
The Credit Market Linkage in The Financial Mediation and Economic Development Connectivity

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Abstract:

This study examined the connectivity between financial mediation and economic development, with emphasis on the credit market in both developed and developing countries. The panel data of selected developed and developing countries over the period 1993 to 2023 was used on some financial indicators such as broad money growth (BMG), domestic credit to the private sector (DCPS), and non-performing loans (BNPL) and real interest rate (RINT) in relation to human development (HDI) in a Dynamic Ordinary Least Squares (DOLS) estimator. The results revealed significant disparities between the two economic groups of developing and developed countries, with the developed countries exhibiting more stable financial structures and higher human development levels. BMG positively impacted HDI in developed economies, while for developing countries, it had a weak and negative impact in developing countries, indicating inefficiencies in financial systems of the developing countries. DCPS was also found to be negatively related with insignificant impact in developed countries, while it exerted a positive and significant impact in developing countries, supporting the Credit Market Imperfection Hypothesis. Thus, while financial intermediation plays important role in economic development, its impact varies across economic environments. The study therefore recommends among others for the strengthening of the financial market structures, enhancing credit accessibility, implementing institutional reforms, and adopting balanced monetary policies for the sustainable economic development.

Keywords: Dynamic Ordinary Least Squares, Economic Development, Financial Intermediation, Panel Data

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1. Introduction

Any economy has to transfer capital from those with extra money (savers) to others who need it for productive purposes (borrowers). This allocation process, which is carried out through financial markets and institutions, has a direct effect on innovation, development, and economic progress. By giving businesses the money,

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they need for expansion, innovation, and infrastructure, finance fosters the growth of new industries, job possibilities, and productivity gains (Faruque et al., 2024). In underdeveloped nations, for example, capital market financing has increased business sales by 10% and employment by 5% in just one year. By 2025, digital finance is expected to generate up to 95 million new jobs and enhance GDP by \$3.7 trillion, (McKinsey Global Institute. 2016, International Finance Corporation, 2025). Since they facilitate the smooth transfer of money from savers to borrowers and act as a stimulant for investment, innovation, and inclusive growth, efficient credit markets are the foundation of contemporary economies. In addition to supporting sustainable economic development, the credit markets' capacity to direct resources toward beneficial purposes emphasizes its vital role in tackling global issues including financial inclusion and economic inequality.

Mehta (2022) clarified that the credit market instruments include government bonds of various maturities, investment-grade bonds, junk bonds, and short-term commercial paper. Also, debt instruments like credit default swaps (CDS), mortgage-backed securities, and collateralized debt obligations are traded in the credit market. While insurance companies, and the government have always been the main players in the credit market, there has been more diverse players given the development of the financial systems thus, the fin-tech (financial technology) and private equity markets are also players in the market (Giglio, 2021).

Fin-tech and private equity have significantly improved the lending market's dynamics. Alternative funding options, especially for startups and companies that might not fit the strict requirements of established banking institutions, have been made available via private equity markets. By filling funding shortages, these markets have supported high-growth industries and encouraged innovation by offering cash through private lending agreements or equity financing (Giglio, 2021).

Likewise, fin-tech has contributed to the transformation of credit markets by utilizing technology to provide financial solutions that are more customer-focused, inclusive, and efficient. Peer to peer lending services, such as Upstart, Lending Club, and others, have taken the place of conventional middlemen by facilitating direct communication between lenders and borrowers. Fin-tech advancements in credit scoring have also made use of alternative data, such social media activity and transaction histories, to evaluate creditworthiness, giving underprivileged group's access. According to the Demirgüç-Kunt et al. (2022), over 1.2 billion adults gained access to a financial account between 2011 and 2021, largely due to digital financial services, and global adoption of fintech lending surpassed \$400 billion in 2023 (Statista, 2024). These developments have improved financial inclusion and lowered credit obstacles, supporting international initiatives to democratize the financial system.

While fintech has considerably increased financial access, pushed credit score innovation, and created alternative funding choices through peer-to-peer lending and private equity, these advancements have not come without hurdles. In many developing countries where digital financial services have grown rapidly, a large

digital gap still prevents widespread access, particularly among underprivileged communities. Despite considerable advances, concerns remain regarding the long-term viability, regulatory soundness, and inclusiveness of fintech-led credit systems. As digital banking continues to transform credit markets, it is critical to consider not only its benefits for financial inclusion and growth, but also the unexpected repercussions it may have in weak or unequal financial systems.

