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DOES DIGITAL PAYMENTS REDUCE THE RISK OF MONEY LAUNDERING? THE ROLE OF FINANCIAL SECTOR DEVELOPMENT

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Abstract. This study examines how financial sector development mediates the relationship between digital payments and money laundering. The current study relies on a sample of 120 countries, including both developed and developing economies, for the years 2014, 2017, and 2021. The findings reveal that digital payments, the rule of law, and political stability reduce the risk of money laundering, indicating that the increased use of digital payments helps reduce the risk of money laundering. This suggests that digital transactions, being more traceable and transparent than cash transactions, can help authorities monitor and prevent illicit financial activities more effectively. Regarding the mediation effect of financial sector development, the results show that financial sector development and the rule of law positively affect the density of digital payment transactions. In addition, it revealed that money-laundering risk is lower when the financial system develops and compliance with laws and political stability. These findings provide actionable insights for policymakers, regulators, and financial institutions committed to strengthening anti-money laundering efforts.

Keywords: digital payment, financial sector development, money laundering risk, role of law, political stability, developed economies, developing economies.

JEL Classification: G2, G29, K23, K2, P0.

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1. Introduction

Money laundering (ML) is acknowledged as a pressing matter and one of the most highly complicated issues. This means hiding illegally obtained revenue and treating it as income from lawful origins (Baldwin, 2003; Levi & Soudijn, 2020). Meticulously executed ML schemes may involve crimes committed at several institutions and in various countries (Veen et al., 2020). Based on this definition, money launderers can utilize myriad methods to elude detection by introducing multiple levels of transactions intended to hide the sources of revenues gained in illegal contexts and make them appear legal (Berg, 2020). For example, these techniques may involve the placement of structured bank deposits or other transactions to legitimatize criminal proceeds by disguising assets obtained through crime and concealing original ownership. This may also involve incorporating shell com-

panies and transferring laundered funds to financial haven nations (Ogbeide et al., 2023; Schneider, 2020).

However, ML poses significant risks at both national and global levels. It undermines economic sovereignty by limiting government control over financial policies and reducing taxable revenues (Aluko & Bagheri, 2012; McDowell & Novis, 2001). Furthermore, it compromises the soundness and reliability of financial systems by enabling the movement of unlawful funds and elevating the risk of liquidity issues (Ofoeda, 2022).

Beyond economic implications, money laundering also endangers global political stability and security by financing criminal activities such as drug trafficking terrorist financing (Caulkins & Reuter, 2022; Compin, 2018).

Given the threats from ML, governments, and other economic sectors, especially the financial sector, collaborate to combat this crime (Lannoo & Parlour, 2021). Financial institutions, including banks, are obligated to adhere to anti-money laundering (AML) procedures to assist authorities in reducing and detecting criminal funds (Berg, 2020; Ogbeide et al., 2023; Pol, 2020). These procedures include commitment to Financial Action Task Force [FATF] guidelines, such as verifying customer identities, tracing the source of funds, and reporting suspicious transactions (FATF, 2020). However, despite these stringent measures, ML risk persists, in particular in economies with a large informal sector or a high proportion of unbanked individuals (Aluko & Bagheri, 2012).

In this context, the financial sector development (FSD) is vital for boosting the efficiency of AML efforts. An advanced financial system enhances regulatory enforcement, increases financial inclusion, and enhances transaction monitoring, making it more difficult for illicit funds to flow undetected. Additionally, FinTech innovations, such as digital payment (DP) systems, have emerged as powerful tools in combating ML by promoting financial transparency and improving the traceability of transactions (Mekpor et al., 2018; Ofoeda, 2022; Wu, 2017). By expanding access to formal financial services and integrating digital solutions, FSD not only facilitates economic progress, it in addition acts as a safeguard against illicit financial activities.

Accordingly, this research seeks to how FSD mediates the link between DP usage and the risk of ML. Drawing on data from 120 countries – encompassing a mix of developed and emerging economies – across the years 2014, 2017, and 2021, the analysis provides insight into how varying levels of FSD shape the effectiveness of AML practices in different national contexts.

Despite the extensive literature on digital payments, financial sector development, and money laundering, prior research has predominantly concentrated on the effectiveness of digital transactions in reducing ML concerns (Setor et al., 2021; Wiwoho et al., 2022) or the contribution of FSD in alleviating these risks (AlQudah et al., 2022; Ofoeda, 2022). Nevertheless the interaction among these elements remains insufficiently examined. This study seeks to address this gap by exploring how DP contribute to strengthening FSD and subsequently mitigating money laundering risks, so providing a more holistic view of financial crime prevention.

