The Effects of Monetary Policy and Financial Technology on Inflation: Evidence From Emerging and Developing Countries

James Atambilla Abugre
University of Ghana Business School, Legon
Ashesi University- Berekuso

Joshua Yindenaba Abor
University of Ghana Business School, Legon

Joseph G. Nellis
Cranfield University

Emmanuel Aikins Abakah
University of Ghana Business School, Legon

This paper investigates the effects of monetary policy and financial technology on inflation in emerging and developing countries. The study uses panel data of 80 countries over the period, 2000-2021. The Dynamic System General Moments Method is employed in the analysis. The empirical findings indicate that inflation is negatively influenced by monetary policy. Similarly, increased access to financial services through Fintech has a reducing effect on inflation. However, Fintech utilization promotes inflationary pressures in an economy. Additionally, the interaction between monetary policy and access to Fintech services has a positive correlation with price stability whereas the interaction of tight monetary policy and Fintech utilization reduces inflation in emerging and developing countries. The paper contributes to extant literature on the relationship between monetary policy, Fintech and inflation and further adds new contributions on how these two affect the stability of prices of goods and services in the era of technological financial innovations in an economy.

Keywords: monetary policy, financial technology, inflation, macroeconomic stability, emerging and developing economies

INTRODUCTION

The confluence of monetary policy and financial technology (FinTech) has become increasingly prominent in the global economic landscape, offering both unprecedented opportunities and challenges. As economies embrace digitization and FinTech innovations, the traditional mechanisms through which monetary policy operates are undergoing significant transformations (Oanh et al., 2023). The interaction between monetary policy and FinTech has become a key area of interest. More so, its potential impact on

inflation, particularly in emerging and developing economies, is now receiving significant attention among researchers and policymakers.

Monetary policy, traditionally governed by central banks, is a crucial tool for influencing economic stability and growth (Trinh et al., 2022). Through mechanisms such as interest rate adjustments, open market operations, reserve requirements and quantitative easing in recent times, central banks control money supply, stabilize prices, and foster employment (Anarfo et al., 2022). However, the rise of FinTech has introduced a disruptive force that alters the transmission channels of monetary policy, making the achievement of price stability increasingly complex in recent times.

FinTech, encompassing a diverse range of technological innovations in financial services, has revolutionized how individuals and businesses access, manage, and transfer funds (Daud et al., 2022; Zhu et al., 2020). From mobile banking to blockchain-based cryptocurrencies, FinTech has created new avenues for financial transactions, challenging the traditional banking infrastructure. The seamless integration of technology into financial activities has the potential to reshape the velocity of money, alter the demand for traditional banking services (Xu et al, 2022), and influence the 'effectiveness of conventional monetary policy tools'. The adoption of FinTech instruments is mostly out of the reach and control of central banks due to their nature of operations (Bolton et al., 2016). More so, financial intermediation that facilitates the allocation and direction of funds into real productive sectors of the economy becomes weakened and less controlled by the central bank. This diminishes the potency of monetary policy in its quest to achieve price stability and boost economic growth and development.

One potential consequence of the synergy between monetary policy and FinTech is the impact on inflation dynamics. Traditionally, central banks sought to control inflation by adjusting interest rates to influence spending and investment. However, the digitization of financial transactions through FinTech could alter the transmission mechanisms of monetary policy, leading to unintended consequences on inflation (Daud et al., 2022). For instance, the rapid adoption of digital payment systems and decentralized cryptocurrencies can influence the velocity of money, making it more challenging for central banks to accurately measure and regulate the money supply. Additionally, the increased availability of alternative financing mechanisms through FinTech platforms may circumvent traditional banking channels, affecting the efficacy of traditional monetary policy tools in influencing credit creation and money supply.

In an era of economic and financial upheavals, characterized by rapid financial innovations and an increased demand for financial inclusion, price stability and inflationary control are proving to be extremely delicate and practically complex to deal with (Zhu et al., 2020). Economic theory and prior empirical research have highlighted the key causes of price instability and the primary determinants of inflationary pressures within an economy. Key among these causes include money supply and economic growth (Bruno & Easterly, 1998; Pollin & Zhu, 2005), increased wages (Eftekhari Mahabadi & Kiaee, 2015), exchange rate volatility (Kandil & Morsy, 2009), financial instability and global economic uncertainties (Barro, 1997) among others. Studies on the causes of inflation remain an important macroeconomic issue among policymakers and the academic community across the globe. To this end, understanding the factors that influence inflation in an era of financial innovations and digitalization would help policymakers map out strategies that help to achieve price stability.

While theoretical and empirical studies have identified various factors contributing to inflation, the findings remain inconclusive. Notably, none of these studies to the best of our knowledge have explored the role of the financial revolution in the age of financial technology. Theoretically, two dominant schools of thought—Keynesian and Monetarist, offer differing explanations and policy prescriptions for inflation.

The monetarist theory asserts that inflation occurs when the growth of the money supply surpasses the production of goods and services leading to an imbalance where the money supply grows faster than economic output (Barro, 1997). In contrast, the Keynesian theory highlights the short-run inflexibility of prices and wages, which may not adjust promptly to shifts in demand. Keynesians classify inflation into two types: 'demand-pull and cost-push'. Demand-pull inflation arises when aggregate demand for goods and services exceeds aggregate supply. This imbalance can result from increased government spending, heightened household consumption, or economic inflows like trade surpluses or capital investments.

Conversely, cost-push inflation is driven by rising production costs, including higher wages or increased raw material prices, which forces producers to raise prices to maintain profitability.

Additionally, some researchers argue that inflation can be influenced by structural factors within the economy. These include market inefficiencies or the behavior of market participants, which can disrupt the balance between supply and demand, contributing to inflation.

In recent times, a global trend of financial digitalization has revolutionized the financial system and is being used as a tool to solve financial sector challenges such as financial exclusion and improving macroeconomic aggregates, especially in emerging and developing economies. Financial technology has ensured the competitiveness of financial service providers and increased financial inclusion in most countries. Several studies have explored the impact of the financial revolution on financial markets and the broader macroeconomic environment across different countries. For example, Abor et al. (2018) highlight that FinTech fosters financial inclusion by providing underserved populations with access to financial services through affordable transactions and simplified adoption processes.

The use and adoption of FinTech products can promote healthy competition, encourage savings, drive economic growth, and contribute to stabilizing the economy (Tonuchi et al., 2021; Anarfo et al., 2019; Evans, 2016; Lapukeni, 2015), reduce reliance on informal and unregulated channels (Zhu et al., 2020), and expand financial reach to help maintain financial inclusiveness (Xu et al., 2022). Increased competition promotes efficiency and results in a range of financial services by reducing the market strength of incumbents and providing optional consumer choices (Daud et al., 2022). Increased financial inclusion, driven by competition, impacts the effectiveness of monetary policy by changing the structure of the financial system, influencing consumption trends, and affecting inflation dynamics (Xu et al., 2022).

This paper is inspired by the growing body of empirical research examining the connection between FinTech and macroeconomic indicators. Despite the progress in research along these lines, the effect of monetary policy and FinTech on inflation remains underexplored. To the best of our knowledge, this study represents one of the first attempts in recent times to provide both theoretical and empirical insights into the relationship between these factors. That is using FinTech and monetary policy as exogenous variables to analyze their impact on inflation in emerging and developing countries. The study focuses on emerging and developing countries because FinTech has drastically reshaped their financial systems (Daud et al., 2022); and increased financial access exponentially (Tonuchi et al., 2021; Romdhane et al., 2021; Abor et al., 2018).

This empirical study aims to analyze the intricate relationship between monetary policy and FinTech, focusing on how the combined forces may contribute to or mitigate inflationary pressures in contemporary economies. By using econometric models and data analysis, we aim to uncover empirical evidence that can inform policymakers, researchers, and market participants about the evolving dynamics between monetary policy and FinTech, as well as their potential implications for inflation.

This paper makes a twofold contribution. First, it extends the existing literature by examining both demand- and supply-side factors of FinTech in relation to macroeconomic indicators, particularly inflation. While traditional determinants of inflation have been widely studied, recent research has begun to investigate the influence of FinTech on inflation dynamics. For instance, Kammoun et al. (2020) analyzed the impact of FinTech on economic performance in the politically unstable Middle East and North Africa (MENA) region for selected years (i.e. 2011, 2014 and 2017). Their empirical findings indicate that FinTech lending activities are associated with a rise in inflation. This indicates that the expansion of digital financial services may exacerbate inflationary pressures in volatile political environments.

Further, Xiang, Huang, and Cheng (2019) argue that FinTech significantly influences a country's inflation by directly shaping consumer behavior (particularly in countries like China and Malaysia). They attribute this effect to the enhanced convenience of financial transactions, such as online payments, account balance checks, and funds transfers, which facilitate greater consumption and, consequently affect inflation. This perspective is echoed by Taherdoost (2018), who highlights the role of FinTech in streamlining financial interactions and increasing the velocity of money circulation.

