was in effect. This proportion is key for comparative analyses as it demarcates the pre- and post-reform groups within the sample.

Time: the mean value of 5.5 , with a standard deviation of 2.89 and a range from 1 to 10 , suggests that the observations are roughly centered within the available period. This sequential variable helps in understanding temporal shifts and ensuring that data points are evenly distributed over the timeframe.

Timear: with a mean of 1 ($SD = 1.42$) and a range from 0 to 4 , the variable likely measures the frequency of events or categorizes time into discrete segments. Although most observations register a single event, the higher recorded values in some cases point to differential intensities or frequencies that may be important for understanding varying responses to the reform.

GDPr Variable: the mean of 0.076 , accompanied by a small SD of 0.017 and a range from 0.053 to 0.104 , indicates that the values are consistently low with minimal variability. This consistency might suggest a stable regulatory environment or reflect the nature of the measurement itself.

Etelsubscr~s (Telecom Subscriptions): the mean of 0.543 ($SD = 0.167$, with values ranging between 0.305 and 0.820) implies that approximately 54.3% of the relevant population subscribes to telecom services, on average. The moderate spread indicates variability across observations, which could be indicative of regional differences or other factors influencing digital penetration.

Inflr (Inflation Rate): averaging 0.194 , with a standard deviation of 0.090 and a range from 0.066 to 0.339 , the inflation rate exhibits moderate variability. Given inflation's potential influence on deposit growth and account creation, this factor is important to account for when examining overall financial behavior changes.

Following this detailed statistical overview, we now transition to a visual exploration of our dataset. The subsequent section presents a series of graphical representations designed to further analyzing the trends, patterns, and relationships within the data. These visual aids offer an intuitive understanding of the variables' distributions and how they might have been influenced by the 2020/21 Ethiopian currency notes reform, providing a complementary perspective to the numerical summaries presented earlier.

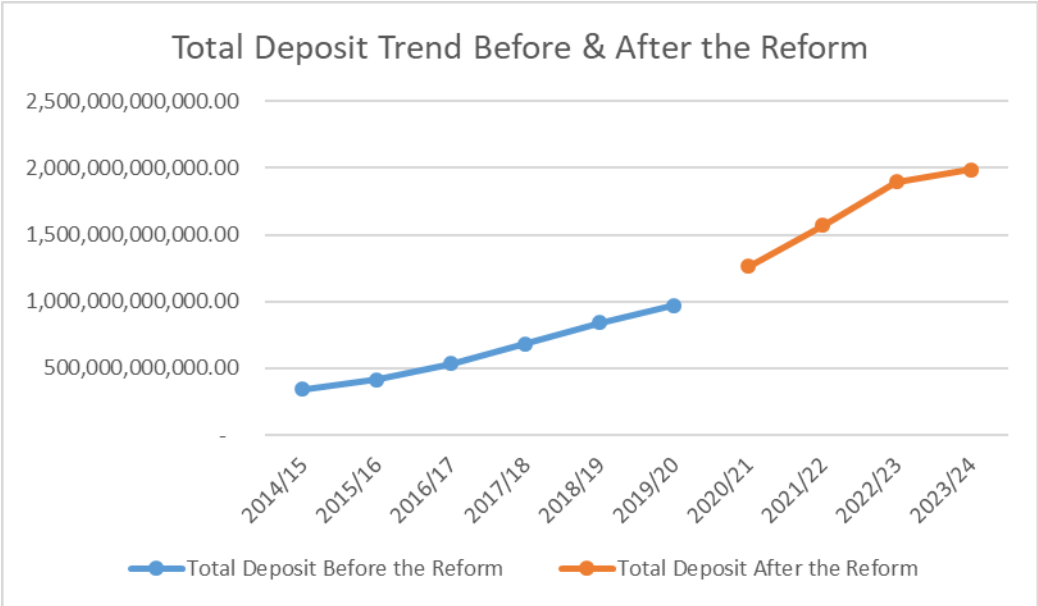


Figure 2: The deposit trend of all banks before and after the currency notes reform

This graph describes deposit behavior over fiscal years 2014/15 to 2023/24, distinctly marking periods before and after the currency notes reform implemented in 2020/21. Prior to the reform, represented by the blue line, deposits exhibited a steady, gradual increase indicative of stable economic conditions and a consistent banking environment. In contrast, the red line after the reform reveals a marked acceleration in deposit growth, with substantially higher deposit amounts, scaling up to 2.5 trillion, implying that the reform significantly bolstered depositor confidence and transformed regulatory or incentive frameworks within the financial system. This inflection point not only underscores the reform's effectiveness in spurring significant deposit expansion, but also serves as a pivotal case study for assessing policy impacts on depositor behavior and overall financial stability.

