

THE MUTUAL RELATIONSHIP BETWEEN FINANCIAL INCLUSION AND EFFECTIVENESS OF MONETARY POLICY: EVIDENCE FROM UPPER-MIDDLE-INCOME COUNTRIES

Finansal Kapsayıcılık ile Para Politikası Etkinlięi Arasındaki Karşılıklı İlişki: Üst-Orta Gelirli Ülkelerden Kanıtlar

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Abstract

Enhancing financial inclusion is crucial for achieving global objectives such as sustainable growth, improved societal welfare, and poverty reduction. Due to its importance, financial inclusion has recently become a key policy issue and a widely studied topic. This study investigates the relationship between financial inclusion and monetary policy in upper-middle-income countries using the Two-Step System GMM and Panel Granger Causality methods. The findings reveal a bidirectional negative relationship between inflation and financial inclusion. Inflation negatively affects financial inclusion, while an increase in financial inclusion has a reducing effect on inflation. Additionally, digitalization, regulatory quality, and money supply positively affect financial inclusion, while the growth of money supply and deposit interest rates increase inflation. According to Granger causality analysis, there is a causality running from financial inclusion to the inflation rate. Accordingly, policymakers in upper-middle-income countries are advised to adopt balanced monetary policies and consider that increasing financial inclusion can help mitigate the adverse effects of inflation.

Öz

Finansal kapsayıcılığın artırılması; sürdürülebilir büyüme, toplumsal refahın yükseltilmesi ve yoksulluğun azaltılması gibi küresel hedeflere ulaşmada kritik bir unsurdur. Bu önem doğrultusunda, finansal kapsayıcılık son yıllarda küresel bir politika öncelięi ve literatürde sıkça incelenen bir konu haline gelmiştir. Bu çalışma, üst-orta gelirli ülkelerde finansal kapsayıcılık ve para politikası arasındaki ilişkiyi İki Aşamalı Sistem GMM ve Panel Granger Nedensellik yöntemleriyle incelemektedir. Bulgular, enflasyon ile finansal kapsayıcılık arasında çift yönlü negatif bir ilişki olduğunu göstermektedir. Enflasyon finansal kapsayıcılığı negatif yönde etkilerken, finansal kapsayıcılıktaki artışta enflasyonu düşürücü etki yapmaktadır. Ayrıca dijitalleşme, düzenleyici kalite ve para arzı finansal kapsayıcılığı pozitif yönde etkilerken, para arzındaki büyüme ve mevduat faizleri enflasyonu artırmaktadır. Granger nedensellik sonuçları, finansal kapsayıcılıktan enflasyona doğru bir nedensellik olduğunu göstermektedir. Bu doğrultuda, üst-orta gelirli ülkelerdeki politika yapıcılara dengeli para politikaları benimsemeleri ve finansal kapsayıcılığın enflasyon üzerindeki olumsuz etkileri hafifletebileceğini dikkate almaları önerilmektedir.

Keywords:

Financial Inclusion, Monetary Policy, Dynamic Panel Data Analysis.

JEL Codes:

C23, F65, E52, G18.

Anahtar

Kelimeler:

Finansal Kapsayıcılık, Para Politikası, Dinamik Panel Veri Analizi

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1. Introduction

Financial Inclusion (hereinafter FI), defined as the ability to provide financial services to all segments of the population at an accessible cost, has recently emerged as a significant policy focus for both policymakers and global economic institutions. Widely acknowledged as a cornerstone of economic empowerment, FI is increasingly seen as a critical strategy for addressing poverty (Ozili, 2020). The World Bank (2022) describes FI as ensuring that individuals and businesses have access to affordable, practical financial products and services—including bank accounts, credit, savings, payments, and insurance—that cater to their needs while being delivered responsibly and sustainably. In alignment with this vision, G20 nations have reinforced their pledge to advance FI globally by adhering to the “G20 High-Level Principles for Digital FI”.

As supported by the academic literature, promoting FI has many societal benefits. Foremost among these contributions are enabling people to manage their financial liabilities efficiently, reducing poverty, and promoting financial stability and economic growth (Honohan, 2008; Bruhn and Love, 2014; Neaime and Gaysset, 2018; Von Fintel and Orthofer, 2020). Moreover, it increases household savings (Aportela, 1999), enables better financial risk management (Naceur et al., 2015), promotes women's empowerment within the social structure (Ashraf et al., 2010; Swamy, 2014), and reduces child labor (Beegle et al., 2003).