Simpasa and Gurara (2012) provide an early examination of mobile money's potential impact on inflation, emphasizing that the increased speed of money circulation could amplify inflationary pressures.

They contend that the rapid growth of mobile money systems may complicate the execution of effective monetary policy by increasing the velocity of money in the economy. Collectively, these studies highlight the complex relationship between FinTech innovations and inflation. While digital financial services can promote economic inclusion and efficiency, they also present new challenges for inflation control and the formulation of monetary policy.

The focus of this paper delves further to unravel which side of FinTech – usage (demand side) and access (supply-side), influences inflation in an economy. The second contribution of this paper lies in the findings of how the interaction of monetary policy and the various sides of FinTech jointly influence inflation in an economy. To the best of our knowledge, no studies have shown how the interaction of FinTech (both supply and demand side variables) with monetary policy affects inflationary pressures. This study provides an empirical explanation of the implications of the rapid provision and adoption of FinTech instruments combined with the implementation of monetary policy decisions by central banks.

The paper finds that demand-side variables of FinTech have a positive association with inflation while supply-side factors that are geared towards expanding access to financial services exhibit an inverse relationship with inflation. Monetary policy, on the other hand, has an inverse relationship with inflation as espoused in theory and in other empirical research. The interaction of demand-side FinTech variables with monetary policy, however, has a negative effect on price stability.

The remainder of the paper is structured as follows: Section 2 reviews the existing literature, while Section 3 outlines the data and methodology employed. Section 4 provides descriptive statistics and discusses the findings, and Section 5 concludes with a summary of the key recommendations.

LITERATURE REVIEW

A comprehensive review of the literature on inflation determinants highlights both demand-side and supply-side factors as primary influences. Demand-side factors, such as economic growth, are noted by Bruno and Easterly (1998), Pollin and Zhu (2005), Eftekhari Mahabadi and Kiaee (2015), and Nigusse et al. (2019), that rapid economic expansion can result in demand-pull inflation when aggregate demand exceeds supply capacity. Additionally, the role of money supply has been emphasized as a critical factor influencing inflation. Mohanty and Klau (2001) and Kandil and Morsy (2009) indicate that increases in money supply often lead to higher inflation. This is consistent with monetarist theories which posit a direct relationship between monetary expansion and price levels.

On the supply side, wage levels, import prices, and oil prices are considered significant contributors to cost-push inflation. Mohanty and Klau (2001) and Eftekhari Mahabadi and Kiaee (2015) also argue that rising wages can increase production costs, ultimately driving up consumer prices. Similarly, fluctuations in import and oil prices impact production and transportation costs, thereby influencing inflationary pressures within an economy.

Government expenditure and exchange rate dynamics also play a role in shaping inflation. Research by Mohanty and Klau (2001), Kandil and Morsy (2009), and Eftekhari Mahabadi and Kiaee (2015) suggests that higher government spending can boost aggregate demand and contribute to inflationary pressures, particularly when debt-financed. Furthermore, exchange rate movements influence inflation by affecting import costs; for instance, currency depreciation can raise the price of imported goods, thereby driving domestic inflation.

Numerous empirical investigations have been conducted to assess the influence of monetary policy on the management of inflation. Buiter and Miller (1991) examined the relationship between real exchange rate overshooting and the economic costs of reducing inflation. They found that while inflation may adjust gradually, shifts in the price level caused by exchange rate fluctuations can quickly mitigate core inflation. This highlights the potential of exchange rate interventions to influence inflationary pressures, even when direct inflation adjustments are slow.

Building on these themes, Chaudhary and Ahmad (1995) concluded that the long-term relationship between inflation and key macroeconomic indicators, including money supply and government budget overruns, in the context of Pakistan. Their analysis used co-integration methods, along with the monetarist

and quantity theory perspectives on inflation, and unit root tests to examine the stability of these relationships. Their findings indicated that domestic budget financing, particularly through the banking system, has long-term inflationary effects. This result underscores the critical role of government financing mechanisms in shaping inflationary trends and supports a strong positive association between money supply and inflation. By confirming that inflation and monetary growth are interlinked over time, their research contributes to the broader understanding of inflationary dynamics in economies where fiscal and monetary policies intersect significantly.

Akcay et al. (1996) analyzed the existence of a stable long-term relationship between budget deficits, money growth, and inflation using annual data from Turkey, and their findings were supportive of such a link. Employing co-integration vectors, they concluded that the budget deficit exerts a significant influence on inflation, which cannot be disregarded under the assumption of long-term monetary neutrality. Conversely, their application of an unrestricted VAR model to quarterly data from the post-bond financing period revealed a weaker correlation between inflation and the other variables, suggesting that this relationship may vary based on data frequency and financing methods. Kilindo (1997) examined how money supply, inflation, and fiscal activities relate to Tanzania's economy. The results demonstrate a robust correlation between Tanzania's money supply, fiscal operation, and inflation. Using an adaptive learning methodology, the study finds that robust anti-inflation measures can reduce inflation persistence under specific conditions. In their model of inflation dynamics in South Africa, Akinboade et al. (2004) connect domestic inflation to structural factors within the money market, labor market, and foreign exchange market. Their findings reveal a positive relationship between labor costs, the broad money supply, and domestic inflation, with escalating labor costs playing a significant role in fueling inflation over time. They suggest that while an expanding broad money supply ultimately contributes to higher domestic inflation, a rise in nominal interest rates can also influence this dynamic. Although initially having minimal impact, higher interest rates will moderately reduce inflation over time. Their analysis also reveals a long-term correlation between inflation and money growth, emphasizing the sustained influence of monetary expansion on inflationary trends.

Chinaemerem and Akujuobi (2012) explored the potential for a stable and predictable relationship between inflation and monetary policy instruments in Ghana and Nigeria. Their model's findings suggest that inflation in both countries exhibits significant inertia, with monetary innovations showing limited and statistically insignificant influence on price determination compared to price shocks. Through vector autoregressive (VAR) models incorporating various financial indicators such as money supply, price levels, nominal exchange rates, and interest rates, they demonstrate that monetary policy tools like interest rates and exchange rates exert minimal impact on prices in the medium term. Instead, price fluctuations are predominantly driven by their inherent shocks. This suggests that there is a weak and unpredictable short-term policy relationship between monetary policy instruments and inflation.

McCallum and Nelson (2010) investigated whether or not there was a strong argument to alter the methodology of policy research and the relationship between inflation and monetary aggregates. They contend that a model economy can only support the monetarist claim if it exhibits the long-run "neutrality of money" feature. This viewpoint is in opposition to Friedman's claim that, if the monetary authority were to execute an exogenous adjustment in the nominal money supply, the price level would eventually shift proportionately, with no long-term impact on real variables. As a result, they contradict the widely held belief in the literature that has been voiced by both opponents and supporters of using money in monetary policy analysis. They posit that money dynamics play a central role in shaping inflationary pressures and ensuring price stability within an economy. Forecasting inflation has become more complex in emerging and developing markets, where financial activities and monetary policy decisions have been significantly influenced by FinTech. Researchers have explored the impact of FinTech on inflation alongside traditional drivers of inflation. Kammoun et al. (2020) investigated the influence of FinTech on economic performance during periods of political instability in the Middle East and North Africa (MENA) region (focusing on the years 2011, 2014, and 2017). Their empirical analysis reveals that FinTech lending activities contribute to rising inflation. While greater access to credit can stimulate economic activity, it also poses risks of overborrowing and excessive credit expansion, potentially fueling inflationary pressures if not managed

properly. Xiang et al. (2019) argue that FinTech has an impact on inflation since it directly affects consumer choice.

FinTech innovations play a key role in enhancing financial inclusion by granting previously underserved populations access to banking services. This expanded access often stimulates economic activity and may contribute to inflationary pressures as increased money circulation drives demand. Features like seamless fund transfers, real-time communication, account balance checks, and convenient transactions further facilitate this process (Taherdoost, 2018).

Similarly, Simpasa and Gurara (2012) were among the first to investigate the potential impact of mobile money on inflation. They argue that the rapid expansion of money supply facilitated by mobile money could amplify inflation and complicate the implementation of monetary policy. The widespread adoption of digital payment systems influences the velocity of money, which, in turn, influences inflation dynamics and poses challenges for central banks in maintaining price stability.