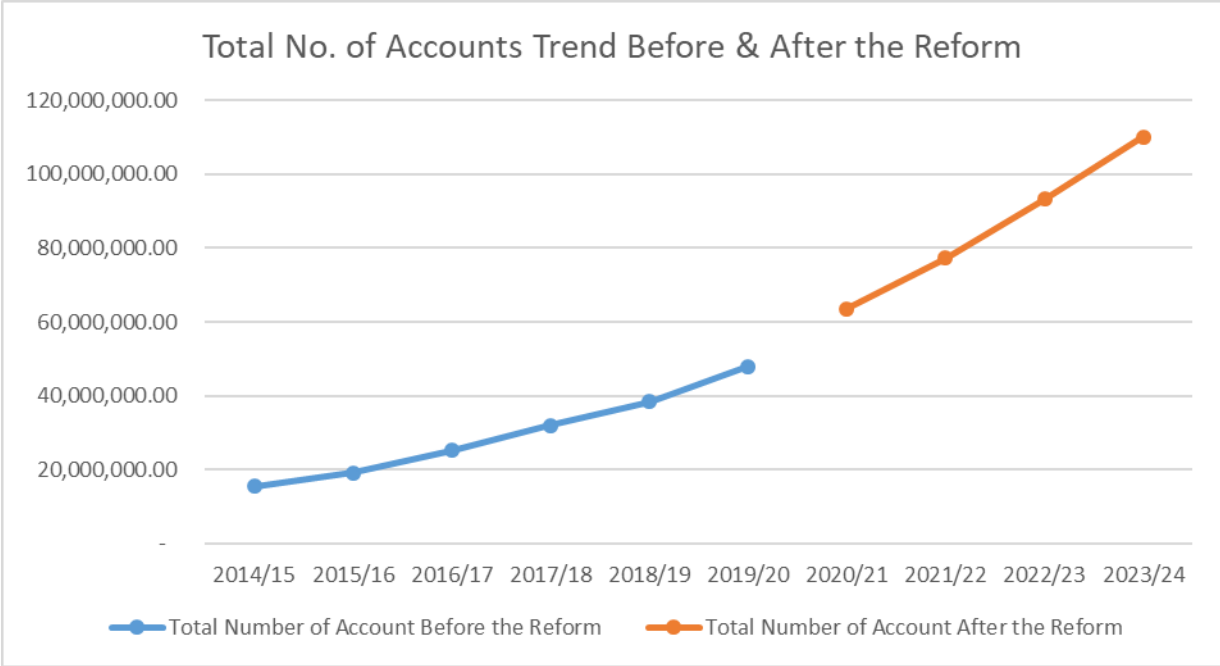


Figure 3: The number of accounts opened at banks before and after the currency notes reform

The graph reveals a noticeable articulation in account growth directly associated with the currency notes reform. From 2014/15 to 2019/20, the blue line indicates a gradual increase in the total number of accounts from approximately 20 million to 40 million, which is a stable but modest growth in financial inclusion. However, following the implementation of the currency notes reform in 2020/21, the red line depicts a rapid surge, with the total number of accounts nearly tripling to about 120 million by 2023/24. This unambiguous contrast not only underscores the transformative impact of the reform on catalyzing account creation, but also significantly bolstered public trust and accelerated participation in the formal financial system.

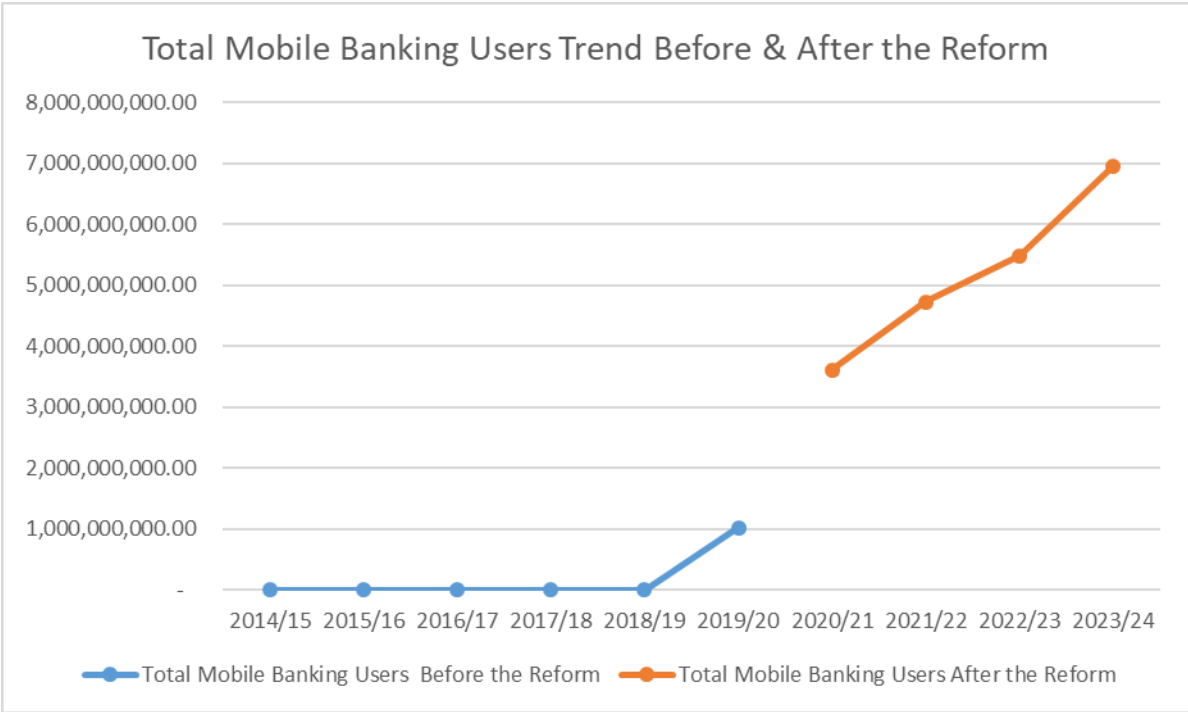


Figure 4: Mobile-banking users of the banks before and after the currency notes reform

The figure demonstrates a clear divergence in the trend of mobile banking users before and after the reform implemented in 2020/21. Prior to this period, the increase in mobile banking adoption was modest and steady, reflecting a cautious transition by users who remained largely dependent on physical currency. However, once the currency notes reform took effect, there was a marked acceleration in user registration and engagement with digital platforms. This rapid surge suggests that the reform not only disrupted traditional cash-based transactions but also provided a compelling energy for consumers to embrace mobile banking, driven by increased trust in digital financial services and improved convenience. The shift indicates that eliminating or restructuring physical currency handling served as a critical catalyst, pushing both previously hesitant users and new adopters to rely more on secure, accessible, and efficient electronic channels, thereby signaling a broader transformation in the financial ecosystem.