Furthermore, by utilizing a multi-year, cross-country dataset covering 120 developed and developing countries, this study provides empirical insights into how digital financial adoption, in conjunction with financial sector development, enhances financial integrity. In addition, the analyzed period – 2014, 2017, and 2021 – encompasses the global impact of the COVID-19 pandemic, further underscoring the significance of this study. The COVID-19 pandemic substantially expedited the implementation of DP due to lockdown measures and

mobility restrictions, reshaping financial transactions worldwide. This rapid shift highlighted the critical need for a robust DP infrastructure and a well-regulated financial sector to enhance transparency, security, and compliance in financial transactions (Blanco-Arana, 2020). Finally, the results of this research provide useful policy implications, demonstrating that digitalization along with robust financial sector development reinforce compliance and oversight mechanisms.

The structure of this paper is as follows: Section two provides a review of relevant literature and outlines the proposed research hypotheses. Section three explains the methodological approach adopted in the study. Section four details and interprets the empirical findings. Finally, section five concludes with key takeaways, policy implications, study limitations, and suggestions for future research.

2. Literature review and hypotheses development

In recent years, the rapid growth of digital payment systems has transformed financial transactions worldwide. While these advancements have driven economic growth and increased financial inclusion, they have also introduced significant risks, particularly in the context of money laundering. As financial systems evolve, understanding the interplay between digital payments, regulatory challenges, and the broader financial sector becomes critical. This section explores the existing literature on these topics, identifying key gaps and establishing hypotheses to examine the link between DP, ML risks, and the mediating role of FSD.

2.1. Digital payment and money laundering risk

A substantial escalation in the risk of ML has occurred as digital payments become increasingly prevalent, and soon all manner of digital transactions is like to be used by nefarious characters. Joyce (2001) pointed out the difficulties of electronic commercial transactions and digital currencies, especially cryptocurrencies as AML problems. Prepaid cards are a form of digital payment and have been likewise named as having the potential for use in money laundering (Choo, 2009). Legal frameworks to govern digital currencies and prevent their misuse are emphasized (Guidara, 2022; Wiwoho et al., 2022). Nonetheless, the effectiveness of ICT to counter ML is diminished without a trained workforce and a competent tax system (Vaithilingam et al., 2015). Compliance issues associated with emerging payment methods, such as such as digitally stored debit cards and mobile financial transfer systems only reinforce the requirement for more advanced risk management techniques (Jack & Suri, 2014). Technological AML/CTF methods are used with customer monitoring and reporting, which also raises privacy and ethical concerns (De Koker, 2016).

Electronic payment systems enable the real-time settlement of purchases by transmitting data across digital networks (Weibing, 2011). The most straightforward method of transferring money associated with ML is the electronic transfer of money, where financial transactions are conducted between parties through telecommunication infrastructures. In ML cases, the individuals involved in sending and receiving an electronic transfer typically aim to obscure the money's origin (Matejić & Ćurčić, 2022).

To combat this, strengthened Know Your Customer (KYC) rules, effective transactions tracking systems, and global cooperation are crucial (Subbagari, 2024). However, the existing AML legal system may not be fully equipped to regulate digital currencies (Yang et al., 2023). The possibility of electronic payment tools, online gambling, and third-party payment platforms to

be used for money laundering further complicates the issue (Thommandru, 2023). Therefore, a comprehensive legal framework and improved AML obligations for nonfinancial institutions are needed to address these challenges (Wiwoho et al., 2022; Yang et al., 2023).

Digitalization has made significant innovations possible across the globe due to borderless environments and globalization that have facilitated these developments, including remote work, mobile banking and online grocery provision (Kaygın et al., 2018). With new virtual platforms, like gaming consoles and virtual reality devices, criminal organizations have been able to expand their illegal operations, including money laundering (Ramos et al., 2019). Even with the many new regulations and changes to existing laws, it is still possible for someone to consider opening an offshore account. In addition, the changes in payment technologies with new proposals such as mobile banking and smart cards altered business operations, reshaping how tax authorities recognize evaders of their taxes (Bodescu et al., 2022). Therefore, the current study posits the following hypotheses:

H1: Digital payments positively affect Money laundering risk.

2.2. The mediation role of financial sector development

Numerous researchers have explored how FSD relates to broader economic development (Afonso & Blanco-Arana, 2024a). For instance, Osuma (2025) as well as Goel and Sharma (2017) highlighted that FSD and the expansion of financial infrastructure serve as key drivers of economic performance. Similarly, Mugova (2017) and Arefjevs et al. (2020) examined the influence of FSD on firm-level development and skills related to information and communication technologies. Strengthening the financial sector also contributes to reducing macroeconomic instability (Kapingura et al., 2022), which results from the role of Fintech firms (Mavlutova et al., 2022). The digital economy influences the financial system, causing changes in consumer behavior and blurring boundaries between the financial sector and other industries (Bakyashri & Jeyadevi, 2024).