Studies indicate that FI contributes directly to eight of the Sustainable Development Goals (SDGs) (Murshed et al., 2023). Evidence suggests that FI plays a significant role in alleviating poverty (Burgess and Pande, 2005; Marron, 2013; Mushtaq and Bruneau, 2019; Chao et al., 2021), ending hunger (Fowowe, 2020), improving health and well-being (Asadullah et al., 2014; Tian and Kling, 2021), reducing gender inequality (Prina, 2015; Kazemikhasragh et al., 2022), energy efficiency and sustainability (Sadorsky, 2010; Kahouli, 2017; Ouyang and Li, 2018; Qu et al., 2020; Yao et al., 2021; Manko and Watkins, 2022; Yu and Tang, 2023), creating decent work opportunities (Honohan, 2008), reducing all forms of inequality (Fouejieu et al., 2020; Omar and Inaba, 2020) and environmental development (Le et al., 2020; Shahbaz et al., 2022; Liu et al., 2022).

Existing literature highlights a range of obstacles to individuals' access to financial products and services. These barriers stem from various socioeconomic and sociocultural factors, including low income, geographical limitations, insufficient technological infrastructure, the unavailability of suitable financial products, high costs associated with financial services, limited financial literacy, distrust in financial institutions, religious considerations, and a perceived lack of need for financial services (Beck et al., 2009; Demirgüç-Kunt and Klapper, 2013; Naceur et al., 2015; CAFI, 2018; Schuetz and Venkatesh, 2020). Individuals unable to access or utilize financial products and services face financial exclusion (Sinclair, 2013). This exclusion contributes to a cycle of poverty by exacerbating income inequality (Beck et al., 2007). Furthermore, financial exclusion is not confined to developing nations but also impacts disadvantaged populations and underprivileged regions within developed countries (Demirgüç-Kunt and Klapper, 2013; Gallego-Losada et al., 2023). According to Célerier and Matray (2019), nearly 40% of the global population lacks access to bank accounts, and even in the United States—boasting the highest FI levels—30% of low-income individuals remain excluded from the financial system.

At this juncture, the concept of digital finance (DF), born out of technological advancements, has emerged as a powerful mechanism to overcome physical obstacles to FI

(Liaquat et al., 2022). While the integration of technology and finance is not new, the most transformative shift has been the advent of sophisticated connectivity and storage innovations like big data, artificial intelligence, blockchain, and cloud computing (Arner et al., 2020). Broadly speaking, DF encapsulates the digitization of financial systems, encompassing all forms of electronic financial services and products—such as lending, payments, investments, insurance, and financial information—delivered to individuals and businesses via digital platforms (Gomber et al., 2017; Ozili, 2018). According to the Global Findex 2021 report, digitalization has led to significant increases in the FI rate, with millions of adults opening and using accounts. Globally, the percentage of adults holding a financial account has climbed to 76%, with the figure reaching 71% in developing economies (Demirgüç-Kunt et al., 2022). The proliferation of internet access and smartphone technology has facilitated the availability of diverse financial products and services to users, including those previously unbanked, paving the way for the emergence of Digital FI (Gallego-Losada et al., 2023). In this context, digital financial services provide a distinct opportunity to promote FI, particularly for marginalized segments of society, by offering customized financial solutions that address their needs while mitigating challenges related to costs, distance, and transparency (Kulkarni and Ghosh, 2021).

Due to its dynamic nature, FI can be influenced by many micro and macro factors and can have an impact on these dynamics. According to Khan (2011), by facilitating access to finance, FI can improve the quality and reduce the cost of services from banks for small-scale firms. These considerations can play a crucial role in enhancing the profitability of businesses and increasing welfare. Previous studies suggest that increasing official savings would help reduce the cost of credit and help business expansion. This situation helps to increase the resilience of small and large enterprises.

In regions where FI is robust, a significant portion of the economy transitions into the formal sector, contributing to the shrinking of the informal economy. This condition enables the effective implementation of monetary policy (hereinafter MP) (El Bourainy et al., 2021). As previously discussed, FI provides multiple contributions, one of which is widely recognized as enhancing the efficacy of MP. Ensuring price stability is regarded as one of the core objectives of central banks. An efficient MP plays a crucial role in achieving this objective. Given that a high level of FI can induce significant shifts in the financial behavior of both households and firms, it becomes imperative for the successful execution of MP and for central banks to maintain stability within the financial system.

For example, Galí et al. (2004) draw attention to the fact that a certain segment of society is far from the financial system when evaluating the effectiveness of MP. According to them, it is challenging for those who are not involved in the financial system to be directly affected by interest rate policies. Therefore, low FI weakens the effectiveness of the MP.

An enhancement of FI, as observed by Mbutor and Uba (2013), promotes savings and investment, thereby strengthening the stability of financial institutions to economic shocks. Furthermore, it holds significant importance in narrowing the savings-investment gap and reduces reliance on foreign capital. Anarfo et al. (2019) highlight that the main objective of MP is to stimulate economic growth and aggregate demand. However, one of the key determinants in achieving this goal is the level of FI. Given that financial systems function as conduits for MP, an enhancement in FI amplifies the efficacy of MP and influences inflation dynamics. Additionally, FI can increase the responsiveness of aggregate demand to changes in interest rates.