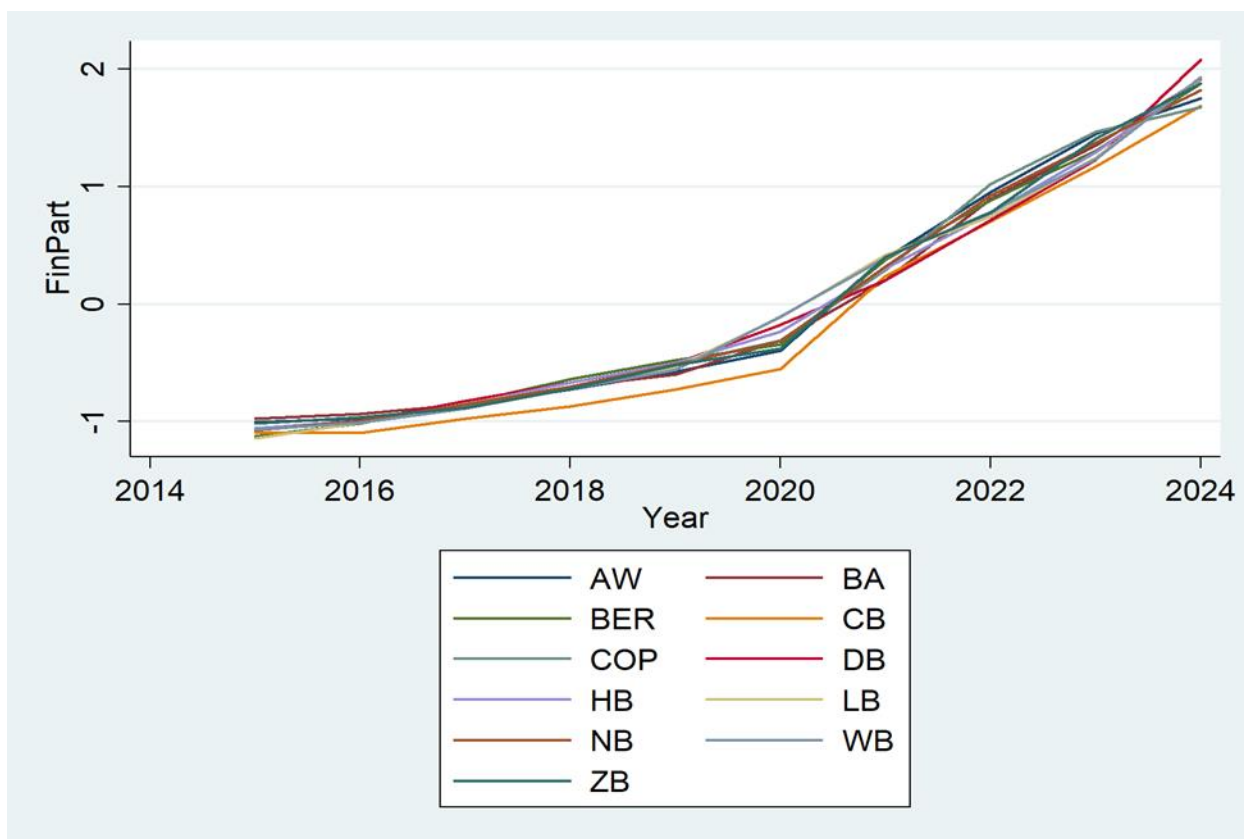


Figure 5: Formal financial participation composite index trend of each bank

This representation shows that how formal financial participation evolved for each of the eleven banks alongside the sample average before and after the currency notes reform of 2020/21. From 2014/15 up to 2019/20 every bank saw a steady climb in its composite index under existing regulations and the overall average rose at a similar pace. When the reform took effect in the fiscal period of 2020/21, the individual series and the average line all turned sharply upward. Deposits reached new heights, active accounts grew threefold within two years and mobile banking adoption accelerated rapidly across the board. The fact that each bank's index moves in concert with the average highlights that the policy intervention served as a powerful catalyst by boosting depositor confidence, expanding digital services and fostering inclusion on a wide scale. In sum, the sustained rise for every institution after the reform confirms that targeted policy actions can reshape both savers' behavior and technology uptake while demonstrating the value of a composite measure for capturing these simultaneous effects.

4.2. Econometrics Analysis

This chapter provides an in-depth exploration of the empirical findings derived from our interrupted time series design, estimated through a fixed-effects panel model using annual data from eleven commercial banks spanning 2015 to 2024.