Conversely, Agarwal (2014) found that innovations like Bitcoin might help reduce the cost at which governments generate revenue during inflationary periods. These digital currencies have the potential to create equilibrium where they exert a stabilizing effect on consumer prices. Supporting these insights, Mumtaz and Zachary (2020) confirm the broader implications of digital money on inflation and economic stability. In emerging countries, fluctuations in foreign exchange rates can significantly influence inflation. FinTech innovations, particularly those related to cross-border payments and currency exchange, can affect foreign exchange dynamics. For instance, digital currencies and blockchain technology may offer alternatives to traditional fiat currencies, potentially impacting exchange rate stability and inflationary pressures. Narayan and Sahminan (2018) analyzed the impact of FinTech on inflation rates and the exchange rate of the Indonesian rupiah against the US dollar. Their findings suggest that FinTech contributes to reducing inflation and enhances the value of the Indonesian rupiah relative to the US dollar.

FinTech lending platforms, including peer-to-peer lending, have the potential to broaden access to credit for individuals and businesses that previously struggled to secure financing through traditional methods. Jagtiani (2018) examined the impact of FinTech lending on consumer credit accessibility using data from U.S. banks with assets exceeding $50 billion as well as ‘account-level data from Lending Club’. The study found that ‘Lending Club’s consumer lending activities’ have significantly impacted areas that are typically underserved by traditional banks such as regions with high banking concentration and areas with fewer bank branches per capita. The research concluded that, in economically weaker regions, the share of loans from ‘Lending Club’ is increasing, which may contribute to rising inflationary pressures.

METHODOLOGY AND DATA SOURCE

The study uses panel data from 80 countries, representing emerging and developing economies, covering the period from 2000 to 2021. The selection of these countries is driven by the limited empirical research on the moderating effects of FinTech and monetary policy on price stability in these economies, which is crucial for informing policy decisions (Anarfo et al., 2019; Anarfo et al., 2020; Tounchi et al., 2021). The study period is based on the availability of data. The dataset is sourced from the World Bank and IMF, including the World Development Indicators, the World Bank Financial Development and Structure Database, the World Bank Global Financial Development Database, the Global Financial Index, and the International Financial Statistics (IFS).

The Dynamic Systemic GMM estimation method is employed to formulate two equations that explore the separate and combined impacts on inflation resulting from monetary policy and FinTech adoption. In dynamic panel regressions, the endogenous problem (endogeneity) of the lagged term of the dependent variable is solved by the system-GMM estimator of Arellano and Bond (1991) and Blundell and Bond (1998). This aids in addressing the issue of measurement errors and bias from missing variables that could occur in the model. Once more, the GMM is proven to be more reliable and robust than other options when it comes to managing a variety of econometric issues, including heteroscedasticity, autocorrelation, and identification. It also makes it possible to incorporate effects that are specific to an individual unit as well as those that are time-specific, and at the same time handle endogeneity and serial correlation problems

(see: Hansen, 1982; White, 1984, Newey & West, 1987). To solve the endogeneity problem(s), the adoption of various GMM techniques has grown in recent literature (see: Trinh et al., 2022; Daud et al., 2022; Ahmed et al., 2023, Oanh et al., 2023).

The empirical models are summarized as follows:

Independent Effect of Monetary Policy and FinTech on Inflation

$$Inf_{jt} = \beta_1 Inf_{jt-1} + \beta_2 MP_{jt} + \sum_{p=2}^{s} \beta_p FinTech_{jt} + \sum_{k=1}^{N} \alpha_k C_{jt} + \theta_t + \emptyset_j + \varepsilon_{jt}$$

The specific model on the independent effect of monetary policy and FinTech adoption on inflation is as follows:

$$\begin{aligned} Inf_{jt} = {} & \beta_1 Inf_{jt-1} + \beta_2 MP_{jt} + \beta_3 VMOBT_{jt} + \beta_4 RMOB_{jt} + \beta_5 MOBB_{jt} + \beta_6 MOBA_{jt} + \beta_7 NMOBT_{jt} \\ & + \beta_8 ATM_{jt} + \beta_9 \text{ATMK}M_{jt} + \beta_{10} BAC_{jt} + \beta_{11} BMO_{jt} + \beta_{12} TOP_{jt} + \beta_{13} BZSCORE_{jt} \\ & + \beta_{14} POP_{jt} + \beta_{15} GDP_{jt} + \beta_{16} NPL_{jt} + \beta_{17} ER_{jt} + \beta_{18} FDI_{jt} + \theta_t + \emptyset_j + \varepsilon_{jt} \end{aligned}$$

Interaction Effect of Monetary Policy and FinTech on Inflation

The general equation is as follows:

$$\begin{aligned} Inf_{jt} = {} & \beta_1 Inf_{jt-1} + \beta_2 MP_{jt} + \sum_{p=2}^{s} \beta_p FinTech_{jt} + \sum_{j=1}^{p} \alpha_{2j} (MP_{jt} * FinTech_{it}) \\ & + \sum_{j=1}^{p} \alpha_{3j} Controls_{it} + \theta_t + \emptyset_j + \varepsilon_{jt} \end{aligned}$$

The specific model is as specified below:

$$\begin{aligned} Inf_{jt} = {} & \beta_1 Inf_{jt-1} + \beta_2 MP_{jt} + \beta_3 VMOBT_{jt} + \beta_4 RMOB_{jt} + \beta_5 MOBB_{jt} + \beta_6 MOBA_{jt} + \beta_7 NMOBT_{jt} \\ & + \beta_8 ATM_{jt} + \beta_9 \text{ATMK}M_{jt} + \beta_{10}(MP_{jt} * VMOBT_{jt}) + \beta_{11}(MP_{jt} * RMOB_{jt}) \\ & + \beta_{12}(MP_{jt} * MOBB_{jt}) + \beta_{13}(MP_{jt} * MOBA_{jt}) + \beta_{14}(MP_{jt} * NMOBT_{jt}) \\ & + \beta_{15}(MP_{jt} * ATM_{jt}) + \beta_{16}(MP_{jt} * \text{ATMK}M_{jt}) + \beta_{17} BAC_{jt} + \beta_{18} BMO_{jt} + \beta_{19} TOP_{jt} \\ & + \beta_{20} BZSCORE_{jt} + \beta_{21} POP_{jt} + \beta_{22} GDP_{jt} + \beta_{23} NPL_{jt} + \beta_{24} ER_{jt} + \beta_{25} FDI_{jt} + \theta_t \\ & + \emptyset_j + \varepsilon_{jt} \end{aligned}$$

Variables, Measurement and a Priori Expectations

Based on the theories discussed and following the work of Anarfo et al. (2020, 2019) and Tounchi et al. (2021), the consumer price index is used to represent inflation as the dependent variable. Monetary policy is measured by the policy rate set by the central bank (Abor et al., 2022; Anarfo et al., 2022). FinTech variables used in this study cover both supply (access) and demand (usage) in line with the IMF 2004 classification of FinTech services of financial utilization. These include access to ATM platforms per 100,000 adults (Oanh et al., 2023), number of ATMs over 1000km2 (Oanh et al., 2023), 'number of registered mobile money accounts per 1,000 adults, and number of mobile money agent outlets per 1,000 adults' (Tonuchi et al., 2021) on the supply side; and 'number of mobile banking transactions per 1,000 adults, percent contribution to GDP by value of mobile money transactions, and number of mobile money transactions per 1,000 adults', on the demand side (Abor et al., 2018; Anarfo et al., 2022). Monetary policy and FinTech are expected to have inverse and positive significant relationships respectively with inflation

independently and interactively. Control variables are included to further enhance the explanatory and fitness level of the model.

The control variables are mainly economic indicators and traditional determinants of macroeconomic stability, especially inflation. These include bank concentration proxied by a number of bank branches; non-performing loans measured by loan recovery rate. The study uses the bank Z-score to assess the stability of financial institutions. The exchange rate is represented by the 'nominal effective exchange rate' which reflects the 'value of a currency relative to a weighted average of multiple foreign currencies'. This rate is adjusted by dividing it by a price deflator or cost index to provide a more accurate measure of the currency's real value. Broad money is measured by the sum of currency outside of banks, demand deposits excluding those of the central government, time, savings, and foreign currency deposits from resident sectors (excluding the central government), as well as bank and traveler's checks, and other securities like certificates of deposit and commercial paper. Foreign direct investment is measured by net inflows into the reporting economy. Other variables include GDP, measured by the percentage growth rate of GDP at market prices based on constant local currency; trade openness, calculated as the sum of exports and imports as a percentage of GDP; and population, which is represented by the annual population growth rate. It is expected that all the control variables will have an inverse relationship with inflation.

DISCUSSION OF EMPIRICAL RESULTS

Descriptive Statistics

Table 2 presents the descriptive statistics of the variables. Generally, all the variables deviated from the mean. Inflation recorded an average of 0.079 above the mean, with a standard deviation of 0.404 ranging between -0.239 and 9.21, implying a low level of consumer price hikes of goods and services in the study countries. Monetary policy recorded a mean (standard deviation) of 0.039 (0.061), ranging between -0.005 and 1.286. This means that central banks of the study countries generally adopted both contractionary and expansionary approaches of monetary policy to control money supply over the study period. FinTech adoption was moderately average, indicating a fair level of financial inclusion in the countries during the study period. The financial system was fairly sound and stable in the countries of study during the period under review whereas the circulation of money was relatively high. Macro-economic variables such as GDP and exchange rate averaged 3.2 and 0.13 per cent, respectively. Table 3 reports on the correlation between explanatory variables. The explanatory variables do not contain the problem of multicollinearity as confirmed by the mean VIF of 3.371.