Lots of studies has been done on financial intermediation on economic growth but only a few have actually concentrated on economic development and as we have come to know, economic development differs from economic growth. While some researchers (Türsoy & Faisal, 2018) showed that financial intermediation is important for economic growth, other studies (John & Nwekemezie, 2019) showed that finance has a negative effect on growth. Most studies (Yakubu, Abokor, & Balay, 2021) concentrate on analyzing how financial development affects growth using bank credit to private sector to measure financial development. Few people talk about how the other aspects of financial intermediation, such deposits and money supply, impact development overall. Therefore, the study plans to add to the existing discussion on the development nexus of financial intermediation in the given environment. The study highlights the significance of financial intermediation in promoting economic development by focusing on variables as deposit credit to private sectors, bank non-performing loans, real interest rate as well as the growth of broad money. It clarifies the ways that a healthy credit market encourages business growth, removes financial constraints, boosts economic progress and enhances the welfare of the poeple. The research also helps to develop policies by recommending ways to strengthen financial institutions and improve the efficiency of loan distribution.

Even while financial intermediation is recognized as being important for economic development, many nations still struggle with inefficient credit markets that limit access to funding for both individuals and enterprises. According to the WorldRemit (2022), about 24% of adults in developing economies remain unbanked, largely due to barriers in credit accessibility, while small and medium enterprises (SMEs) face a \$5.7 trillion global financing gap annually, a number that swells to \$8 trillion when informal enterprises are included, (IFC, 2023), indicating the persistence of systemic inefficiencies in credit markets. Investment, innovation, and overall economic growth are hampered by financial constraints, especially in developing countries. Information asymmetry, excessive interest rates, and inadequate regulatory frameworks all contribute to inefficiencies in the lending sector. The gap between financial sector expansion and economic progress raises doubts about the effectiveness of financial intermediation in converting into sustainable growth and development.

In order to investigate the relationship between economic development and financial intermediation, the study aims to: 1) appraise bank non-performance loans in the credit market to economic development, 2) ascertain the broad money growth to economic development, and 3) ascertain how real interest rate on credit market relates to economic development. Through improved loan accessibility and investment

efficiency, this study emphasizes how important financial intermediation is for fostering economic development in both developed and developing countries. It clarifies how a healthy credit market may facilitate business growth, reduce financial barriers, and support businesses. Policymakers might also utilize the data to strengthen financial institutions and enhance the functioning of the loan market.

2. Theoretical Background

Credit Market

The credit market is where governments and businesses issue debt to investors, including investment-grade bonds, junk bonds, and short-term commercial paper. Apart from debt offerings such as notes and securitized liabilities like mortgage-backed securities, collateralized debt obligations (CDOs), and credit default swaps (CDS), the credit market is also occasionally called the debt market (Cleartax, 2023).

Compared to the stock market, the credit market is far larger in terms of monetary value. Consequently, the state of the credit market is a barometer for the general well-being of the markets and the economy. Because the credit market typically shows a sign of trouble before the stock market does, some analysts refer to it as the canary in the mine. The government, which issues Treasury bonds, notes, and bills with maturities ranging from one month to thirty years, is the largest issuer of debt. Corporate bonds, the second-largest credit market group, are also issued by firms. Investors use corporate bonds to give businesses funding to expand their operations. At the conclusion of the period, the business reimburses the principal and charges the holder interest in return. To fund projects and activities, governments and municipalities issue bonds. A municipality bond, for example, might be issued to finance a city housing project (CFA Institute, 2024).

Types of Credit Market

In an economy, there are two primary types of credit markets: formal and informal. An informal market is a credit market that is not subject to governmental regulation. A formal credit market is controlled by the government and is often found in developed countries. Municipalities, companies, and national governments can issue bonds in industrialized countries with regulated credit markets when they need money. The issuer pays the investors' interest on the bonds, and when investors buy bonds, they are essentially giving the issuer money. In addition to selling their bonds to other investors at a price higher or lower than their face value before to maturity, investors can also sell their bonds back to the issuers at face value when they mature.

Credit market vs. Equity market

The equity market allows investors to purchase stock in a firm, whereas the credit market allows them to purchase consumer or corporate loans. For instance, when an investor purchases a bond issued by a business, they are investing in the credit market

and giving the business money. They are acquiring a portion of the business itself if they purchase shares. Depending on the kind of stock and what the company offers investors, this implies that they can participate in its gains or losses, or they can experience increases or decreases in the market value of the business (Oaktree Capital Management, 2019).

Economic Development

Economic development is multidimensional, hence there is no one precise definition for it. Jaffee (1998) defined economic development as the process of creating and utilizing physical, human, financial, and social assets to generate improved and broadly shared economic well-being and quality of life for a community or region. Seidman, Holt and Greenwood (2005) on the other hand differentiating between economic development and economic growth noted that the former is a broadly based and sustainable increase in the overall standard of living for individuals within a community. The United Nations Development Programme (UNDP) (1997), also defined development as providing people with greater choices where decisions are made with the people and their nation in mind. The UNDP views sustainability, productivity, equity, and empowerment as the four main pillars of development, especially human development.