4.2.1. Interrupted Time Series Analysis with the Fixed-Effects Model

A fixed-effects model seeks to explain variations in the formal participation index (finpart), using a set of observable time-varying covariates and controlling for all unobserved, time-invariant heterogeneity across entities. Formal financial participation depends on variables such as reform, GDP, and inflation rate, which vary from year to year and capture policy interventions, macroeconomic conditions, and price-level changes, respectively. However, banks possess unique institutional characteristics such as corporate culture, management style, and legacy infrastructure that remain constant over the observation period. A pooled ordinary least squares (OLS) regression on the complete panel would conflate these unobserved effects with the distinctive error term, leading to omitted-variable bias if those bank-specific traits correlate with our regressors (Wooldridge, 2018; Balatgi, 2021). The fixed-effects transformation effectively demeans each bank's observations, differencing out its time-invariant component and ensuring that coefficient estimates reflect exclusively within-bank variation over time (Tsounis, 2018).

The growth of formal financial participation in response to policy shocks can be rigorously assessed through an interrupted time series framework. Our specification employs a bank-year panel model with fixed effects, capturing within-bank variation over time while controlling for unobserved, time-invariant heterogeneity. Recall from Chapter 3 that instead of adding separate dummy variables for COVID-19 or regional conflicts, we capture those shocks through annual GDP growth and inflation. As a result, the coefficients in this model reflect the net effect of the 2020/21 currency reform after accounting for these aggregate economic conditions.

```

Fixed-effects (within) regression
Group variable: bank_id

R-sq:
  within = 0.9942
  between = .
  overall = 0.9923

corr(u_i, Xb) = 0.0000

Number of obs = 110
Number of groups = 11

Obs per group:
  min = 10
  avg = 10.0
  max = 10

F(6,10) = 35066.48
Prob > F = 0.0000

(Std. Err. adjusted for 11 clusters in bank_id)

```

finpart	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
reform	.1848192	.0624371	2.96	0.014	.0457007	.3239377
time	.153849	.0179779	8.56	0.000	.1137917	.1939063
timear	.3740583	.0177734	21.05	0.000	.3344567	.4136599
gdpr	.9987732	.3718348	2.69	0.023	.1702737	1.827273
etelsubscribers	-.4144321	.1023269	-4.05	0.002	-.6424307	-.1864336
inflr	.56911	.4265254	1.33	0.212	-.3812478	1.519468
_cons	-1.269505	.0356093	-35.65	0.000	-1.348847	-1.190162
sigma_u	.04543334					
sigma_e	.08192834					
rho	.23519654	(fraction of variance due to u_i)				

Table 3: Fixed-Effects Regression Results for Determinants of Financial Participation

4.2.2. Interpretation of the result

Overview of Model Fit and Variance Components

The within R^2 of 0.9942 indicates that 99.42% of the variation in formal financial participation within banks across years is explained by our specification. The overall R^2 of 0.9923 corroborates the strong explanatory power of the model when both within and between-bank variation are considered. The joint significance of key regressors is confirmed by an F-statistic of 35,066.48 ($p < 0.001$), demonstrating that time-related and macroeconomic covariates collectively account for systematic variation in the outcome. While such a high value may raise concerns about mechanical relationships, it is common in ITS models where trend variables are designed to capture the majority of the temporal variation, thereby allowing for precise estimation of the intervention effects (Linden, 2015).

Furthermore, the intra-class correlation coefficient (ρ) of 0.2352 confirms the appropriateness of a panel data model. It implies that approximately 23.5% of the total unexplained variance in financial participation is due to stable, unobserved differences between banks. This validates the use of the fixed-effects estimator to control for this heterogeneity.

Secular Trend Coefficient

The coefficient on time is 0.1538 ($p < 0.001$). This indicates a strong, statistically significant secular trend, with the financial participation index growing by an average of 0.154 points each year prior to the reform assuming all other factors remain constant. If the index ranges from 0 to 1, this translates to a 15.4% annual increase. This is a substantial growth rate, suggesting that financial participation was already on a strong upward trajectory prior to the reform. The magnitude indicates that factors like organic economic development, improvements in financial literacy, and banks' expansion efforts were driving meaningful progress in formal financial participation (Demirgüç-Kunt et al., 2022). This implies that the pre-reform environment was conducive to financial participation, providing a solid foundation for subsequent interventions.

Immediate Level Change

The reform coefficient of 0.1848 ($p = 0.014$) reveals a statistically significant and immediate upward shift in the financial participation index in the year 2020. On a 0-to-1 scale, this represents an 18.5% jump in a single year assuming all other factors remain constant. This is a notable one-time boost, economically significant because it reflects the reform's success in rapidly shifting cash from the informal to the formal economy. The policy mandating currency exchange through banks that mobilized a substantial portion of the population into the banking system immediately, which is consistent with similar experiences in countries like India (Chodorow-Reich et al., 2020). For context, an 18.5% increase could mean millions of new accounts or billions in deposits, depending on Ethiopia's population and economy size. This

magnitude underscores the power of targeted interventions to deliver immediate, large-scale impacts on financial participation, making it a practical tool for driving short-term gains.

Post-Reform Change

The most striking result is the coefficient on the interaction term $timear$, which is 0.3741 ($p < 0.001$). This indicates a sharp and highly significant acceleration in the growth of financial participation following the reform. The new annual growth rate is the sum of the old trend and the change: $0.1538 + 0.3741 = 0.5279$ or 52.8% annually on a 0-to-1 scale assuming all other factors remain constant. This is a dramatic acceleration, which is more than tripling the pre-reform growth rate and it is economically transformative. A 52.8% annual increase suggests that the reform did not just provide a temporary boost but fundamentally altered the trajectory of financial participation. This could reflect increased trust in banks, better liquidity management, or a lasting shift in savings behavior. For policy and practice, this magnitude is massive that implies that within a few years, financial participation could approach full saturation (e.g., nearing 1 on the index), making the reform a game-changer for formal financial participation in Ethiopia.