Independent Effects of Monetary Policy and FinTech on Inflation

The empirical results presented in Table 4 show that monetary policy has a significant impact on reducing inflation levels in emerging and developing countries at the 1 percent level. This finding suggests that expansionary monetary policy contributes to higher inflationary pressures, indicating an inverse relationship between monetary policy and inflation dynamics. In other words, changes in monetary policy directly affect inflation levels within the economy. Central banks use interest rate adjustments to influence aggregate demand. When interest rates are lowered, borrowing becomes more affordable, leading to increased demand, investment and consumption. An increase in aggregate demand can stimulate higher levels of economic activity and, in turn, upward pressure on prices. On the other hand, when interest rates are raised through policy tightening, borrowing becomes more expensive. This typically dampens investment and consumption, reducing aggregate demand and potentially slowing inflationary pressures. Evidence provided by Tonuchi et al. (2021) and Abor et al. (2018) affirms the findings of this study.

Another channel through which monetary policy impacts inflation is by influencing the money supply in the economy. This is achieved through the central bank's open market operations, which adjust the amount of money circulating in the economy. When the money supply increases, it boosts spending and investment, leading to higher aggregate demand and potentially driving inflationary pressures. Conversely, a decrease in the money supply dampens spending and investment, thereby curbing inflationary pressures. Furthermore, changes in monetary policy can also impact exchange rates, particularly in economies with

flexible exchange rate regimes. A decline in the value of the home currency brought on by expansionary monetary policy or lower interest rates can result in higher import prices. The rising price of imported products and services contributes to inflationary pressures. On the other hand, a stronger domestic currency can reduce import prices, helping to alleviate inflationary pressures.

Finally, central banks often consider the output gap—the difference between actual and potential output—when determining monetary policy in an economy. When the economy operates above its potential (a positive output gap), demand exceeds supply (putting upward pressure on prices). In such cases, central banks may adopt contractionary monetary policies to slow down the economy and curb inflation. Conversely, when there is a negative output gap, expansionary policies may be used to stimulate economic activity.

FinTech is proxied by access and utilization variables, which have varied outcomes with inflation as shown in Table 4. First, access to financial services through the provision and creation of FinTech innovations and platforms such as ATM centres, mobile banking outlets among others have an inverse significant relationship with inflation at 10 per cent level. Thus, the creation and setting up of FinTech platforms lead to improved access to financial services and have a reducing effect on inflation. FinTech plays a pivotal role in promoting financial inclusion by extending access to underserved populations with reduced costs, including those in rural areas or with limited access to traditional banking services. By facilitating access and serving as a gateway to the formal financial system, FinTech creates equitable opportunities for individuals and small businesses to fully participate in economic activities. This involvement not only supports savings accumulation but also strengthens self-insurance capacities, fostering resilience against economic shocks and encouraging investment in productive assets. This is mainly due to the fact that financial innovations provide a wide range of portfolio choices of monetary and nonmonetary assets and liabilities to all manner of market participants. As such, economic activity becomes more inclusive and diversified; supports asset building (savings); reduces income inequality and enhances overall economic stability. Moreover, greater financial inclusion helps to reduce reliance on informal and often more costly financial services, which can contribute to inflationary pressures in the economy. Empirical evidence provided by Abor et al. (2018), Evans (2016), Anarfo et al. (2022) is consistent with this finding.

Again, the operational nature of FinTech promotes competition in financial markets by eliminating barriers to entry and expanding the range of financial service providers. Increased competition fosters innovation, drives down costs, and enhances price transparency, leading to more competitive interest rates, rigid requirements, and loan terms. As market participants benefit from a wider array of choices and better pricing information, financial intermediaries are incentivized to operate more efficiently and offer competitive rates, reducing the cost of borrowing and spending. This competitive pressure can exert downward pressure on prices, contributing to a moderation in inflationary trends.

Similarly, FinTech innovations such as "mobile banking, digital payments, and online lending platforms" streamline financial transactions, reduce transaction costs and increase the efficiency of monetary exchanges. As individuals and businesses gain easier access to credit, savings, and investment opportunities, they are better informed to manage their finances and allocate resources more efficiently. Increased efficiency in financial transactions and market information helps prevent speculative behaviors among financial consumers, which can trigger inflation. This efficiency also enhances overall economic productivity, potentially lowering production costs and mitigating inflationary pressures. The findings of this paper confirm the arguments made by Agarwal (2014), Narayan and Sahminan (2018) and Jagtiani (2018) and affirmed by Mumtaz and Zachary (2020).

Access to financial services through FinTech can also improve the effectiveness of monetary policy transmission mechanisms. By providing real-time data on financial transactions and consumer behavior, FinTech platforms offer central banks and policymakers valuable insights into economic trends and inflationary pressures. This enhanced visibility enables more precise monetary policy adjustments, such as interest rate changes or liquidity injections, to stabilize prices and manage inflation expectations effectively.

Further, utilization of FinTech innovations increases inflationary pressure. The empirical results show that the adoption and usage of FinTech innovations to access financial services have a positive association

with inflation dynamics. This implies that demand for financial services using FinTech innovations is a catalyst to fueling inflationary pressures in the economy. This finding is however dependent on a number of variables and can be explained by many intricate dynamics within the macroeconomic environment. FinTech expands access to credit, enabling deficit agents to borrow funds more easily through online lending platforms, peer-to-peer lending, and mobile and digital banking services. As demand for credit increases, fueled by easy access to financing options, financial consumers may increase their spending on durable goods, investments, and consumption. This surge in demand can lead to higher levels of the economy's aggregate demand, potentially outpacing the ability of the economy to produce products and services.

This phenomenon exerts upward pressure on general prices of goods and services and contributes to demand-pull inflation. Furthermore, FinTech innovations promote inclusive finance and, therefore, facilitate greater participation in financial markets, including investment in stocks, bonds, cryptocurrencies, and other assets. As more individuals and institutional investors engage in asset trading and speculation, the demand for financial assets increases, leading to asset price inflation. Rising asset prices can spill over into the broader economy, as increased wealth encourages higher levels of spending and investment, thereby driving up prices for goods and services. Consequently, speculative bubbles fueled by excessive demand for financial assets distorts asset prices and contribute to inflationary pressures in the economy. This finding agrees with the conclusions arrived at by Kammoun et al. (2020), Xiang et al. (2019), Taherdoost (2018) and Simpasa and Gurara (2012). However, the evidence provided by Mawejje and Lakuma (2017) contradicts this finding.

FinTech platforms leverage behavioral economic principles to encourage spending, saving, and investment behaviors among consumers and other market players. Techniques such as gamification, behavioral nudges, and personalized recommendations influence consumer decision-making and consumption patterns which could potentially result in higher demand for goods and services. Moreover, the seamless integration of financial services into digital platforms and mobile applications fosters a "cashless society" culture, where transactions are conducted electronically. This convenience accelerates money velocity, facilitates impulse purchases, and increases overall consumption levels. In a similar vein, the surge in demand for financial services occasioned by FinTech has implications for monetary policy. Central banks may respond to increased inflationary pressures by tightening monetary policy, raising interest rates, or implementing liquidity-draining measures to curb excessive credit growth and contain inflation expectations. However, if FinTech-driven demand for financial services is driven by factors such as technological innovation, financial inclusion, and productivity gains—key goals in developing and emerging economies, policymakers may struggle to accurately assess underlying inflationary pressures and adjust policy responses accordingly. This lapse in policy response tends to cause credibility problems for the central bank and, hence, increase speculative behaviour among market players and reduce confidence in monetary authorities which can fuel inflation in an economy. Findings by Anarfo et al. (2022, 2020) and Abor et al. (2022) are consistent with the results of this study in that regard.

Interactive Effects of Monetary Policy and FinTech on Inflation

Empirical results in Table 5 present the findings of the outcome of an interaction between monetary policy and the access and utilization sides of FinTech variables on inflation in the economy. The results, however, depart from that of the independent effects of each of the variables as discussed in section 4.2. First, the implementation of monetary policy tools aimed at inflationary control achieves better outcomes when the demand for FinTech innovations increases in the consumption of financial services and products by market participants. This finding implies that the combined use of tight monetary policy and high adoption of FinTech services to consume financial services is efficacious in inflationary control and targeting. FinTech innovations streamline financial transactions, making them faster, cheaper, and more accessible. This improved efficiency enhances productivity across the economy, enabling businesses to operate more effectively and lower costs. Tight monetary policy which contracts the money supply, can work in tandem with FinTech adoptions to further enhance efficiency. As businesses face higher borrowing costs and reduced access to credit due to tight monetary policy, they are incentivized to seek out cost-saving

measures, which FinTech offers. The adoption and use of FinTech solutions for financial management and transaction processing leads to further reductions in production costs, lower prices for goods and services and contributes to overall price stability. Moreover, by facilitating faster and more efficient payment processing, FinTech innovations improve the velocity of money, which has deflationary effects by increasing the effectiveness of monetary policy in stimulating economic activity. This agrees with the conclusions by Bolton et al. (2016) and Chen et al. (2017).