These interdependencies render the relationship between MP and FI critical for policymakers and researchers. The inability to clearly define this relationship often compels policymakers to prioritize one policy over the other, adding complexity to the subject and making it a significant area of interest for scholarly inquiry.

FI is increasingly recognized as a critical policy element due to its potential contributions to sustainable growth and stability, reducing inequality, financing SMEs, promoting digital finance, and consequently curbing the informal economy. However, insufficient FI can weaken the effectiveness of MP by limiting transmission mechanisms. Although upper-middle-income countries (UMIC) possess relatively developed financial systems, it is difficult to argue that they have achieved full effectiveness in terms of FI. Moreover, for these countries to attain their fundamental goal of transitioning to high-income status, both FI and the effectiveness of MP must improve. Examining the mutual relationship between FI and the effectiveness of MP becomes particularly relevant in this context. To address this need, the study clearly formulates the following key research questions in the introduction: (i) What is the nature of the relationship between FI and MP effectiveness in UMICs? (ii) Does FI influence inflation dynamics, and vice versa? To our knowledge, no prior study has explored this relationship specifically in UMICs. Therefore, this study aims to conduct an in-depth analysis of the interplay between FI and the effectiveness of MP within the framework of UMICs. The findings are expected to contribute to filling a significant gap in the academic literature while also providing valuable insights for policymakers in shaping regulatory and policy decisions.

FI holds strategic importance not only for the efficiency of the financial system but also for promoting social equity, enhancing economic participation, and supporting sustainable growth. UMICs, in their efforts to achieve higher income status and broader development goals, must ensure widespread access to financial services. In this context, FI should not be viewed merely as a unidirectional development indicator but as a dynamic component that also shapes the effectiveness of MP. The main motivation of this study lies in understanding this mutual interaction and contributing to the more effective use of policy tools accordingly. This study provides critical insights for central banks and economic authorities. It offers an empirical framework for understanding the extent to which FI influences the implementation of MP and the achievement of macroeconomic objectives. Moreover, by examining the relationship between FI and structural factors such as digitalization and regulatory quality, it delivers valuable implications for regulatory bodies, DF platforms, and private sector actors operating in the financial technology space. In this regard, the study not only contributes to the theoretical literature but also serves as a practical guide for various stakeholders in their policy development and strategic planning efforts.

2. Literature Review

Given its significant importance, FI has become a critical area of research for numerous national and international organizations, scholars, and practitioners. A review of the FI literature reveals a focus on the drivers of FI, the development of measurement methodologies, and the effects of FI on various macroeconomic and microeconomic variables. Despite the growing interest in the impact of FI on MP in recent years, the literature on this topic remains relatively limited.

The work by Galí et al. (2004) serves as a foundation for many subsequent studies in this domain. They explored the impact of individuals who are excluded from the financial system—non-savers and non-borrowers—on the effectiveness of MP, positing that access to financial systems plays a crucial role in the effectiveness of MP. Mbutor and Uba (2013) analyzed the effect of FI on MP in Nigeria from 1980-2012 and concluded that FI negatively affects inflation, thereby increasing MP effectiveness. A similar conclusion was reached by Mehrotra and Yetman (2014) in their study of 130 countries. They argued that FI significantly influences inflation and that the effectiveness of MP tends to be higher in countries with greater levels of FI. As such, optimal MP is highly sensitive to FI.

Lenka and Bairwa (2016), in their analysis of the SAARC countries between 2004 and 2013, observed that FI increases the effectiveness of MP and is instrumental in achieving price stability. Anarfo (2019) also reached similar conclusions, noting that FI impact on the inflation rate and other macroeconomic indicators in sub-Saharan African countries from 1990-2014, with the effect on inflation generally being negative. El Sherif (2019) investigated the impact of FI on MP effectiveness in Egypt and found that FI negatively affects inflation in both the short and long term, with a reciprocal causal relationship between FI and inflation. Similarly, Saraswati et al. (2020), in their study of Indonesia from 2009 to 2018, concluded that FI has a positive impact on inflation in both the short and long term, although the effects of FI shocks on inflation are not permanent. El Bourainy et al. (2021) found that FI has a negative impact on inflation and enhances the effectiveness of MP across 37 developing countries. Jungo et al. (2022) explored the relationship between FI and the effectiveness of MP in Sub-Saharan Africa and the Latin American & Caribbean regions for the period 2005-2018, determining that FI positively influences effectiveness of MP in Sub-Saharan Africa but has a negative effect in the Latin American & Caribbean region.

Although much research suggests a positive connection between FI and effectiveness of MP, a few studies present contrary findings. For example, Di Bartolomeo and Rossi (2007) explored the effectiveness of MP in countries with low financial system participation. They argued that participation in financial markets diminishes the effectiveness of MP and that an increase in the number of individuals without access to credit markets improves effectiveness of MP. Similarly, Lapukeni (2015) reported that FI undermined the effectiveness of MP in Malawi between 2001 and 2013. Ascari et al. (2011) argued that financial market participation does not significantly affect MP, and Evans (2016b) found no impact of FI on MP in African countries from 2005 to 2014. Instead, he suggested that the effectiveness of MP drives FI. Furthermore, Suman (2017), in his review of FI literature between 2008 and 2017, noted that most studies focused on the impact of FI on economic growth, emphasizing the scarcity of studies examining the effects of FI on MP and recommending further research in this area.