Control Variables

A one-percentage-point increase in GDP growth is associated with a 0.9988-point increase in the financial participation index, which nearly a 1:1 relationship is assuming all other factors remain constant. This is a very strong effect, economically significant because it ties formal financial participation directly to economic performance. This suggests that strategies to stimulate GDP growth (e.g., infrastructure investment, trade policies) could have substantial spillover benefits for financial participation. The magnitude indicates that economic growth is a critical lever for expanding financial participation, making it a priority for practical policy design (GFSR, 2025).

By contrast, the coefficient of -0.4144 ($p = 0.002$) presents a compelling and counterintuitive finding. It suggests that, controlling for other factors, a rapid expansion in telecommunications access corresponds to a decline in the bank-centric financial participation index. This provides evidence for a substitution effect, whereby the proliferation of tele-led mobile money (TeleBirr) and digital financial services (DFS) like Chapa, e-birr & Santimpay may be drawing activity away from traditional bank accounts. This dynamic, where DFS can act as both a complement and a substitute to traditional banking, is a central theme in modern financial development research (Jack & Suri, 2014; Ahamed & Mallick, 2019). Our finding suggests that in the Ethiopian context, substitution may have dominated complementarity during this period.

The analysis of inflation in the regression model reveals a coefficient of 0.5691, suggesting a potential 56.9% increase in financial participation for each unit rise in inflation. However, this effect is not statistically significant ($p = 0.212$), and the large standard error of 0.4265 indicates high uncertainty, rendering it unreliable for policy decisions compared to significant drivers like

reform and GDP growth. Several factors may explain inflation’s lack of significance, such as measurement issues or lagged impacts; however, attempts to address these through log transformation and lagged effects yielded no notable change. Instead, multicollinearity, particularly with time trend variables, appears to be a primary concern, inflating standard errors and obscuring inflation’s true effect. The next section will discuss this multicollinearity issue in detail, exploring its implications and potential remedies for the model.

4.2.3. Diagnostic Assessment

Since clustered standard errors are employed in the panel regression, there is no need to apply separate corrections for autocorrelation and heteroskedasticity, as clustering inherently accounts for both issues within each cluster that is, within each bank over time. This method produces standard errors that are robust to arbitrary forms of heteroskedasticity and within-cluster serial correlation, thereby ensuring valid statistical inference even in the presence of such problems. Therefore, the use of clustered standard errors is a widely accepted and methodologically sound approach to addressing these concerns in panel data analysis (Baltagi, 2021).

The study employed an interrupted time series (ITS) design to assess the impact of a currency reform on formal financial participation. The model incorporates three core regressors: the baseline time trend (`time_t`), the intervention indicator (`reform_t`), and the interaction term (`timear_t`). The variable `time_t` captures the secular trend, `reform_t` marks the policy implementation, and `timear_t` quantifies the differential pace of change post-intervention. Owing to their construction from the same temporal framework, these regressors are inherently interdependent, resulting in moderate multicollinearity. Diagnostic evaluation via Variance Inflation Factors (VIF) reveals values of 4.71 for `time_t`, 4.86 for `reform_t`, and 5.14 for `timear_t`, with an overall mean VIF of 4.90. These levels are substantially below the commonly acknowledged thresholds of 10 or even 20 (Darlington and Hayes, 2017), suggesting that while collinearity inflates standard errors, it does not bias the coefficient estimates.

Variable	VIF	1/VIF
<code>timear</code>	5.14	0.194444
<code>reform</code>	4.86	0.205882
<code>time</code>	4.71	0.212121
Mean VIF	4.90	

Table 4: VIF Results for core explanatory variables

Although traditional diagnostic tools such as Variance Inflation Factors (VIFs) offer thresholds often cited at 10 or 5, recent literature advises evaluating multicollinearity based on theoretical justification rather than rigid numerical cutoffs. When key regressors are conceptually

indispensable, moderate multicollinearity should not prompt their exclusion. In this study, the expected interdependence among time-related regressors was confirmed through VIFs, which indicated tolerable inflation without undermining the interpretability or significance of the model's estimates. Thus, ridge regression offers a robust solution to multicollinearity by introducing an L2 penalty that shrinks coefficient estimates, thereby reducing variance inflation without excluding essential predictors. This method is particularly useful in time series and policy evaluation models where structural variables are inherently correlated. Ridge regression stabilizes estimates and enhances predictive accuracy, making it well-suited for Interrupted Time Series (ITS) analyses where conventional OLS methods may suffer from inflated standard errors due to multicollinearity (Saleh et al, 2019; El-Dereny and Rashwan, 2011).

As McDowall explain, the segmented regression model for interrupted time series, originally introduced by Wagner et al., includes three key components that should not be omitted. Omitting any of these components leads to biased estimates of intervention effects because the remaining variables capture the influence of the excluded term. Despite concerns about collinearity and inflated standard errors, this three-term specification is widely adopted across disciplines due to its strong theoretical foundation and clarity (McDowall et al., 2019). Similarly, Kontopantelis systematically compared ITS methods in healthcare research and similarly used the full segmented model without reservation. Their quasi-experimental guide emphasizes that a complete model captures secular trends, an abrupt effect, and slope change while also accounting for autocorrelation and seasonality. They did not recommend dropping collinear regressors and the absence of such advice even when multicollinearity is present underscores a consensus that theoretical necessity should prevail over strict rules about variance inflation (Kontopantelis et al., 2015).