Financial Instability Hypothesis

The financial instability hypothesis, developed by Hyman Minsky in 1977, asserts that excessive risk-taking during economic booms makes financial systems fundamentally unstable. Long stretches of economic stability, in Minsky's opinion, push investors and financial institutions to take on more debt, which fuels speculation and Ponzi schemes. When borrowers are unable to pay their debts, this buildup of financial fragility ultimately leads to crises. By stressing the cyclical nature of financial instability and the necessity of regulatory actions to reduce systemic risks, the hypothesis casts doubt on the traditional understanding of efficient markets.

Structuralist View of Financial Development

According to the structuralist view of financial development, structural economic restrictions including income inequality, institutional flaws, and market defects cause financial systems to develop differently in different nations. Structuralists support a more interventionist role for the government in regulating financial markets to alleviate development bottlenecks, in contrast to the liberalization approach, which places an emphasis on deregulation. In order to ensure that credit distribution promotes inclusive growth and productive investment rather than just maximizing short-term profits, this point of view argues that financial regulations should be customized to particular economic settings.

Credit Market Imperfection Hypothesis

The credit market imperfection hypothesis contends that information asymmetry in financial markets causes moral hazard and adverse selection. Because of these flaws, lenders might restrict credit instead of just changing interest rates, which would keep some productive borrowers from getting loans. Investment and economic progress are hampered by this inefficiency, especially in emerging nations where credit limits are more severe. In order to lessen inequalities and increase credit accessibility, the hypothesis emphasizes the significance of institutional reforms and financial regulation (Stiglitz & Weiss, 1981).

Empirical Literature

Bist (2018) used panel data analysis for 16 low-income countries between 1995 and 2014 to investigate the long-term association between financial development and economic growth. Panel unit root and panel co-integration techniques, including dynamic and completely modified OLS methods, are used in the study. The findings support a strong and favorable long-term correlation between economic expansion and financial development. The analysis also reveals that these nations continue to have relatively low private sector credit flows, which may be a growth hindrance. According to the findings, policymakers ought to concentrate on establishing conducive conditions for the expansion of the private sector, since this could encourage additional economic growth in these areas.

Pan and Mishra (2018) looked into the connection between China's economic expansion and the growth of the stock market. The study finds a long-term negative association between the Shanghai A-share market and the actual economy using the Toda-Yamamoto causality test, the Autoregressive Distributed Lag (ARDL) model with structural discontinuities. It was discovered that other indicators of stock market activity, like sectoral indices and stock market liquidity, were important.

Using a sizable sample of developing, emerging, and advanced economies, Botev, Égert, and Jawadi (2019) investigated on the connection between financial development and economic growth. The authors employ a variety of nonlinear threshold regression models. Since there was no obvious tipping point beyond which financial development has a detrimental impact on economic growth, the study's findings refute the "too-much-finance-is-bad" theory. Additionally, the study showed that market financing and banking work in tandem, with bank loans having a greater beneficial effect on growth in economies with more developed stock markets. This complementarity has comparatively low thresholds. Furthermore, it doesn't seem that a nation's degree of economic development or trade openness has an impact on the consequences of bank and market financing.

Ketteni and Kottaridi (2019) used data from 66 nations between 2000 and 2013 to examine how credit market liberalization affected economic growth. In order to determine both linear and nonlinear relationships between financial regulation and

GDP growth, they used a Partially Additive Linear Model with marginal integration. Their results demonstrate the threshold and varied consequences of credit deregulation. Initial credit reforms have a positive effect on growth in industrialized nations, and the benefits continue when a certain threshold is crossed. On the other hand, deregulation hinders growth in emerging and developing nations, maybe as a result of particular economic circumstances and institutional flaws. Concurrent institutional reforms to optimize growth gains were recommended indicating that credit market deregulation alone is insufficient to boost growth in emerging nations.

The relationship between non-performing loans (NPLs) and economic growth (EG) in Turkey was examined in the study by Kartal, Kirikkaleli, and Ayhan (2021). Utilizing quarterly data from 2005/Q1 to 2019/Q4, the study applied the wavelet coherence approach to capture both short-term and long-term causal linkages. The results show notable co-movements between NPLs and EG at various frequencies, with economic growth strongly influencing NPLs over the long run. Additionally, during the period from 2007 to 2010, EG was found to cause NPLs in the short term, indicating that credit expansion during this time, despite rising NPLs, supported the growth of Turkey's economy. The study emphasizes the predictive power of EG on NPLs in Turkey.