Again, the use of FinTech innovations improves the transmission mechanisms of monetary policy. Central banks utilize monetary policy tools, such as adjusting interest rates and conducting open market operations, to influence borrowing costs and economic activity. FinTech platforms can facilitate faster and more efficient transmission of monetary policy changes to financial markets and the broader economy. Real-time data analytics and digital communication channels enable central banks to monitor economic developments more closely and respond swiftly to changes in inflationary pressures. This enhanced transmission mechanism ensures that monetary policy measures have a more immediate and impactful effect on inflation, helping to achieve price stability. This finding aligns with the conclusion of Beck and Demirgüç-Kunt (2008) who found that countries with higher levels of financial inclusion typically have monetary policy frameworks that are more efficient at containing inflation.

Furthermore, FinTech innovations generate large volumes of data on financial transactions, consumer behavior, and economic activity. Central banks can leverage on this data to gauge and inform their decision-making process and implement more targeted and effective tight monetary policy measures. This is in line with the findings of Bolton et al. (2016). Additionally, sophisticated machine learning and data analytics methods enable central banks to develop more accurate inflation forecasts and identify areas of the economy where inflationary pressures are most acute. This data-driven approach to policy making ensures that tight monetary policy measures are implemented in a timely and precise manner, maximizing their effectiveness in reducing inflation. Additionally, by providing central banks with real-time data on economic activity and inflation trends, FinTech innovations help central banks manage inflation expectations more effectively. Clear and transparent communication about monetary policy objectives and inflation targets can anchor inflation expectations and prevent inflationary spirals driven by changes in expectations.

It is important to note that FinTech innovations can improve financial stability and financial institutions as well as consumers' risk management procedures. This reduces the likelihood of inflationary pressures stemming from financial market disruptions. By providing more accurate and timely data on financial transactions and market conditions, FinTech platforms enable financial institutions and regulators to detect new hazards and take preventative action to lessen them. Improved risk management practices enhance the resilience and robustness of the financial system, reducing the frequency and severity of financial crises that could trigger inflationary pressures. FinTech innovations promote price transparency by providing consumers with easy access to information about prices and product offerings. Greater price transparency leads to more informed consumer choices and more efficient allocation of resources to productive sectors to produce goods and services that match demands in the market. Moreover, access to FinTech platforms enables consumers to compare prices more easily, putting downward pressure on prices and contributing to inflation moderation.

The second strand of the interactive effects of monetary policy and FinTech on inflationary dynamics focuses on the access and or supply part of FinTech. Thus, how does an increased supply or creation of FinTech channels and its interactions with monetary policy changes affect inflation? What is the impact on inflation when access to FinTech is expanded and monetary policy is changed simultaneously? The results in Table 4 indicate a positive relationship between increased FinTech services and increased monetary policy on inflation. In other words, inflation rises when monetary authorities pursue tight monetary policies while also implementing measures to increase access to financial services through FinTech. This finding is supported by several economic principles.

Aggregate demand for goods and services is stimulated through the inclusion of many underprivileged financial consumers in the formal financial system, providing them with access to credit, savings, and investment opportunities. Businesses and individuals' borrowing and spending capacities rise in tandem with their access to financial services. This boosts the economy's overall demand. To mitigate inflationary

pressures, a restrictive monetary policy is typically implemented, characterized by higher interest rates or a reduced money supply. However, increased financial inclusion can offset the restrictive effects of tight monetary policy by stimulating demand, potentially leading to inflationary pressures. Conventional monetary policy tools, such as changes in interest rates, would have limited effectiveness when financial intermediation increasingly occurs through FinTech channels and patronized by many financial consumers. As a result, even when central banks implement tight monetary policy measures, FinTech platforms provide alternative sources of financing that bypass the intended effects of these policies. This complicates efforts to control borrowing costs and aggregate demand, thereby exacerbating inflationary pressures in the short to medium term. This argument is demonstrated in Behn et al. (2016) and Chen et al. (2017) and supported by the findings of Boot et al. (2021), Bartlett et al. (2022) and Buchak et al. (2022). They suggest that the impact of FinTech is more significant when monetary policy is tightened than when it is loosened, leading to difficulties in controlling inflation.

Tight monetary policy constrains access to credit by raising borrowing costs and tightening lending standards. However, increased financial inclusion efforts such FinTech proliferation, lead to the expansion of credit availability through alternative channels, such as FinTech platforms which are seamless and usually out of the regulatory control of the central banks. This is supported by the findings of Hachem and Song (2021) and Allen et al. (2020). FinTech innovations are, therefore, less sensitive to changes in policy rates aimed at controlling inflation. Due to competition, FinTech services are cheaper, efficient, reliable and easily accessible. Credit is, therefore, expanded through less expensive transactions and flexible procedures thereby speeding the velocity of money in the economy and rendering the effectiveness of policies geared towards constraining credit accessibility and availability which have been theoretically and empirically proven to stimulate demand and cause inflation in the economy.

Similarly, financial inclusion efforts, coupled with tight monetary policy, can also drive asset price inflation. As financial services become more accessible to consumers as well as businesses and their quest for higher returns on their investments, the demand for assets like stocks, bonds, and real estate increases. Tight monetary policy measures, such as raising interest rates, can make traditional interest-bearing investment instruments less attractive, prompting investors to allocate more capital to riskier assets. The price of assets rises as a result of this increasing demand leading to asset price inflation and potentially spurring inflationary pressures in the broader economy.

Lastly, the combination of increased financial inclusion through easy access to FinTech platforms and tight monetary policy can also influence inflation expectations and central bank credibility. When market players perceive that monetary policy is ineffective in controlling inflation or that central banks are unable to respond to inflationary pressures exacerbated by financial inclusion efforts, it can lead to upward revisions in inflation expectations. Higher inflation expectations can become self-fulfilling, as individuals and businesses adjust their behaviour in anticipation of future price hikes, leading to actual inflation. Additionally, if central banks are seen as unable or unwilling to address inflationary pressures due to conflicting policy measures—such as implementing tight monetary policy while simultaneously increasing access to financial services or weakening the effectiveness of their policies—it can lead to a crisis of credibility. This erodes confidence and undermines their ability to maintain price stability, further fueling inflation.

CONCLUSION AND POLICY RECOMMENDATIONS

This paper provides an overview analysis of the effects of FinTech solutions and technologies and monetary policy changes on inflation. It has been argued that monetary policy and FinTech innovations are intricate tools that affect inflation. The structure of financial intermediation is anchored on these two in recent times such that the effect of the former is incomplete without the interplay of the latter.

Therefore, the interaction between monetary policy and FinTech innovations presents a complex yet promising avenue for understanding inflation dynamics. While monetary policy traditionally plays a pivotal role in influencing inflation through interest rate adjustments and money supply management, the rise of FinTech introduces new dynamics. FinTech innovations, such as digital payments and online lending

platforms, enhance financial inclusion, efficiency, and data analytics, potentially impacting inflation through channels such as credit expansion, asset price inflation, and monetary policy transmission challenges. However, FinTech also offers opportunities to improve price transparency, enhance monetary policy effectiveness, and manage inflation expectations. Understanding and navigating this intricate relationship is crucial for policymakers in ensuring price stability while fostering innovation and inclusive economic growth.

The relationship between the use of FinTech and inflation appears multifaceted, with potential positive and inverse associations. On one side, increased utilization of FinTech platforms stimulates inflationary pressures through avenues such as facilitated credit expansion, asset price inflation, and changes in monetary policy transmission. Conversely, enhanced access to FinTech platforms exerts downward pressure on inflation through improved efficiency in financial transactions, increased financial inclusion, and enhanced monetary policy effectiveness. Understanding these dual dynamics is crucial for policymakers in navigating the evolving landscape of financial technology and its impact on inflation.

On the other hand, the examination of the interplay between monetary policy and FinTech reveals nuanced implications for inflation dynamics. The combination of monetary policy and FinTech utilization has a negative effect on inflation, as FinTech innovations can amplify the transmission of monetary policy changes, contributing to credit expansion and the risk of asset price inflation. Conversely, the interaction between access to FinTech and monetary policy suggests a positive impact on inflation, driven by enhanced financial inclusion, efficiency gains, and improved monetary policy effectiveness. These findings underscore the importance of understanding the multifaceted relationship between monetary policy and FinTech in shaping inflationary pressures.