When the FI literature is broadly examined, it becomes evident that it has witnessed significant expansion over the years. A considerable body of literature focuses on the determinants of FI and its relationship with macroeconomic variables. However, while extensive research exists on FI and its broader macroeconomic implications, relatively limited attention has been given to its direct impact on the effectiveness of MP. Existing studies typically adopt either country-specific empirical analyses or broad comparative studies encompassing multiple income groups. Country-specific research primarily investigates the unique dynamics of a single economy, providing detailed insights into how FI influences MP transmission. In contrast, large-scale comparative analyses explore the macroeconomic consequences of FI at a global level.

Despite the growing body of research in this field, FI's role in shaping the effectiveness of MP has yet to be comprehensively examined within UMICs. In this study, however, this relationship is thoroughly investigated within the context of UMICs.

3. Research Methodology

3.1. Data Set

This study investigates the nexus between FI and the effectiveness of MP in UMICs for the period 2010–2020. The research initially aimed to encompass all UMICs; however, due to data limitations for certain countries during the relevant period, the final dataset consisted of 24 UMICs between 2010 and 2020. Accordingly, two research models were developed. In the first model, the dependent variable is the FI index (FII). While single indicators can be used in FI studies, indices that capture the accessibility, usability, and utilization dimensions of FI provide a more comprehensive representation. Therefore, FII was calculated to measure FI across multiple dimensions. In the second model, following the relevant literature (e.g., Anarfo, 2019; Saraswati, 2020; El Bourainy et al., 2021; Jungo et al., 2022 etc.), the inflation rate was selected as the dependent variable, serving as a key indicator of effectiveness of MP. To enhance the robustness of the models and improve the reliability of the results, control variables were incorporated based on both empirical findings and theoretical frameworks. Detailed information on the variables used in the study is presented in Table 1.

Table 1. Information of the Variables Used in the Study

Symbol	Variables	Data Source
FII	(D1): Number of commercial bank branches per 100,000 adults (D2): Number of ATMs per 1,000 km ² (D3): Outstanding loans from commercial banks (% of GDP)	FAS
INF	Inflation, consumer prices (annual %)	WDI
FFI	Financial freedom index	Heritage Foundation
DF	Number of ATMs per 100,000 adults	FAS
PERGRW	GDP per capita growth (annual %)	WDI
MONEY	Broad money growth (annual %)	WDI
QUALITY	Regulatory Quality (country score between -2.5 and 2.5)	WGI
DEPINT	Deposit interest rate (%)	WDI
STAB	Political stability and absence of terrorism/violence (country score between -2.5 and 2.5)	WGI
CCOR	Control of corruption (country score between -2.5 and 2.5)	WGI
MOBIL	Mobile cellular subscriptions (per 100 people)	WDI

Note: WGI: Worldwide Governance Indicators. WDI: World Development Indicators. FAS: Financial Access Survey.

Firstly, the multidimensional FII is calculated with sub-indices (D1, D2 and D3) following Sarma (2008) as follows;

$$Di = \frac{A_i - m_i}{M_i - m_i} \quad (1)$$

A_i : The level value of dimension i,

m_i : The minimum value of dimension i,

M_i : The maximum value of dimension i.

After each sub-index is calculated in this way, the FII including these sub-indices is calculated as follows.;

$$FII = 1 - \frac{\sqrt{(1 - d_1)^2 + (1 - d_2)^2 + (1 - d_3)^2}}{\sqrt{3}} \quad (2)$$

In Eq. 1, d_i takes a value between 0 and 1; the higher the value of d_i , the higher the success of the relevant unit in that dimension. Then, FII, which is calculated by including the three sub-indices, takes a value between 0 and 1. When this value approaches 0, it means that FI decreases, and when it approaches 1, it means that FI increases (Sarma, 2008).

Table 2 presents descriptive statistics for the variables preferred in the study. When the data in the table are analyzed, it is seen that the average GDP per capita growth in UMICs in the relevant period is around 1.7%. The average inflation level in these countries is 4.11%, and the average deposit interest rate is 5.09%. The level of financial freedom in these countries is around 55 points. Furthermore, the average regulatory quality is 0.154.