The effect of credit market structure on agricultural development in West African nations was examined in the Kassouri and Kacou (2022) study. The authors investigate the function of agricultural credits, credit to households and businesses engaged in agriculture, and domestic credit to the private sector using sophisticated panel data estimate approaches to handle endogeneity and cross-sectional dependence. The results show that expanding agricultural loans and credit to businesses involved in agricultural production might greatly increase agricultural productivity, supporting both the supply-leading and demand-following theories. The report suggested that enhancing agricultural development requires specific policy changes in the lending markets.

The importance of financial intermediation in economic growth and its relationship with business cycles was examined in Konstantakopoulou (2023). The author explores how monetary factors and financial frictions influence financial intermediation and its effects on economic activity. Using a theoretical approach, the role of financial intermediaries in improving fund allocation, reducing monitoring costs, managing liquidity risks, and facilitating efficient resource distribution was highlighted. Financial intermediation was found to be crucial for economic growth while and financial market frictions can amplify external shocks, affecting macroeconomic stability.

The effect of financial development and inclusion on economic growth in Nigeria was examined in the study by Anthony-Orji et al. (2023). Using classical linear regression and annual data from 1981 to 2019, the study assessed how financial accessibility and development influence growth. The findings reveal that both financial development and financial inclusion have a significant positive effect on Nigeria's economic

growth. The authors recommend policies that empower financial intermediaries to mobilize and distribute funds more efficiently and affordably, especially to underserved individuals and productive sectors of the economy.

The impact of domestic credit on the economic growth of Nigeria was investigated on by Olannye, Maku, and Adelowokan (2023). They employed the time series data from 1981 to 2020 on the Auto-Regressive Distributed Lag (ARDL) to examine the short- and long-run effects of credit allocation to both the private and public sectors. The findings revealed that credit to the private sector significantly promotes economic growth, while credit to the public sector has an insignificant effect. The study recommends the adoption of sector-specific domestic credit policies, improved public-private collaboration, and the implementation of effective risk management practices to enhance the productivity of public sector credit.

Cheng et al. (2024) examined the effect of bond market development on economic growth in selected developing countries from 1990 to 2020. Employing the Autoregressive Distributed Lag (ARDL) on GDP per capita as a proxy for economic growth and bond market development indicators such as government and corporate bond capitalisation. The results reveal a long-term relationship among the variables. Government bond capitalisation, trade openness, and inflation positively impacted on economic growth, while there was a negative impact of corporate bond capitalisation and domestic credit to the private sector. The study recommends that governments promote bond market development by simplifying listing procedures and creating policies that attract investors and encourage corporate participation.

3. Methodology

Theoretical Framework

The study employed the Minsky's Financial Instability Hypothesis (FIH). According to FIH, extended economic stability promotes excessive risk-taking and credit expansion, both of which can result in crises and financial fragility. While the Human development Index (HDI) measures economic development, broad money growth, domestic credit to the private sector, non-performing loans, and real interest rates are indicators of financial intermediation. According to FIH, financial stability and development are eventually threatened by misallocation of funds and an increase in loan defaults, which are represented in non-performing loans (NPLs), even though credit expansion can initially spur growth.

Although broad money growth improves liquidity, if left unchecked, it could lead to inflation or asset bubbles. Private sector credit encourages profitable investment, but if it is not properly regulated, it may also cause instability. While real interest rates have an impact on borrowing patterns and credit allocation, non-performing loans (NPLs) are a sign of credit risk and deteriorating financial health. The theoretical framework can be represented thus

$$HDI_t = \mathcal{F}(BMG_t + DCPS_t + RINT_t + BNPL_t)$$

HDI_t = Human Development Index at time t

BMG_t = Broad money Growth at time t

$DCPS_t$ = Domestic Credit to Private Sector at time t

$RINT_t$ = Real Interest Rate at time t

$BNPL_t$ = Bank Non Performing Loans at time t

In line with FIH, the model hypothesizes that:

$$\frac{\partial HDI}{\partial BMG} > 0, \text{ excessive growth may introduce instability.}$$

$$\frac{\partial HDI}{\partial DCPS} > 0, \text{ up to a point, after which it may reverse}$$

$$\frac{\partial HDI}{\partial RINT} > 0,$$

can be positive or negative depending on the structure of credit markets

$$\frac{\partial HDI}{\partial BNPL} < 0,$$

can be positive or negative depending on the structure of credit markets

Model specification

$$HDI = \alpha_0 + \alpha_1 BMG + \alpha_2 DCPS + \alpha_3 RINT + \alpha_4 BNPL + \mu_t$$

Where; HDI =

BMG = broad money growth

$DCPS$ = domestic credit to private sector

$RINT$ = real interest rate

$BNPL$ = bank non-performing loans

α_0 = constant

α_1 to α_4 = parameters

μ_t = error term

The model can be further be expressed in DOLS form as

$$HDI = \alpha_0 + \sum_{i=0}^k \beta_1 BMG + \sum_{i=0}^k \beta_2 DCPS + \sum_{i=0}^k \beta_3 RINT + \sum_{i=0}^k \beta_4 BNPL + \sum_{k=0}^p \gamma_k \Delta X_{t-1} + \sum_{i=0}^k \delta_k \Delta X_{t-1} + \sum_{i=0}^k \phi_k X_{t-1} + \sum_{i=0}^k \varpi_k X_{t-1} + \mu_t$$

Data and estimation method.