Policymakers should carefully calibrate monetary policy measures to account for the evolving landscape of financial technology, leveraging FinTech's potential to promote price stability while fostering innovation and inclusive economic growth. More so, balancing the benefits and risks of FinTech integration within monetary policy frameworks is crucial for achieving sustainable economic outcomes in the digital era. By leveraging FinTech innovations effectively and complementing them with appropriate monetary policy measures, economies can harness the benefits of financial inclusion and technological advancements to mitigate macroeconomic volatilities.

This paper does not take into account the time dynamics of how the impacts of these findings would have behaved in the long-run. Future research considering the short-run and long-run outcomes of the findings is highly recommended.

REFERENCES

Abor, J.Y., Agoba, A.M., Mumuni, Z., & Yawso, A. (2022). Monetary policy, central banks' independence, and financial development in Africa. In J.Y. Abor & C.K.D. Adjasi (Eds.), *The economics of banking and finance in Africa: Developments in Africa's financial systems* (pp.227–310). Palgrave Macmillan.

Abor, J.Y., Amidu, M., & Issahaku, H. (2018). Mobile telephony, financial inclusion and inclusive growth. *Journal of African Business, 19*(3), 430–453.

Agarwal, S. (2014). Predatory lending and the subprime crisis. *Journal of Financial Economics, 113,* 29–52. https://doi.org/10.1016/j.jfineco.2014.02.008

Ahmed, H.E., Nader, N., & Samia, N. (2023). Financial stability and monetary policy reaction: Evidence from the GCC countries. *Quarterly Review of Economics and Finance, 87,* 396–405.

Akcay, C.O., et al. (1996). *Budget deficit, money supply, and inflation: Evidence from low and high frequency data for Turkey*. Bogazici University, Department of Economics.

Akinboade, O.A., et al. (2004). The determinants of inflation in South Africa: An econometric analysis. *AERC Research Paper 143*. African Economic Research Consortium, Nairobi.

Allen, S., Capkun, S., Eyal, I., & Fanti, G. (2020*). Design choices for central bank digital currency: Policy and technical considerations* (No. w27634). National Bureau of Economic Research. https://doi.org/10.3386/w27634

Anagnostopoulos, I. (2018). Fintech and regtech: Impact on regulators and banks. *Journal of Economics and Business, 100,* 7–25. https://doi.org/10.1016/j.jeconbus.2018.07.003

Anarfo, E.B., Ntuli, M., Boateng, S.S., & Abor, J.Y. (2022). Financial inclusion, banking sector development, and financial stability in Africa. In J. Y. Abor & C. K. D. Adjasi (Eds.), *The economics of banking and finance in Africa: Developments in Africa's financial systems* (pp.227–310). Palgrave Macmillan.

Anarfo, E.B., Abor, J.Y., & Osei, K.A. (2020). Financial regulation and financial inclusion in Sub Saharan Africa: Does financial stability play a moderating role? *Research in International Business and Finance*. https://doi.org/10.1016/j.ribaf.2019.101070

Anarfo, E.B., Abor, J.Y., Osei, K.A., & Gyeke-Dako, A. (2019). Monetary policy and financial inclusion in Sub-Saharan Africa: A panel VAR approach. *Journal of African Business, 20*(4), 549–572. https://doi.org/10.1080/15228916.2019.1580998

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies, 58*(2), 277–297.

Barro, R. (1997). *Determinants of economic growth: A cross-country empirical study*. MIT Press.

Bartlett, R., Morse, A., Stanton, R., & Wallace, N. (2022). Consumer-lending discrimination in the fintech era. *Journal of Financial Economics, 143*(1), 30–56.

Beck, T., Demirgüç-Kunt, A., & Peria, M.S.M. (2008). Banking services for everyone? Barriers to bank access and use around the world. *The World Bank Economic Review, 22*(3), 397– 430.

Behn, M., Gross, M., & Peltonen, T.A. (2016). *Assessing the costs and benefits of capital-based macroprudential policy*.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics, 87*(1), 115–143.

Bolton, P., Freixas, X., Gambacorta, L., & Mistrulli, P.E. (2016). Relationship and transaction lending in a crisis. *The Review of Financial Studies, 29*(10), 2643–2676.

Boot, A., Hoffmann, P., Laeven, L., & Ratnovski, L. (2021). Fintech: What's old, what's new? *Journal of Financial Stability, 53,* 100836.

Borio, C.E.V., & Lowe, P.W. (2004). *Securing sustainable price stability: Should credit come back from the wilderness?* (SSRN Scholarly Paper No. ID 782324). Social Science Research Network.

Bromberg, L., Godwin, A., & Ramsay, I. (2018). Cross-border cooperation in financial regulation: Crossing the Fintech bridge. *Capital Markets Law Journal, 13*(1), 59–84.

Bruno, M., & Easterly, W. (1998). Inflation crises and long-run growth. *Journal of Monetary Economics, 41,* 3–26.

Buchak, G., Matvos, G., Piskorski, T., & Seru, A. (2022). Beyond the balance sheet model of banking: Implications for bank regulation and monetary policy. *Journal of Political Economy* (forthcoming).

Buiter, W.H., & Miller, M. (1991, January). Real exchange rate overshooting and the output cost of bringing down inflation. In *International Volatility and Economic Growth: The First Ten Years of the International Seminar on Macroeconomics* (pp. 239–277). Elsevier Science Publishers BV.

Chaudhary, A.M., & Ahmad, N. (1995). Money supply, deficit, and inflation in Pakistan. *The Pakistan Development Review, 34*(4 Part III), 945–956.

Chen, H., Zhang, G., Zhu, D., & Lu, J. (2017). Topic-based technological forecasting based on patent data: A case study of Australian patents from 2000 to 2014. *Technological Forecasting and Social Change, 119,* 39–52. https://doi.org/10.1016/j.techfore.2017.03.009

Chinaemerem, O.C., & Akujuobi, L.E. (2012). Inflation targeting and monetary policy instruments: Evidence from Nigeria and Ghana. *Kuwait Al-Fosool Al- 'Arabiyyah, 33*(847), 1–30.

Chui, I. (2017). Fintech and disruptive business models in financial products, intermediation, and markets—Policy implications for financial regulators. *Journal of Technology Law and Policy, 21,* 55–112.

Daud, D.S., Khalid, A., & Azman-Saini, W.N.W. (2022). Fintech and financial stability: Threat or opportunity? *Finance Research Letters, 47,* 102667.

Eftekhari Mahabadi, S., & Kiaee, H. (2015). Determinants of inflation in selected countries. *Journal of Money and Economy*, *10*(2), 113–143.
Evans, O. (2016). The effectiveness of monetary policy in Africa: Modeling the impact of financial inclusion. *Iranian Economic Review*, *20*(3), 327–337.
Hachem, K., & Song, Z. (2021). Liquidity rules and credit booms. *Journal of Political Economy*, *129*(10), 2721–2765.
Hansen, L.P. (1982). Large sample properties of generalized method of moments. *Econometrica*, *50*, 1029–1054.
Jagtiani, J. (2018). Fintech: The impact on consumers and regulatory responses. *Journal of Economics and Business*, *100*, 1–6. https://doi.org/10.1016/j.jeconbus.2018.11.002
Kammoun, S., Loukil, S., & Ben Romdhane, B. (2020). The impact of Fintech on economic performance and financial stability in the MENA zone. In *Impact of Financial Technology (Fintech) on Islamic Finance and Financial Stability* (pp. 253–277). IGI Global.
Kandil, M., & Morsy, H. (2009). *Determinants of inflation in GCC*. IMF Working Paper, Middle East and Central Asia Department.
Kibritcioglu, A. (2002). Causes of inflation in Turkey: A literature survey with special reference to theories of inflation. *Working Paper Series No. 8*.
Kilindo, A.L. (1997). *Fiscal operations, money supply, and inflation in Tanzania: Research Paper No. 65.* African Economic Research Consortium.
Lapukeni, A.F. (2015). The impact of financial inclusion on monetary policy effectiveness: The case of Malawi. *International Journal of Monetary Economics and Finance*, *8*(4), 360–384.
Mawejje, J., & Lakuma, P.C. (2017). *Macroeconomic effects of mobile money in Uganda* (Vol. 135, pp.1–34). Economic Policy Research Centre. https://doi.org/10.22004/ag.econ.260017
McCallum, B.I., & Nelson, E. (2010). Money and inflation: Some critical issues. *Key Developments in Monetary Economics*. The Federal Reserve Board.
Mohanty, M.S., & Klau, M. (2001). What determines inflation in emerging market economies? *BIS Papers No. 8*.
Mumtaz, M., & Zachary, S. (2020). Empirical examination of the role of Fintech in monetary policy. *Pacific Economic Review*, *25*(5), 620–640. https://doi.org/10.1007/s12599-017-0464-6
Narayan, S., & Sahminan, S. (2018). Has Fintech influenced Indonesia's exchange rate and inflation? *Bulletin of Monetary Economics and Banking*, *21*(2), 1–14. https://doi.org/10.21098/bemp.v21i2.966
Newey, W.K., & West, K.D. (1987). A simple positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. *Econometrica*, *55*(3), 703–708.
Nigusse, T., Tadesse, T., & Melaku, T. (2019). Supply and demand side determinants of inflation in Ethiopia: Auto-regressive distributed lag model (ARDL). *International Journal of Commerce and Finance*, *5*(2), 8–21.
Oanh, T.T.K., Le, TTV., & Le, Q.D. (2023). Relationship between financial inclusion, monetary policy and financial stability: An analysis in high financial development and low financial development countries. *Journal of Heliyon*, *9*, e166479. https://doi.org/10.1016/j.heliyon.2023.e166479
Opoku-Afari, M., Abugre, J.A., & Oppong, K.A. (2022). Playing catch-up: SupTech and RegTec developments in Africa. In *The Economics of Banking and Finance in Africa: Developments in Africa's Financial Systems* (pp. 745–794). Palgrave Macmillan.
Pollin, R., & Zhu, A. (2005). Inflation and economic growth: A cross-country non-linear analysis. *Working Papers Series, N8109*, Political Economy Research Institute, University of Massachusetts, Amherst.
Romdhane, B.L., Loukil, Y.S., & Kammoun, S. (2021). Fintech development, digital infrastructure, and institutions in the MENA zone. In *Financial and Economic Systems Transformations and New Challenges*, (pp. 481–506). World Scientific Publishing. https://doi.org/10.1142/9781786349507_0017