Table 2. Descriptive Statistics of Variables

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
D1	264	21.02648	13.45771	5.1	91.9
D2	264	27.98019	18.85022	.65	83.19
D3	264	44.28	19.07867	15.91	120.66
FII	264	.5635254	.0669486	.442	.7955
DF	264	59.62114	30.70304	18.76	185.41
MONEY	264	10.39038	7.234445	-3.74833	62.0543
DEPINT	264	5.090379	3.825435	.01	25.41
MOBIL	264	117.0341	27.32763	48.90232	185.407
INF	264	4.116652	4.909425	-2.595	55.412
FFI	264	55.37879	10.56613	30	70
PERGRW	264	1.740976	4.153311	-17.17671	9.823415
STAB	264	-.1419528	.5703773	-2.009063	1.111055
QUALITY	264	.1545808	.3866198	-.7754207	1.038354
CCOR	264	-.2296448	.4889838	-1.099215	1.003351

Table 3 presents the correlation matrix of the variables. The correlation matrix is used to verify whether the model suffers from a multicollinearity problem.

Table 3. Correlation Matrix

Variable	FII	INF	DF	CCOR	DEPINT	MOBIL	MONEY	PERGRW	STAB	QUALITY
FII	1.0									
INF	-0.2	1.0								
DF	0.3	0.1	1.0							
CCOR	0.1	-0.1	-0.1	1.0						
DEPINT	0.1	0.4	0.2	-0.0	1.0					
MOBIL	0.2	0.1	0.4	0.3	-0.1	1.0				
MONEY	-0.1	0.6	0.1	-0.1	0.4	-0.0	1.0			
PERGRW	0.1	-0.1	-0.1	-0.0	0.1	-0.1	-0.1	1.0		
STAB	0.0	-0.1	-0.2	0.5	-0.4	0.2	-0.3	-0.1	1.0	
QUALITY	0.4	-0.3	0.0	0.5	-0.1	0.3	-0.1	0.2	0.1	1.0

The results indicate that the FII is negatively correlated with INF and MONEY. Furthermore, INF exhibits a negative relationship with the variables CCOR, PERGRW, STAB

and QUALITY, while it shows a positive correlation with DF, DEPINT, MOBIL, and MONEY. The correlation coefficients between INF and the independent variables range between 0.1 and 0.6. These values suggest that there is no severe multicollinearity problem among the explanatory variables.

In addition, the Variance Inflation Factor (VIF) values are employed to further assess the presence of multicollinearity. A VIF value below 5 is generally considered indicative of the absence of multicollinearity. As shown in Table 4, all variables have VIF values below this threshold, suggesting that none of the explanatory variables exhibit multicollinearity concerns.

Table 4. VIF

Variable	VIF
FII	1.05
INF	1.68
DF	1.27
CCOR	1.47
DEPINT	1.45
MOBIL	1.40
MONEY	1.58
PERGRW	1.08
STAB	1.69
QUALITY	1.58

3.2. Research Method and Model Design

Dynamic panel data estimators incorporate the lagged value of the dependent variable as an explanatory variable within the model, which facilitates the assessment of how previous values of the dependent variable influence its current period. This inclusion enables the examination of temporal dependencies and dynamic relationships within the data. The Two-Step System GMM estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998) is considered to be one of the most up-to-date and advanced estimators of dynamic panel data estimators, which largely overcomes the existence of different unit-specific effects and the endogeneity problem. Moreover, this estimator is resistant to problems such as heteroskedasticity and autocorrelation. Since more instrumental variables are used in this estimator, the efficiency of the investigated models also increases. Therefore, the Two-Step System GMM estimator was preferred in this study.

GMM is particularly effective in addressing causality and endogeneity issues in short panel data settings. In this context, cross-sectional dependence was not directly incorporated into the model. One of the main reasons for this is that the instrumental variables used—particularly the lagged values of the independent variables—have the capacity to indirectly account for common shocks (Roodman, 2009).

Based on the existing theoretical and empirical literature (Mehrotra and Yetman, 2014; Lenka and Bairwa, 2016; Evans, 2016a; Evans, 2016b; Ozili, 2018; Neaime and Gaysset, 2018; Anarfo et al., 2019; Saraswati et al., 2020; El Bourainy et al., 2021; Murshed et al., 2023; Al-Samadi, 2023, etc.), Model 1 is developed to assess the impact of the effectiveness of MP on FI, while Model 2 examines the effect of FI on the effectiveness of MP.

Model 1;

$$FII_{it} = \partial_0 + \beta_1 FFI_{it-1} + \beta_2 INF_{it} + \beta_3 DF_{it} + \beta_4 QUALITY_{it} + \beta_5 MONEY_{it} + \beta_6 PERGRW_{it} \quad (3)$$

Model 2;

$$INF_{it} = \alpha_0 + \alpha_1 INF_{it-1} + \alpha_2 FII_{it} + \alpha_3 MONEY_{it} + \alpha_4 DEPINT_{it} + \alpha_5 PERGRW_{it} + \alpha_6 STAB_{it} + \alpha_7 CCOR_{it} + \phi_i + v_t + u_{2it} \quad (4)$$

In the analysis models, i is the unit dimension, t is the time dimension, α_0 and ∂_0 are the model constant terms and u_{1it} , u_{2it} are errors. $\beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7$ are the coefficients of the variables in Model 1. $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7$ are the coefficients of the variables in Model 2. ϕ_i is unobservable effect and v_t indicates time-specific factor.