The study used secondary data from 1993 to 2023. Variables like BMG , $RINT$, $DCPS$, $BNPL$ were sourced from the World Bank Development Indicators (WDI) (2024) while HDI was sourced from the World Bank Human Development Reports, various years. The selected countries for the study were USA, Switzerland, Germany, Australia and Japan for developed countries and Nigeria, India, Indonesia, South Africa and Brazil to represent developing countries. The reason for the selection was for each country to represents a key region (North America, Europe, Asia, Africa, and Latin America), ensuring a balanced perspective. The data were tested for unit root using the Levin, Lin & Chu t test while the model was tested for Multicollinearity along with other diagnostic tests. Given the outcome of the unit root test, cointegration was carried out using the Pedroni and the Kao test. The Dynamic Ordinary Least

Square (DOLS) estimation method was employed to determine the long-run connectivity between economic development and financial intermediation given credit market. while the econometric test was carried out using E-views 10 econometric package and Stata 13 econometric package.

4. Empirical Findings/Result

Descriptive Statistic

Table 1. Descriptive Statistics for Developed Countries

Statistic	HDI	BMG	BNPL	DCPS	RINT
Mean	0.895348	4.809223	0.680391	126.8781	2.070314
Median	0.913000	4.419345	0.000000	140.0194	2.010283
Maximum	0.967000	18.23299	4.959904	220.3156	8.475772
Minimum	0.000000	-2.752340	0.000000	0.000000	-1.258522
Std. Dev.	0.129186	4.428238	1.009896	57.61909	2.123097
Skewness	-6.485122	0.708394	1.835556	-0.806663	0.651585
Kurtosis	45.24980	3.050660	6.404279	3.006240	2.747211
Jarque-Bera	12614.88	12.98032	161.8857	16.81014	11.38059
Probability	0.000000	0.001518	0.000000	0.000224	0.003379
Sum	138.7790	745.4296	105.4606	19666.11	320.8987
Sum Sq. Dev.	2.570095	3019.831	157.0630	511273.7	694.1613
Observations	155	155	155	155	155

Source: Authors' Regression Output on data, (2025).

Table 2. Descriptive Statistics for Developing Countries

Statistic	HDI	BMG	BNPL	DCPS	RINT
Mean	0.574675	250.8791	2.642364	52.20565	6.794404
Median	0.631000	14.96855	2.043029	39.73520	5.261943
Maximum	0.938000	3280.653	37.25329	142.4220	44.63517
Minimum	0.000000	-0.794167	0.000000	0.000000	-24.60017
Std. Dev.	0.196155	843.1697	4.267707	45.96710	10.95956
Skewness	-1.970656	3.326553	4.333083	0.624270	1.533750
Kurtosis	6.505051	12.07017	31.43611	1.996923	6.000013
Jarque-Bera	178.5073	811.9121	5670.502	16.45885	118.1285
Probability	0.000000	0.000000	0.000000	0.000267	0.000000

Sum	88.50000	38635.38	406.9241	8039.670	1046.338
Sum Sq. Dev.	5.886938	1.09E+08	2786.639	323285.1	18377.12
Observations	154	154	154	154	154

Source: Authors' Regression Output on data, (2025).

The descriptive statistics highlight disparities between developed and developing countries. The average HDI is significantly higher in developed countries (0.895) than in developing ones (0.575), reflecting better education, income, and life expectancy, in line with modernization theory. The greater HDI variability in developing countries (standard deviation of 0.196) suggests uneven progress across regions. Broad money growth (BMG) is markedly higher in developing countries (mean of 250.88 vs. 4.81), which may indicate expansionary monetary policies practiced in developing countries. Bank non-performing loans (BNPL) average 2.64 in developing countries versus 0.68 in developed ones, pointing to weaker financial institutions and greater credit risk in the former. This supports the financial repression hypothesis, which links underdeveloped financial systems to inefficiencies in credit allocation. Domestic credit to the private sector (DCPS) is more prevalent in developed countries (mean of 126.88) than in developing countries (52.21), consistent with financial development theory, which emphasizes the role of deep financial systems in supporting growth.

Unit Root Test

The test for stationarity of the variables was carried out using the Levin, Lin & Chu t test. The results for the developed and developing countries are as presented below.