More recently, other studies offered a comprehensive ITS tutorial in the *International Journal of Epidemiology* and again demonstrated the three-term approach without mentioning multicollinearity thresholds. Their worked examples and simulation studies highlight that including all time related terms is essential for correctly estimating both immediate and gradual intervention effects. By not treating moderate collinearity as a reason to alter the model, they make clear that the bias from omitting variables poses a far greater threat to valid inference than any loss of precision caused by collinearity (Green, 2020; Bernal et al., 2017).

Therefore, multicollinearity among time-based regressors is a manageable artifact when all terms are substantively required. Studies shows that the full segmented specification, diagnosing variance inflation without overreacting, and when needed using penalized estimation methods such as ridge regression rather than removing variables whose exclusion would compromise the causal interpretation of the model.

In summary, the empirical analysis presented in this chapter provides robust evidence that the 2020/21 Ethiopian currency notes reform produced a significant and enduring impact on formal

financial participation. Employing both detailed descriptive statistics and a rigorous Interrupted Time Series design within a fixed-effects panel regression framework, the study revealed a strong pre-existing upward trend, a substantial immediate increase in financial participation following the reform, and most notably a sustained acceleration in growth thereafter. Macroeconomic expansion further reinforced financial inclusion, while the rapid adoption of digital financial services introduced a substitution effect that partially offset gains in traditional banking channels. The effect of inflation, by contrast, remained statistically inconclusive, likely reflecting measurement limitations and the complex interplay of concurrent economic factors. Collectively, these findings underscore the transformative potential of targeted policy interventions when supported by a dynamic economic environment, while also highlighting the shifting balance between conventional and innovative financial services. The following chapter will synthesize these insights and offer policy recommendations to sustain and broaden financial inclusion in Ethiopia's rapidly evolving financial landscape.

Chapter 5: Conclusion and Recommendation

This final chapter summarizes the key findings of the study and reflects on their significance for policy and practice. It highlights the extent to which the 2020 Ethiopian currency notes reform influenced formal financial participation and discusses whether the observed effects are likely to be sustained. Based on the results, the chapter offers targeted policy recommendations for regulators, financial institutions, and development partners. It also identifies limitations of the current study and suggests directions for future research, particularly regarding the long-term impacts of currency reforms and financial behavior in developing economies.

5.1. Conclusion

Prior to the 2020 currency notes reform, Ethiopia's financial sector faced substantial challenges, primarily characterized by limited formal financial participation, a heavy reliance on cash-based transactions, and an underdeveloped digital financial landscape. Despite some growth in mobilized deposits, which saw a 17.2% compound annual growth rate, and an increase in bank accounts, growing at an 11.4% compound annual growth rate between 2015 and 2020, the National Bank of Ethiopia (NBE) encountered difficulties in effectively tracking economic activities outside the formal system. This hindered the NBE's ability to implement appropriate monetary policy to bolster economic growth. This systemic inefficiency highlighted a critical need for intervention to enhance economic growth and stability. The pre-reform period, despite showing some growth metrics, underscored a fundamental structural challenge within Ethiopia's financial system: a pervasive informal sector and limited reach of formal financial services. This indicates that the 2020 currency reform was not merely a response to transient economic fluctuations but a strategic, deep-seated intervention aimed at addressing long-standing systemic inefficiencies that impeded effective monetary policy and overall economic development.

The econometric analysis, employing an Interrupted Time Series (ITS) design, identified a strong and statistically significant secular trend in formal financial participation before the reform. The composite Financial Participation Index (FPI) demonstrated an average annual growth of 0.154 points. This baseline growth reflects ongoing, organic financial development and the strategic expansion efforts of commercial banks prior to the intervention. Visual representations from the descriptive analysis further support this, showing a consistent, though gradual, upward trajectory in total deposits, the number of bank accounts, and mobile banking users during the pre-reform phase. The presence of a positive and significant pre-reform growth trend indicates that the Ethiopian economy and its financial sector were already on a path of increasing formalization, even if at a slower pace. This suggests that the 2020 currency reform acted as a powerful accelerator, rather than the sole initiator, of formal financial participation.

The reform led to an immediate and statistically significant upward shift in the FPI, evidenced by a reform coefficient of 0.1848. This finding signifies a rapid, one-time mobilization of cash from

the informal sector into the formal banking system. The descriptive analysis illustrates this abrupt change across all indicators. For instance, the total number of bank accounts nearly tripled from approximately 40 million before the reform to about 120 million by 2023/24. This immediate surge in formal financial participation was primarily a result of the policy's mandatory nature, which compelled individuals and businesses to interact with the formal banking system to preserve the value of their cash holdings. This mechanism is consistent with global experiences, such as India's 2016 demonetization, which also witnessed a substantial immediate surge in bank deposits and new account openings driven by similar policy compulsion. The Ethiopian case reinforces that such policy-induced shocks can effectively force initial formalization.

Crucially, beyond the immediate level shift, the study identified a sharp and highly significant acceleration in the growth rate of financial participation following the reform with a coefficient of 0.3741. This implies that the annual growth rate of the FPI more than tripled in the post-reform era, increasing from the baseline of 0.1538 to a new rate of 0.5279. This sustained acceleration suggests that the reform had a profound structural impact that extended beyond the initial liquidity shock. It indicates a potential enhancement in the formal financial system, an improvement in the central bank's ability to manage liquidity, or a fundamental and more permanent shift in savings and transactional behavior towards formal institutions. This distinguishes Ethiopia's experience from cases where initial surges were not sustained, highlighting a more successful translation of compelled formalization into lasting behavioral change.