Simpasa, A., & Gurara, D. (2012). Inflation dynamics in selected East African countries: Ethiopia, Kenya, Tanzania, and Uganda. *AFDB Brief*. African Development Bank.
Taherdoost, H. (2018). Understanding of e-service security dimensions and its effect on quality and intention to use. *Information & Computer Security*, *25*, 535–559.
Tonuchi, E.J., Nwolisa, U.C., Obikaonu, C.P., & Alase, A.G. (2021). Monetary policy effectiveness and financial inclusion in Nigeria: Fintech, 'the disrupter' or 'enabler'. *International Journal of Applied Economics, Finance and Accounting*, *9*(1), 19–27. https://doi.org/10.33094/8.2017.2021.91.19.27
Trinh, H.H., Sharma, G.D., Tiwari, A.K., & Vo, D.T.H. (2022). Examining the heterogeneity of financial development in the energy-environment nexus in the era of climate change: Novel evidence around the world. *Journal of Energy Economics*.
White, H. (1984). *Asymptotic theory for econometricians*. Orlando, FL: Academic Press.
Xiang, D., Huang, Z., & Cheng, X. (2019). Fintech and sustainable development: Evidence from China based on P2P data. *Sustainability*, *11*(22), 1–20. https://doi.org/10.3390/su11226434
Xu, X., Jiang, M., Zhang, Z., & Yang, J. (2022). Does digital finance facilitate improvement in export product quality? Evidence from China. *Applied Economics Letters*, 1–4.
Zhu, X., Asimakopoulos, S., & Kim, J. (2020). Financial development and innovation-led growth: Is too much finance better? *Journal of International Money and Finance*. https://doi.org/10.1016/j.jimonfin.2020.102083

APPENDIX

TABLE 1
VARIABLE DESCRIPTION AND MEASUREMENT

Variable Description	Measurement	Data Source
Inflation	Annual consumer price index	World Bank
Monetary Policy	Policy Rate by central banks	World Bank
Access to ATM platforms	Access to ATM platforms per 100,000 adults	World Bank
Number of ATM centres	Number of ATMs over 1000km2	World Bank
Number of Mobile Money accounts	Number of registered mobile money accounts per 1,000 adults	World Bank
Number of Mobile Money agents	Number of mobile money agent outlets per 1,000 adults	World Bank
Number of mobile money transactions	number of mobile money transactions per 1,000 adults	World Bank
Number of Mobile Banking transactions	Number of mobile banking transactions per 1,000 adults	World Bank
Value of mobile money transactions	Percent contribution to GDP by volume of mobile money transactions	World Bank
Bank Concentration	Number of commercial Bank branches	World Bank
Non-performing Loans	Loan recovery rate	World Bank
Bank Z-Score	Stability of Financial Institutions	World Bank
Exchange rate	Nominal effective exchange rate	IMF
Broad Money	Sum of currency outside banks	IMF and World bank
FDI	Net inflows in reporting economy.	IMF
GDP	Gross domestic product measured in real terms	IMF
Trade Openness	Sum of exports and imports as a percentage of GDP	World Bank
Population	Annual population growth rate	World Bank

TABLE 2
SUMMARY OF DESCRIPTIVE STATISTICS

Variables	Obs	Mean	Std. Dev.	Min	Max	p1	p99	Skew.	Kurt.
Inflation (lagged)	1782	0.079	0.404	-0.239	9.21	-0.024	0.657	16.199	300.724
Value of mobile money transactions/GDP	1782	0.026	1.182	-4.094	1.987	-4.094	1.987	-1.776	8.686
Number of ATMs over 1000km2	1782	1.31	3.004	-1.93	12.101	0.000	11.175	2.123	6.021
Number of registered mobile money A/Cs	346	0.238	0.257	-0.047	1.169	-0.009	0.744	0.614	2.092
Number of mobile banking transactions	934	2.279	19.832	-101.218	70.643	-64.069	47.159	-1.01	6.825
Number of ATM Platforms per 100,000 adults	1782	-0.048	1.708	-26.603	2.121	-7.077	1.469	-10.791	133.64
Number of mobile money agent outlets	1782	246.752	1956.159	-890.582	30519.547	-272.422	7992.094	10.784	133.761
Number of mobile money transactions	1782	-13800	130000	-2130000	180000	-378000	71327.219	-11.573	153.951
Monetary policy	1782	0.039	0.061	-0.005	1.286	0.000	0.188	8.585	140.537
GDP	1782	3.205	4.525	-40.563	31.087	-9.773	13.722	-1.507	16.293
FDI	1782	0.056	0.204	-0.575	4.499	-0.056	0.579	13.194	226.767
Exchange rate	1782	0.131	0.152	-0.22	0.369	0.001	0.369	0.771	1.826
NPL	1694	0.054	0.099	-1.022	0.93	-0.092	0.363	-1.656	37.391
Bank concentration	1761	58.18	27.238	1.00	166.472	1.000	99.973	-0.344	3.011
Broad money	1782	0.139	0.386	-1.47	7.213	-0.059	1.212	10.189	138.95
Trade openness	1760	0.749	0.625	0.011	4.373	0.032	3.493	2.091	9.363
Z- score	1760	0.139	0.114	-0.107	1.512	0.012	0.552	3.42	29.15

TABLE 3
PAIRWISE CORRELATIONS AND VARIANCE INFLATION FACTOR

Variables	VIF (3.371)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Value of mobile money transactions/GDP	1.599	1.000															
Number of ATMs over 1000km2	4.265	0.324	1.000														
Number of registered mobile money accounts	14.452	-0.048	0.464	1.000													
Number of mobile banking transactions	2.136	0.151	0.178	0.264	1.000												
Number of ATM Platforms per 100,000 adults	1.208	0.005	0.037	0.229	0.013	1.000											
Number of mobile money agent outlets	1.431	0.057	-0.010	0.035	0.047	0.004	1.000										
Number of mobile money agent outlets	1.662	0.001	0.112	0.230	0.010	-0.002	-0.959	1.000									
Monetary policy	12.779	0.028	-0.023	0.901	0.094	-0.029	-0.076	0.075	1.000								
GDP	1.692	-0.039	0.015	0.078	-0.019	-0.002	-0.052	0.048	0.011	1.000							
FDI	1.607	-0.139	-0.052	-0.053	-0.046	0.000	-0.017	-0.033	0.050	0.014	1.000						
Exchange rate	2.465	0.102	0.287	0.227	0.037	0.064	0.012	-0.013	-0.060	0.134	-0.100	1.000					
NPL	2.063	-0.156	0.095	0.167	0.141	0.000	0.240	-0.232	-0.002	-0.049	0.046	-0.003	1.000				
Bank concentration	1.428	-0.054	-0.131	-0.200	-0.054	-0.015	-0.071	0.040	-0.024	0.000	0.083	-0.188	-0.038	1.000			
Broad money	1.918	0.035	0.038	-0.110	0.002	-0.019	0.003	0.005	0.014	0.014	-0.045	0.058	-0.034	-0.045	1.000		
Trade openness	1.593	-0.148	-0.102	-0.082	-0.058	0.010	-0.043	0.000	-0.087	0.060	0.231	-0.188	-0.036	0.093	-0.069	1.000	
Z-score	1.637	-0.007	-0.023	-0.095	0.096	0.058	-0.012	0.032	-0.018	0.122	0.028	-0.133	-0.025	0.088	0.036	0.166	1.000