To investigate the causality between the variables in the study, a panel causality approach has been applied. For this purpose, the Panel Vector Autoregressive (VAR) model has been utilized. Within the scope of the study, the panel VAR models established for Model 1 (5) and Model 2 (6) are as follows:

$$FII_{it} = \delta_0 + \sum_{j=1}^k \theta_j \Delta FII_{it-j} + \sum_{j=1}^k \beta_j INF_{it-j} + \sum_{j=1}^k \partial_{1j} DF_{it-j} + \sum_{j=1}^k \partial_{2j} QUALITY_{it-j} + \sum_{j=1}^k \partial_{3j} MONEY_{it-j} + \sum_{j=1}^k \partial_{4j} PERGRW_{it-j} + \sum_{j=1}^k \partial_{5j} MOBIL_{it-j} + u_{1t} \quad (5)$$

$$INF_{it} = \mu_0 + \sum_{j=1}^k \phi_j \Delta INF_{it-j} + \sum_{j=1}^k \gamma_j FII_{it-j} + \sum_{j=1}^k \delta_{1j} MONEY_{it-j} + \sum_{j=1}^k \delta_{2j} DEPINT_{it-j} + \sum_{j=1}^k \delta_{3j} PERGRW_{it-j} + \sum_{j=1}^k \delta_{4j} STAB_{it-j} + \sum_{j=1}^k \delta_{5j} CCOR_{it-j} + u_{2t} \quad (6)$$

In eq. 5 and 6 established for model 1 and model 2, δ_0 and μ_0 represent the constant parameters, while u_{1t} and u_{2t} denote the error terms. The coefficients of the variables in Eq.5 are represented by $\theta_j, \beta_j, \partial_{1j}, \partial_{2j}, \partial_{3j}, \partial_{4j}, \partial_{5j}$. Similarly, the coefficients of the variables in eq.6 are represented by $\phi_j, \gamma_j, \delta_{1j}, \delta_{2j}, \delta_{3j}, \delta_{4j}, \delta_{5j}$. For the estimated panel VAR models, the lag length is denoted by k , and the appropriate lag length has been determined by the Schwarz information criterion.

4. Results and Discussions

Table 5 reports the results of the cross-sectional dependence test for the variables. Based on the outcomes of multiple tests, the null hypothesis, which assumed no cross-sectional dependence among the variables, was rejected at the 1% significance level. These results indicate that all the variables exhibit cross-sectional dependence. As a next step, the presence of unit roots in the variables was assessed through the Pesaran (2007) panel unit root test, which incorporates cross-sectional dependence.

Table 5. Results of Cross-Section Dependence Tests

Variables	Breusch-Pagan LM	Pesaran Scaled LM	Bias-corrected Scaled LM	Pesaran CD
FII	1412.487* (0.000)	48.372* (0.000)	47.172* (0.000)	16.809* (0.000)
DF	1618.272* (0.000)	57.131* (0.000)	55.931* (0.000)	25.163* (0.000)
INF	546.381* (0.000)	11.508* (0.000)	10.308* (0.000)	8.489* (0.000)
QUALITY	842.545* (0.000)	24.114* (0.000)	22.914* (0.000)	-0.009 (0.992)
MONEY	381.704* (0.000)	4.499* (0.000)	3.299* (0.001)	6.709* (0.000)
DEPINT	711.907* (0.000)	18.553* (0.000)	17.353* (0.000)	6.482* (0.000)
STAB	774.365* (0.000)	21.212* (0.000)	20.012* (0.000)	0.489 (0.625)
CCOR	830.213* (0.000)	23.589* (0.000)	22.389* (0.000)	-1.197 (0.231)
PERGRW	1534.965* (0.000)	53.585* (0.000)	52.385* (0.000)	37.509* (0.000)
MOBIL	1058.269* (0.000)	33.296* (0.000)	32.096* (0.000)	7.950* (0.000)

Note: * indicates significance at the 1% level. The values included in parenthesis indicate the probability values.

Table 6 presents the results of the panel unit root test. According to the panel unit root test results, the null hypothesis that FII, INF, MONEY, and MOBIL variables have a unit root has been rejected at least at the 5% significance level. These results indicate that these variables are stationary. Since the DF, QUALITY, PERGRW, DEPINT, STAB, and CCOR variables have a unit root, their first differences have been taken. Consequently, it has been determined that these differenced variables are stationary.