Table 3. Stationarity Test for Developed Countries

Variable	Test Statistic	p-value	Level or First Difference	Stationarity Status
HDI	-4.69518	0.0000	1(0)	Stationary at level
BMG	-2.44125	0.0073	1(0)	Stationary at level
BNPL	-4.15271	0.0000	1(1)	Stationary at 1st difference
DCPS	-2.46450	0.0069	1(1)	Stationary at 1st difference
RINT	-7.54699	0.0000	1(1)	Stationary at 1st difference

Source: Authors' Regression Output on data, (2025).

Table 4. Stationarity Test for Developing Countries

Variable	Test Statistic	p-value	Level or First Difference	Stationarity Status
HDI	-2.41938	0.0078	1(1)	Stationary at 1st difference
BMG	-2.82765	0.0023	1(0)	Stationary at level
BNPL	-3.37204	0.0004	1(0)	Stationary at level
DCPS	-10.9398	0.0000	1(1)	Stationary at 1st difference
RINT	-3.83535	0.0001	1(0)	Stationary at level

Source: Authors' Regression Output on data, (2025).

The Stationarity test results indicate mixed integration orders. For developed countries, HDI and BMG are stationary at level $I(0)$, while BNPL, DCPS, and RINT become stationary after first differencing $I(1)$. This blend necessitates careful modeling to avoid spurious regression results. Similarly, in developing countries, HDI, DCPS are $I(1)$ while BMG, BNPL, and RINT are $I(0)$. The mix of integration orders in both samples justifies the use of panel co-integration tests and long-run estimation techniques like the Dynamic Ordinary Least Squares (DOLS).

Cointegration Test

Given that the some of the variables were integrated of order one, there need for the determination of cointegration among the variables. This was done using both the Pedroni and the Kao test.

Table 5. Cointegration Test for Developed Countries

Test	Statistic	Probability
PEDRONI (WITHIN-DIMENSION)		
Panel v-Statistic	13.10656	0.0000
Weighted Panel v-Statistic	-1.225436	0.8898
Panel rho-Statistic	-1.713250	0.0433
Weighted Panel rho-Statistic	2.003437	0.9774
Panel PP-Statistic	1.232226	0.8911
Weighted Panel PP-Statistic	2.213954	0.9866
Panel ADF-Statistic	1.476667	0.9301
Weighted Panel ADF-Statistic	2.030426	0.9788
PEDRONI (BETWEEN-DIMENSION)		
Group rho-Statistic	-0.672282	0.2507
Group PP-Statistic	1.867629	0.9691
Group ADF-Statistic	2.159326	0.9846
KAO TEST (RESIDUAL BASED)		
ADF t-Statistic	-1.865734	0.0310
Residual Variance	0.017806	-

HAC Variance	0.013652	-
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Source: Authors' Regression Output on data, (2025).

Table 6. Cointegration Test for Developed Countries

Section	Test Statistic	Unweighted Statistic	Prob.	Weighted Statistic	Prob.
Within-Dimension	Panel v-Statistic	-0.235354	0.5930	0.094688	0.4623
	Panel rho-Statistic	-2.870619	0.0020	-2.404279	0.0081
	Panel PP-Statistic	-5.794719	0.0000	-5.376181	0.0000
	Panel ADF-Statistic	0.844626	0.1992	-1.282816	0.0998
Between-Dimension	Group rho-Statistic	-1.286211	0.0992		
	Group PP-Statistic	-5.202723	0.0000		
	Group ADF-Statistic	-0.800636	0.2117		

Source: Authors' Regression Output on data, (2025).

The co-integration results further reinforce the existence of a long-run relationship among the variables, albeit with some differences in strength and consistency across groups. For developed countries, the Pedroni test produced results showed that both Panel rho-statistic and the Kao residual-based ADF t-statistic as significant. In contrast, developing countries demonstrated stronger co-integration under Pedroni's within-dimension test, especially through the significant Panel rho and PP-statistics. This could imply that despite greater volatility, these economies may exhibit a more synchronized long-term relationship between financial variables and HDI, this may possibly due to their more homogeneous structural characteristics or greater susceptibility to external shocks, as highlighted in the structuralist perspective.

Dynamic Estimation

Table 6. Dynamic Ordinary Least Square (DOLS) for Developed Countries

Variable	Coefficient	Std. Error	t-Statistic	Probability
BMG	0.000177	0.000485	0.365413	0.7164
BNPL	0.002818	0.003265	0.862921	0.3925
DCPS	-0.0000183	0.0000964	-0.190149	0.8500
RINT	0.005974	0.002553	2.339917	0.0235
Statistic	Value			
R-squared	0.982965			

Adjusted R-squared	0.962027
S.E. of Regression	0.004650
Sum Squared Residuals	0.001038
Long-run Variance	1.98E-05

Source: Authors' Regression Output on data, (2025).