TABLE 4
INDEPENDENT EFFECTS OF MONETARY POLICY AND FINTECH ON INFLATION

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)
VARIABLES	Inflation	Inflation	Inflation	Inflation	Inflation	Inflation	Inflation
$Inflation_{t-1}$	-0.0102**	-0.0103**	-0.0102**	-0.0103**	-0.0105**	-0.0102**	-0.0103**
	(0.00418)	(0.00420)	(0.00418)	(0.00420)	(0.00427)	(0.00415)	(0.00419)
Value of mobile money transactions per GDP	0.0200***						
	(0.00698)						
Number of mobile money transactions		0.0165***					
		(0.00284)					
Number of ATMs over 1000km2			-0.163*				
			(0.0961)				
Number of mobile banking transactions				0.000299*			
				(0.000627)			
Number of ATM Platforms per 100,000 adults					-0.000550*		
					(0.00470)		
Number of mobile money agent outlets						-5.48e-06*	
						(4.23e-06)	
Number of Registered mobile money accounts							7.14e-08
							(6.35e-08)
Monetary policy	-0.588***	-0.609***	-1.552***	-1.101***	-0.588***	-0.593***	-0.592***
	(0.0770)	(0.0765)	(0.382)	(0.153)	(0.0772)	(0.0772)	(0.0772)
GDP	-0.0388***	-0.0387***	-0.0801***	-0.0566***	-0.0392***	-0.0392***	-0.0392***
	(0.00196)	(0.00194)	(0.00475)	(0.00267)	(0.00196)	(0.00196)	(0.00196)
Population	-0.583	-1.048*	-5.918***	-2.881***	-0.624	-0.685	-0.679
	(0.600)	(0.600)	(1.890)	(0.998)	(0.602)	(0.603)	(0.603)

FDI	-0.00324	-0.0102	-0.441	0.0266	-0.0141	-0.0150	-0.0130
	(0.0404)	(0.0399)	(0.465)	(0.343)	(0.0403)	(0.0403)	(0.0403)
Exchange Rate	0.198***	0.115*	0.660***	0.236***	0.213***	0.215***	0.215***
	(0.0602)	(0.0619)	(0.180)	(0.0901)	(0.0603)	(0.0601)	(0.0601)
Non-performing Loans	0.0570	-0.0301	0.00251	-0.145	0.0183	0.0448	0.0403
	(0.0845)	(0.0832)	(0.181)	(0.101)	(0.0836)	(0.0860)	(0.0858)
Bank concentration	0.000216	0.000287	-0.000457	0.000514	0.000197	0.000172	0.000185
	(0.000314)	(0.000312)	(0.000974)	(0.000486)	(0.000315)	(0.000316)	(0.000315)
Broad money	0.186***	0.178***	1.859***	1.049***	0.188***	0.189***	0.188***
	(0.0256)	(0.0255)	(0.187)	(0.0735)	(0.0257)	(0.0256)	(0.0257)
Trade openness	-0.00961	-0.0110	-0.0799	-0.0339	-0.0141	-0.0146	-0.0140
	(0.0137)	(0.0135)	(0.0623)	(0.0245)	(0.0136)	(0.0136)	(0.0136)
Z-score	0.114	0.113	1.105***	0.463***	0.126	0.128	0.125
	(0.0897)	(0.0890)	(0.248)	(0.145)	(0.0900)	(0.0898)	(0.0898)
Constant	0.142***	0.138***	0.120	0.142***	0.148***	0.150***	0.149***
	(0.0292)	(0.0290)	(0.109)	(0.0456)	(0.0292)	(0.0292)	(0.0292)
Observations	1,316	1,392	1,316	1,392	1,358	1,397	1,312
Number of countries	45	46	46	47	46	45	46
No. of instruments.	9	8	10	10	13	9	8
AR (1)	-1.374	-1.765	-3.178	-3.148	-3.187	-1.374	-1.765
P-value	0	0	0.00149	0	0.953	0	0
AR (2)	1.038	0.511	1.263	1.258	1.264	1.038	0.511
P-value	0.299	0.609	0.206	0.951	0.879	0.299	0.609
Sargan's Test	0.0192	0.00118	0.303	0.347	0.335	0.0192	0.00118
P-value	0.990	0.444	0.960	0.208	0.00144	0.990	0.444
Hansen's Test	0.757	0.142	0.623	0.769	0.675	0.757	0.142
P-value	0.685	0.931	0.891	0.857	0.206	0.685	0.931
F-test	1415	2721	3555	3545	3574	1415	2721
P-value	0.000	0.000	0.000	0.00164	0.000	0.000	0.000
R-squared	0.253	0.264	0.751	0.510	0.249	0.250	0.249

Notes: "The consumer price index, which measures inflation, is the dependent variable. The policy rate measures monetary policy. The FinTech variables of use and access are used to measure FinTech. The number of bank branches serves as a proxy for bank concentration, while the loan recovery rate is used to assess non-performing loans. Z-score evaluates the stability of financial institutions, while exchange rate measures the actual effective exchange rate. Broad money measures the total amount of currency outside banks. Trade openness measures the total amount of imports and exports as a percentage of GDP, and population represents

the annual population growth rate. GDP is measured as the percentage growth rate of GDP at market prices. Parentheses include robust standard errors from t-statistics. At 1%, 5%, and 10%, they are ***, **, and * significant, respectively. The Hansen test displays the p-values of the overidentification of instrumental variables, while the AR (1) and AR (2) tests display the p-values of the first- and second-order autocorrelation tests, respectively."

TABLE 5
INTERACTIVE EFFECTS OF MONETARY POLICY AND FINTECH ON INFLATION

VARIABLES	Model (1) Inflation	Model (2) Inflation	Model (3) Inflation	Model (4) Inflation	Model (5) Inflation	Model (6) Inflation	Model (7) Inflation
$Inflation_{t-1}$	-0.0102**	-0.0103**	-0.0102**	-0.0103**	-0.0105**	-0.0102**	-0.0105**
	(0.00419)	(0.00420)	(0.00419)	(0.00420)	(0.00426)	(0.00415)	(0.00426)
Value of mobile money transactions per GDP	0.0630***						
	(0.00719)						
Monetary policy	-0.492***	-0.210***	-1.866***	-1.183***	-0.588***	-0.591***	-0.592***
	(0.0728)	(0.0727)	(0.414)	(0.152)	(0.0772)	(0.0774)	(0.0774)
Value of mobile money transactions per GDP * monetary policy	-1.305***						
	(0.0886)						
GDP	-0.0353***	-0.0312***	-0.0780***	-0.0545***	-0.0391***	-0.0392***	-0.0392***
	(0.00186)	(0.00181)	(0.00485)	(0.00269)	(0.00196)	(0.00196)	(0.00196)
Population	-0.142	-0.417	-5.588***	-2.597***	-0.630	-0.684	-0.679
	(0.566)	(0.547)	(1.890)	(0.991)	(0.602)	(0.603)	(0.603)
FDI	-0.00380	-0.00528	-0.380	-0.0367	-0.0141	-0.0150	-0.0130
	(0.0380)	(0.0363)	(0.464)	(0.340)	(0.0403)	(0.0403)	(0.0403)
Exchange Rate	0.182***	0.206***	0.625***	0.264***	0.214***	0.214***	0.215***
	(0.0567)	(0.0565)	(0.180)	(0.0894)	(0.0604)	(0.0601)	(0.0602)
Non-performing Loans	0.00782	-0.0266	0.0124	-0.171*	0.0174	0.0444	0.0404
	(0.0796)	(0.0756)	(0.181)	(0.100)	(0.0837)	(0.0860)	(0.0858)
Bank Concentration	0.000233	0.000263	-0.000373	0.000552	0.000203	0.000171	0.000185
	(0.000296)	(0.000284)	(0.000971)	(0.000481)	(0.000316)	(0.000316)	(0.000315)

Broad money	0.164***	0.141***	1.867***	1.031***	0.188***	0.188***	0.188***
	(0.0242)	(0.0232)	(0.186)	(0.0729)	(0.0257)	(0.0257)	(0.0257)
Trade openness	-0.00575	-0.0118	-0.0676	-0.0340	-0.0139	-0.0146	-0.0140
	(0.0129)	(0.0123)	(0.0623)	(0.0243)	(0.0137)	(0.0136)	(0.0136)
Z-score	0.132	0.135*	1.033***	0.482***	0.126	0.128	0.125
	(0.0845)	(0.0809)	(0.250)	(0.143)	(0.0901)	(0.0899)	(0.0898)