Table 6. Results of Panel Unit Root Test

Variables	Statistics
FII	-2.929***
DF	-1.647
INF	-3.047***
QUALITY	-1.513
MONEY	-2.465**
PERGRW	-2.032
MOBIL	-2.551**
DEPINT	-1.661
STAB	-1.895
CCOR	-1.800
Δ DF	-4.290***
Δ QUALITY	-2.512**
Δ PERGRW	-2.600***
Δ DEPINT	-2.841***
Δ STAB	-2.619***
Δ CCOR	-2.579**

Note: ***, **, * significance at the 1%, 5% and 10% levels, respectively. The significance levels are - 2.58 for 1%; -2.33 for 5%, and -2.21 for 10%, respectively. Δ indicates the first difference of the series Δ denotes the first difference of the series.

This section of the study presents the results of the analyses conducted for Model 1 and Model 2 using the Two-Step System GMM method. Table 7 displays the results obtained from these analyses. The findings for the model 1 reveal that the lagged value of FII has a positive effect on the current period FII at the 1% significance level. This result confirms the validity of employing the dynamic panel data methodology in this study. The inflation rate exerts a statistically significant negative impact on FI at the 5% significance level, which is consistent with the findings of Evans (2016a), Kouladoum et al. (2022), and Al-Samadi (2023), who also

reported that inflation negatively influences FI. Regarding control variables, digitalization in the financial sector has a positive effect on FI at the 10% significance level, while regulatory quality positively impacts FI at the 5% significance level. These findings align with those of Van et al. (2022). Additionally, the growth in money supply exerts a significant impact on FI at the 1% significance level, supporting the conclusions of Jungo et al. (2022) and El Sherif (2019), who similarly argued that money supply positively affects inflation.

For the model 2, the results indicate that the lagged value of inflation has a statistically significant positive effect on current period inflation at the 1% significance level. Moreover, FII negatively affects inflation at the 5% significance level. This finding corroborates the results of various studies in the literature, including Mbutor and Uba (2013), Mehrotra and Yetman (2014), Lenka and Bairwa (2016), Anarfo (2019), El Sherif (2019), Saraswati et al. (2020), Jungo et al. (2022), and El Bourainy et al. (2021). The growth in money supply and the deposit interest rate, both included as control variables, exert a positive and statistically significant effect on inflation. These results are consistent with the findings of Lapukeni (2015), Evans (2016b), Jungo et al. (2022), and El Bourainy et al. (2021).

Table 7. GMM Results

Dependent: FII	Model 1	Dependent: INF	Model 2
FII _{t-1}	.7336958 (0.000)***	INF _{t-1}	.2406972 (0.001)***
DF	.000152 (0.091)*	FII	-8.021825 (0.039)**
INF	-.0008681 (0.028)**	MONEY	.3024042 (0.099)*
QUALITY	.0222141 (0.012)**	DEPINT	.2849913 (0.028)**
MONEY	.000536 (0.000)***	PERGRW	-.0388552 (0.494)
FFI	-.0003228 (0.287)	STAB	-.9859665 (0.183)
PERGRW	-.0001024 (0.637)	CCOR	-.1641093 (0.878)
MOBIL	-.0000477 (0.599)		
C	.1596809 (0.025)**	C	3.158685 (0.231)
Wald T.	0.000	Wald T.	0.000
AR(1)	0.008	AR(1)	0.108
AR(2)	0.342	AR(2)	0.190
Hansen T.	0.158	Hansen T.	0.194
Instrument Variable S.	17	Instrument Variable S.	17
Number of Observations	240	Number of Observations	240

Note: Coefficients are given outside the parentheses, and *, **, *** indicate 10%, 5%, and 1% significance levels, respectively.

Table 8 displays the results of the panel Granger causality tests for Model 1 and Model 2. The findings for model 1 reveal that FII is a Granger cause of INF at the 5% significance level. Evidence of bidirectional causality is observed between FII and MONEY, at least at the 10% significance level. The results further suggest that FII causes DF, while QUALITY influences FII, both at the 10% significance level. No causality is detected between FII and the PERGRW and MOBIL variables. For Model 2, the results indicate a one-way causality from FII to INF at

the 5% significance level. Additionally, bidirectional causality between INF and PERGRW is found to be significant at the 5% significance level.

Table 8. Panel Granger Causality Results

Model 1			Model 2		
Null Hypothesis	Test Statistic	p-value	Null Hypothesis	Test Statistic	p-value
FII → INF	4.853**	0.029	INF → FII	1.667	0.198
INF → FII	1.668	0.198	FII → INF	4.853**	0.027
FII → MONEY	2.731*	0.099	INF → MONEY	0.002	0.968
MONEY → FII	8.649***	0.004	MONEY → INF	1.064	0.304
FII → DF	2.827*	0.094	INF → PERGRW	3.916**	0.049
DF → FII	1.760	0.186	PERGRW → INF	4.215**	0.041
FII → QUALITY	0.013	0.908	INF → DEPINT	0.085	0.771
QUALITY → FII	3.710*	0.055	DEPINT → INF	0.142	0.707
FII → PERGRW	0.251	0.617	INF → STAB	0.262	0.609
PERGRW → FII	0.536	0.465	STAB → INF	0.146	0.703
FII → MOBIL	1.528	0.218	INF → CCOR	0.019	0.891
MOBIL → FII	2.664	0.104	CCOR → INF	0.012	0.914

Note: ***, **, * signify 1%, 5% and 10% significance levels, respectively.