Table 7. Dynamic Ordinary Least Square for Developing Countries

Variable	Coefficient	Std. Error	t-Statistic	Probability
BMG	-3.03E-05	1.77E-05	-1.708565	0.0911
BNPL	0.003994	0.001466	2.724224	0.0078
DCPS	0.002205	0.001545	1.426895	0.1572
RINT	-0.003686	0.001534	-2.403451	0.0184
Statistic	Value			
R-squared	0.448324			
Adjusted R-squared	0.143951			
S.E. of Regression	0.066145			
Sum Squared Residuals	0.380641			
Long-run Variance	0.001984			

Source: Authors' Regression Output on data, (2025).

From the result of Dynamic Ordinary Least Squares (DOLS) given that the variables are co-integrating it was revealed that for the developed countries (Table 4.4A), broad money growth (BMG) exerts a positive but not significant effect on development (0.000177, $p = 0.7164$), implying that monetary expansion does not strongly influence long-run human development outcomes in advanced economies. This may be attributed to mature financial systems where excess liquidity is less likely to directly spur growth. Bank non-performing loans (BNPL) also show a positive but not significant relationship (0.002818, $p = 0.3925$), suggesting that these economies have sound banking regulations and risk management frameworks that cushion development from the adverse effects of credit defaults. A negative non-substantial impact of Domestic credit to the private sector (DCPS) was found (-0.0000183, $p = 0.8500$), possibly indicating diminishing marginal returns to credit in saturated markets. In contrast, real interest rates (RINT) are positive and significant (0.005974, $p = 0.0235$), supporting the idea that stable, well-calibrated interest rates promote savings and investment, thereby advancing development.

For developing countries, BMG has a negative and not significant effect (-3.03E-05, $p = 0.0911$), unlike the positive direction observed in developed nations. This suggests that monetary expansion in emerging economies may not translate into development gains due to issues such as inflationary pressures, weak transmission mechanisms, or inefficient financial institutions, aligning with the Structuralist view that financial

deepening without institutional reform yields limited results. BNPL shows a positive and significant impact (0.003994, $p = 0.0078$). This implies that although defaults are rising, the broader access to credit may still be contributing to growth, at least in the short term, though this raises questions about long-term sustainability.

DCPS exerts a positive but not significant effect (0.002205, $p = 0.1572$), showing potential benefits for development, especially when compared to the negative coefficient seen in developed economies. This supports the Credit Market Imperfection Hypothesis, which emphasizes that improved access to private credit can stimulate entrepreneurial activities and growth in less developed economies. Lastly, RINT reveals a negative and significant effect (-0.003686, $p = 0.0184$), in stark contrast to the positive impact observed in developed countries.

5. Discussion

The findings reveal substantial differences in financial development and human development between developed and developing countries. Developed countries generally exhibit higher human development, greater financial depth, and more stable financial conditions, while developing countries experience greater monetary volatility, higher credit risks, and limited access to financial resources. These differences indicate that financial development does not automatically translate into improvements in human development but depends on institutional quality, financial efficiency, and socioeconomic structures. This finding aligns with Schumpeter (1934), King and Levine (1993a, 1993b), and Levine and Zervos (1998), who emphasize the importance of financial intermediation in promoting economic development. Similarly, Jaffee (1998), Greenwood and Holt (2010), Saci et al. (2009), and Bist (2018) highlight the role of financial structures and institutional conditions in shaping development outcomes. The importance of financial accessibility is further supported by Demirgüç-Kunt et al. (2022), Anthony-Orji et al. (2023), and the International Finance Corporation (2023), who emphasize financial inclusion as an essential component of sustainable development.

The stationarity and cointegration results suggest the presence of long-run relationships between financial variables and human development, although the evidence varies across country groups and testing approaches. These findings indicate that financial development and socioeconomic progress may evolve together over time, but their relationships are influenced by differences in financial market structures and economic conditions. Botev et al. (2019) demonstrate that the relationship between financial development and economic growth can be nonlinear, while Ketteni and Kottaridi (2019) emphasize the importance of credit market regulations. Konstantakopoulou (2023) further explains that financial intermediation interacts with economic growth and business cycles. The findings also reveal that broad money growth has an insignificant positive relationship with human development in developed countries and an insignificant negative relationship in

developing countries. This suggests that monetary expansion alone may not generate improvements in human welfare. Similar perspectives are discussed by John and Nwekemezie (2019), Jammeh (2022), and Türsoy and Faisal (2018), who examine the importance of financial intermediation and financial depth for economic performance. McKinsey Global Institute (2016) further emphasizes that financial expansion becomes more beneficial when accompanied by financial accessibility and inclusion.