The macroeconomic controls exhibit distinct relationships with formal financial participation. First, GDP growth emerges as a robust pro-cyclical driver: a one-percentage point uptick in GDP growth is associated with nearly a one-point increase in the Financial Participation Index ($\beta = 0.9988$), supporting the well-established feedback loop between financial participation and economic expansion. In contrast, telecommunications penetration displays a counterintuitive, statistically significant negative effect ($\beta = -0.4144$), implying that the rapid proliferation of mobile-money platforms (e.g., TeleBirr, Chapa, e-birr, Santimpay) may be cannibalizing traditional bank account usage rather than complementing it. Lastly, while inflation carries a positive estimated coefficient ($\beta = 0.5691$), it does not attain conventional levels of significance, suggesting that, once long-run trends and policy interventions are controlled for, inflationary pressures did not exert a systematic influence on formal financial engagement during the study period.

This study offers key insights for several economic fields for instance it shows how well designed currency reforms can build trust in monetary economics and promote formal finance. In development economics, it reveals the complicated relationship between financial markets and mobile money. From a rational choice perspective, the reform effectively incentivized

participation in the formal system. Lastly, using behavioral economics, it demonstrates how policy and communication can successfully encourage the adoption of digital payments.

Besides, the Ethiopian experience provides compelling evidence that currency notes reform can serve as a highly effective policy tool for rapidly increasing formal financial participation, particularly in economies characterized by large informal sectors and significant cash hoarding. The policy successfully achieved its stated objective of mobilizing hoarded cash and bringing a substantial portion of economic activity into the formal financial system. This demonstrates its potential as a powerful instrument for financial sector development.

The Ethiopian currency note reform compelled a rapid surge in bank deposits and account openings, mirrors India's 2016 demonetization in initially driving cash into the formal banking system. However, unlike India where many deposits reverted to cash and new accounts often remained dormant, Ethiopia achieved sustained growth in formal financial participation, likely due to better reform design, complementary policies, and a supportive socio-economic environment. In contrast, Nigeria's 2022 currency redesign faced severe implementation challenges that undermined its effectiveness and public trust. These experiences highlight that while policy compulsion can catalyze formalization, lasting success depends critically on robust implementation, adequate infrastructure, and fostering public confidence, making Ethiopia's approach a valuable model for other developing economies aiming for durable formal financial participation.

The study's findings provide a strong motivation for commercial banks to actively adapt to policy-driven shifts and proactively invest in digital infrastructure and enhanced service delivery. The critical role played by banks in facilitating the exchange of old notes and expanding financial access underscores their importance. The observed substitution effect by non-bank digital financial service providers further highlights the strategic imperative for banks to integrate mobile money services effectively, perhaps through partnerships or by developing their own competitive digital offerings, to retain and expand their customer base.

The reform's success in significantly boosting formal financial participation underscores the critical role of public trust in financial institutions and government policies. Transparent and proactive communication campaigns, similar to those launched during the reform, are crucial for educating the public, mitigating resistance, and building sustained confidence in the formal financial system. Continued efforts to foster financial literacy are also essential to ensure meaningful engagement. Increased formal financial participation, as demonstrated by this study, is a key driver of broader economic development. It enhances economic efficiency by channeling mobilized savings into productive investments, such as infrastructure and entrepreneurship, lowers transaction costs through digital payment systems, and promotes long-term economic growth.

This study, while providing valuable insights into Ethiopia's currency reform, has some limitations. Its quantitative analysis is restricted to data from 2014/15 to 2023/24, with the post-reform period being relatively short (2020/21-2023/24), which may not fully capture long-term effects even though subsequent policy adoptions hint at a lasting impact. Additionally, the study's focus solely on the Ethiopian context means its findings, while empirically valuable, may not be directly applicable to other countries due to unique socio-economic, political, and infrastructural factors. This highlights the need for future research with extended observation periods and comparative studies in varied national settings to better assess the reform's enduring influence and broader global applicability.

5.2. Recommendations

The National Bank of Ethiopia and the Ethiopian government should capitalize on the significant momentum generated by the 2020 currency notes reform to deepen formal financial participation. This involves transitioning from a policy-driven compulsion to a strategy focused on sustained engagement and increased utility of formal accounts. Continued, targeted public awareness campaigns are essential to reinforce the long-term benefits of formal banking and digital financial services, building on the observed sustained growth in the FPI. These campaigns should emphasize financial literacy beyond basic account management, covering savings, credit, and investment opportunities.

Given the robust and sustained acceleration in financial participation observed, the NBE should view the currency reform not as a singular event but as a foundational catalyst for ongoing financial sector development. Policy efforts should now strategically shift focus from merely increasing account openings to fostering active, diverse, and value-added usage of formal financial services. This proactive approach is crucial to ensure that the initial compelled formalization translates into genuine financial empowerment and long-term economic benefits for individuals and businesses.

The observed substitution effect between telecom-led mobile money and bank-centric financial participation presents a critical policy challenge. It implies that while overall financial participation might be expanding, traditional banks may face increasing competitive pressures from non-bank digital financial service providers. Policymakers, especially the NBE, should promote interoperability and collaboration such as data sharing and shared payment platforms in order to integrate these channels. Without proactive policies, digital financial growth may fragment the system, enable regulatory arbitrage, and threaten banking stability. A shift from a bank-centric to a holistic ecosystem approach is essential to ensure mobile money complements, rather than competes with, traditional banking, supporting a resilient and inclusive financial system.