5. Conclusion and Policy Recommendations

In today's world, it is believed that FI makes significant contributions to many SDGs, such as sustainable growth, poverty reduction, gender equality, and preventing the informal economy. These issues are increasing the importance of FI day by day. Due to this importance, both national authorities and international organizations like the World Bank, as well as policymakers are developing strategies and taking significant steps to increase FI. Based on this importance, this study has investigated the relationship between FI and the effectiveness of MP in UMICs and reached important results.

When the findings obtained in the scope of the study are evaluated together, there are several key points. One of the most significant points is the mutual relationship between inflation and FI, which is consistent with Jungo et al. (2022). According to the findings, FI is negatively influenced by inflation, and at the same time, FI has a negative impact on inflation. The level of inflation is considered a significant indicator of the success of MP. According to the widespread view in the literature, increased participation in the financial system, i.e., increased FI, increases the effectiveness of MP by enabling MP implementations to affect more people directly. The findings of this study are consistent with this view. On the other hand, effective MP encourages participation in the financial system and increases FI. Increased FI, in turn, increases the effectiveness of MP and significantly affects price stability.

The findings related to the control variables are as follows. Digitalization within the financial sector exerts a positive influence on FI; however, this nexus remains statistically weak. Despite the weak association, the integration of technological advancements into the financial system facilitates significantly easier access to financial services. This enhanced accessibility can, in turn, bolster FI. Therefore, in regulatory reforms aimed at fostering FI, technological factors should be regarded as a critical consideration. The expansion of the money supply contributes positively to FI. This result can be attributed to the reflection of an increased money supply in the form of deposits held in banks. Additionally, regulatory quality also exerts a positive impact on FI. Regulatory quality is an important indicator that reflects the government's ability to make

regulations to support and develop the private sector. In this regard, improving the quality of regulations can enhance efficiency and transparency in the financial system, reducing market inefficiencies. This, in turn, increases the likelihood of FI. Interest rates have a positive impact on inflation. This effect can be evaluated in two different ways. Firstly, from the perspective of supply-side inflation, an increase in lending interest rates can raise costs, potentially leading to an increase in the general price level. Secondly, since the study uses deposit interest rates as an interest rate indicator, an increase in deposit interest rates can be seen as increasing disposable income, leading to an increase in total demand and, consequently, an increase in the general price level. The results indicate that the growth in money supply is positively related to inflation, consistent with theoretical expectations. It is generally accepted that an increase in money supply can lead to an increase in total demand, which in turn can lead to an increase in the general price level.

The findings highlight the mutual relationship between FI and the effectiveness of MP, emphasizing the need for a cohesive and integrated policy approach in UMICs. Policies aimed at enhancing FI should prioritize expanding digital financial services, improving regulatory quality, increasing financial literacy, and reducing barriers to banking access. Strengthening fintech infrastructure and mobile banking can foster broader participation in the formal financial system, leading to more efficient transmission of MP measures across different economic segments. At the same time, maintaining inflation stability is crucial, as high inflation negatively affects FI by reducing the real value of savings, discouraging long-term investments, and increasing borrowing costs. Policymakers should implement credible inflation-targeting frameworks, ensure exchange rate stability, and balance money supply growth to prevent inflationary pressures from undermining FI. A well-coordinated monetary and fiscal policy mix is essential for achieving both price stability and sustainable FI expansion. Given the inverse relationship between FI and MP effectiveness, regulatory frameworks should account for their interplay to optimize policy outcomes. Central banks must enhance FI monitoring mechanisms, leverage financial technology for data-driven decision-making, and align FI initiatives with broader monetary objectives.

Despite its contributions, this study has certain limitations. First, although the initial aim was to cover all UMIC, data availability limited the sample to 24 countries over the period 2010–2020. Future research could broaden the scope by including more countries and longer time spans, provided that consistent data become accessible. Second, while a composite FI index was used to reflect multiple dimensions of inclusion, qualitative aspects such as financial literacy, trust in financial institutions, or informal finance usage were not included due to data constraints. Future studies may incorporate such variables through alternative data sources or case study approaches. Finally, while robust econometric techniques like Two-Step System GMM and Panel Granger Causality were applied, further research could explore alternative methodologies or conduct subgroup analyses to validate and enrich the empirical findings.

Declaration of Research and Publication Ethics

This study which does not require ethics committee approval and/or legal/specific permission complies with the research and publication ethics.

Researcher's Contribution Rate Statement

The authors declare that they have contributed equally to the article.

Declaration of Researcher's Conflict of Interest

There is no potential conflicts of interest in this study.

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