Bank non-performing loans exhibit a positive but insignificant relationship with human development in developed countries, whereas a positive and significant relationship is observed in developing countries. This unexpected positive association in developing economies may reflect broader credit expansion occurring alongside increasing loan defaults rather than a direct developmental benefit of non-performing loans. Ahmad et al. (2016) and Kartal et al. (2021) highlight the complex relationship between banking credit risk and economic performance. Cohen et al. (2024) and Oaktree Capital Management (2019) further emphasize the importance of financial supervision and credit risk management in maintaining financial stability. Meanwhile, domestic credit to the private sector shows an insignificant negative relationship in developed countries and an insignificant positive relationship in developing countries, suggesting that credit expansion does not necessarily improve human development without effective resource allocation. This interpretation is consistent with Seidman (2005), Kassouri and Kacou (2022), and Olannye et al. (2023), who emphasize the importance of productive credit allocation. Mehta (2022) and CFA Institute (2024) explain the role of credit market structures in financial resource distribution, while Pan and Mishra (2018), Cheng et al. (2024), and International Finance Corporation (2025) highlight the potential contribution of financial markets and intermediaries to productive investment, employment, and economic development.

Real interest rates demonstrate contrasting relationships with human development across the country groups. In developed countries, real interest rates have a positive and significant relationship with human development, suggesting that stable financial conditions and savings incentives may be associated with improved socioeconomic outcomes. Conversely, the negative and significant relationship in developing countries indicates that higher borrowing costs may constrain investment, financial accessibility, and economic opportunities. These findings are consistent with Yakubu et al. (2021), who emphasize the importance of financial intermediation for economic development. Khan (2024) also highlights the relevance of financial resource flows and macroeconomic conditions in shaping economic performance. The contrasting relationships suggest that financial policies should reflect differences in economic structures and financial market maturity, particularly because monetary conditions that support stability in developed economies may create additional financing constraints in developing countries.

Financial innovation and digital transformation may provide additional opportunities to strengthen the contribution of financial development to human development,

particularly in developing economies. Although these factors were not directly examined in the empirical model, they offer relevant explanations for differences in financial accessibility and efficiency. Giglio (2021) emphasizes the growing importance of financial technology in transforming financial services, while Faruque et al. (2024) highlight the opportunities and challenges of digital transformation among small businesses. Khan et al. (2024) further demonstrate the relevance of institutional quality, innovation, and technological development for financial market advancement. Statista (2024) documents the expansion of fintech investment, while WorldRemit (2022) highlights continuing challenges related to financial inclusion and exclusion. These perspectives suggest that financial technology, supported by effective institutions and appropriate regulation, may improve financial accessibility and strengthen the potential contribution of financial systems to socioeconomic development.

Overall, the findings suggest that the relationship between financial development and human development is context-dependent and differs considerably between developed and developing countries. While real interest rates demonstrate significant but opposing relationships across the country groups, non-performing loans are significantly associated with human development only in developing economies. In contrast, broad money growth and domestic credit to the private sector do not exhibit statistically significant relationships in either group. These findings extend financial development theory by emphasizing that the effectiveness of financial systems depends not merely on monetary expansion or credit availability but also on institutional effectiveness, financial stability, and productive resource allocation. Therefore, policymakers in developed countries should prioritize financial stability and efficient intermediation, while developing countries should strengthen financial inclusion, credit quality, and access to affordable financing. The study contributes to the literature by highlighting the importance of evaluating financial development through broader human development outcomes rather than economic growth alone.

6. Conclusions

This article develops the Digital Supply Coordination for Upcycling–Repurposing (DSC-UR) conceptual framework as an approach to integrating circular economy activities with digital supply chain coordination and MSME margin optimization. The model consists of five main components: Digital Resource Mapping, Digital Supplier Coordination, Upcycling–Repurposing Production Coordination, Digital Market Coordination, and the Margin Optimization System.

The integration of these components produces a *closed-loop* mechanism that links material availability, suppliers, MSME production, markets, and economic information. The main conceptual contribution of this study lies in the shift in orientation from mere waste reduction toward circular value creation. Upcycling–repurposing practices are positioned not only as an environmental strategy but also as an economic value-creation strategy.

Digital Supply Coordination functions as an *enabling mechanism* that increases information transparency and coordination among actors. Improved coordination is projected to generate cost efficiency and higher product value, which ultimately contribute to the optimization of MSME margins. The DSC-UR Model remains a conceptual framework and therefore requires validation and empirical testing. Future research could conduct FGDs with stakeholders, map MSME supply chains, measure cost and margin structures, and test the effectiveness of the model among circular economy MSMEs in Padang Lawas Regency. The results of such testing are expected to yield a DSC-UR Model that not only makes a theoretical contribution but can also be implemented as an instrument for developing circular economy MSMEs at the regional level.

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