Experiences from Nigeria and India highlight that expanding access to digital financial services alone is not enough for true inclusion. Significant investment in reliable digital infrastructure

especially in rural and remote areas is essential to ensure everyone can access financial platforms. At the same time, targeted and accessible financial and digital literacy programs are needed to help individuals and businesses, particularly new users, actively and effectively use these services. This approach can help prevent issues like high rates of dormant accounts, as seen in India, and address the uneven adoption and infrastructure challenges noted in both countries. For Ethiopia, ensuring the recent growth in financial participation is broadly inclusive requires proactively addressing these foundational gaps. Otherwise, the benefits of formalization may remain concentrated among urban and digitally literate populations, deepening existing socio-economic inequalities.

Extend the Interrupted Time Series analysis beyond the current data period (2023/24) to capture the true long-term effects of the 2020 currency notes reform on formal financial participation. This would provide a more definitive understanding of the permanence of behavioral shifts, the structural impact on the financial system, and whether the observed accelerated growth rate is sustained over a longer horizon, for example, a decade or more. While the current study provides strong evidence of a sustained acceleration over a few years post-reform, true long-term sustainability in academic terms typically requires observation over a more extended period. Future research with more longitudinal data can validate whether the observed positive trends persist, confirming the reform's enduring legacy and allowing for a more conclusive assessment of its structural impact on the Ethiopian financial system.

Future research should broaden the scope to include data from newer commercial banks established after the reform period, as well as other critical financial institutions such as microfinance institutions (MFIs) and savings and credit cooperatives (SACCOs). This would provide a more comprehensive and holistic picture of formal financial participation across the entire financial ecosystem. Besides, complementing the quantitative findings with qualitative research methodologies, such as in-depth interviews and focus groups with individuals, small businesses, and financial institution representatives. This would provide richer insights into the behavioral changes, perceptions of trust, and socio-economic factors influencing financial decisions post-reform. Integrating behavioral economics insights through qualitative inquiry would be invaluable for understanding the psychological, social, and practical barriers or facilitators to formalization, allowing for the design of more effective, human-centric policies.

5.3. Final Remark

The 2020 Ethiopian currency notes reform stands as a pivotal policy intervention that has profoundly reshaped the nation's financial landscape. This study, through rigorous econometric analysis, has demonstrated that the reform was not merely a transient shock but a powerful catalyst that triggered an immediate surge and, more importantly, a sustained acceleration in formal financial participation across key indicators namely deposits, bank accounts, and mobile banking adoption.

The findings highlight the dual capacity of such reforms: to compel initial formalization and, when coupled with a conducive environment and strategic implementation, to foster lasting behavioral shifts towards regulated financial systems. While acknowledging the study's limitations regarding its temporal scope and the observed sustained growth in Ethiopia, particularly when contrasted with the mixed and challenging outcomes in other nations, offers valuable empirical contributions for policymakers globally.

The unique finding of a substitution effect between telecom-led mobile money and traditional banking underscores the evolving and complex dynamics of financial participation in the digital age, urging a multi-dimensional policy approach that promotes synergy over competition. Ultimately, this research contributes significantly to the understanding of monetary policy's role in fostering and broadening formal financial participation, and overall economic resilience in developing economies. It reaffirms that decisive, well-executed policy interventions can indeed drive meaningful progress towards a more formalized and inclusive financial future, provided they are supported by robust infrastructure, strategic management of digital channels, and continuous efforts to build public trust and financial literacy.

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Appendix

Ridge Regression Robustness Check

Although fixed-effects estimates yield unbiased coefficients under the assumption of strict exogeneity, the high correlation among time-related regressors in an ITS design can inflate standard errors and diminish statistical precision. Ridge regression, which imposes an L2 penalty on the magnitude of coefficients, offers a systematic approach to mitigate variance inflation without excluding essential predictors. By shrinking coefficients toward zero in proportion to their collinearity, ridge regression trades a small amount of bias for substantial reductions in variance. This bias–variance trade-off enhances the stability of parameter estimates under multicollinearity, allowing us to verify that the substantive conclusions regarding level shifts and slope changes persist when penalization is applied. Employing ridge regression as a robustness check therefore provides reassurance that our inference about the impact of the 2020 currency reform on financial participation does not hinge solely on the finite-sample properties of the OLS fixed-effects estimator (Saleh et al., 2019; Hsu et al., 2012).

As an auxiliary analysis, we fitted a ridge regression model to assess the stability of coefficient estimates under penalization. The penalty parameter λ was chosen by ten-fold cross-validation, yielding $\lambda = 0.9576$. The ridge model achieved an R^2 of 0.9353. Table A1 displays the penalized coefficients.

Ridge regression	Number of observations	=	110
	R-squared	=	0.9353
	alpha	=	0.0000
	lambda	=	0.9576
	Cross-validation MSE	=	0.0668
	Number of folds	=	10
	Number of lambda tested	=	100

finpart	Coef.
reform	.2824542
time	.0633245
timear	.1530798
gdpr	-1.767853
etelsubscribers	.996618
inflr	1.399422
_cons	-1.305403

Table 5: Ridge Regression Coefficients

Although ridge shrinks and redistributes coefficient magnitudes, the overall post-reform effect (sum of level and slope coefficients) remains positive at approximately 0.435 index points per year, corroborating the main ITS findings. This exercise illustrates the bias–variance trade-off inherent to penalized estimation but affirms the robustness of policy conclusions.