FSD is critical to economic growth, yet it also presents significant vulnerabilities to ML activities (Sundarakani & Ramasamy, 2013). While having active AML regulations can mitigate this risk, the influence of such regulations on the relationship between finance and growth remains discriminatory across countries (Ofoeda, 2022). It is widely recognized that ML as a type of financial crime poses a serious a serious danger to the soundness of banking systems (Kot, 2021), and its risk has been analyzed in time series with cyclic component only (Levchenko et al., 2019); there are studies forecasting it by neural network models too (Lieonov et al., 2020). A way of managing ML risk may also include identifying the level of convergence with other financial companies and credit unions in this regard (Vnukova et al., 2018). Setor et al. (2021) revealed through fixed-effects and instrumental variable analysis that digital transactions substantially reduce corruption. Akartuna et al. (2023) highlighted the emerging threats associated with disruptive innovations like cryptocurrencies and alternative payment tools, by outlining the criminal strategies, vulnerable actors, and risk indicators involved. Gani and Rasul (2020) suggest that strong institutional frameworks can enhance financial transparency and stability, which may indirectly contribute to reducing money laundering activities.

The connection between digital payment and ML risk is complex and characterized by non-linear dynamics. Wang (2023) identified an inverted U-shaped pattern, where the FinTech development initially heightens the risk of ML but contributes to its decline over time. Wiwoho et al. (2022) showed that the scope of potential abuse in DP extends to registered

and unregistered sectors, illustrating further why a comprehensive legal framework is necessary for preventing financial crime. Khelil et al. (2023) discussed the role of digitalization in tackling money laundering and highlighted good ethical conduct and subsequent low corruption as a necessity to enhance this perspective. Tang and Ai (2016) illustrated risks and threats surrounding new technologies such as prepaid card systems where confirmation levels are non-existent or unidentified, resulting in vulnerabilities for money laundering activities. Research by Pratomo et al. (2023) and bin Zul Kepli and Zulhuda (2019) further advocates for enhanced legal and regulatory oversight in managing financial crime risks associated with digital currencies and financial technologies. Therefore, the current study posits the following hypotheses:

H2: FSD mediates the association between Digital payment and Money laundering risk.

3. Research methodology

3.1. Data and sample

This study was carried out through a secondary data analysis. We first used the Basel Institute on Governance to get money laundering risk data. Next, data on digital payment was obtained from the Global Findex database. A third data source was the IMF's International Financial Statistics (IFS) database on financial sector development. Lastly, information on FDI, GDP per capita, and trade openness was collected from the World Bank's Word Development Indicators (WDI). The last database consulted to feed the rule of law and political stability variables was taken from World Governance Indicators (WGI) based on the work done by the World Bank.

The study targets a sample of all countries, excluding those with a large amount of missing data. In this light, the study analyzes a sample of 120 countries worldwide for the years 2014, 2017, and 2021. These years were selected following the strategy of the Global Findex database, which provides data on digital payment transactions in the form of waves every three years. The list of countries included in the final sample is provided in Appendix Table A1.

3.2. Variables

This study considers money laundering risk as the dependent variable. Following previous research (Alexandre & Balsa, 2023; Ofoeda, 2022), this risk is assessed within capital markets using the Basel AML Index, developed by the Basel Institute on Governance. The Basel AML Index provides an independent annual evaluation of countries based on their exposure to ML and terrorist financing (ML/TF) threats. The index aggregates performance across five key areas: strength of the AML/CFT framework (65%), prevalence of bribery and corruption (10%), financial transparency and standards (15%), public accountability and openness (5%), and legal as well as political risks (5%). Scores range from 0 (indicating minimal risk) to 10 (indicating the highest risk).

The primary independent variable in this study is digital payment adoption, sourced from the Global Findex database. This variable captures the extent of digital transaction activity by calculating the share of individuals aged 15 and above who have either sent or received a digital payment. This approach has been widely adopted in the literature to represent digital payment usage levels (Antonijević et al., 2021; Setor et al., 2021).

In this study, financial sector development functions as the mediating variable. The Financial Development Index, based on the methodology provided by the International Monetary Fund (IMF), is used to assess this construct. It is a composite index that evaluates both financial institutions and financial markets. The development of financial institutions is reflected through indicators such as private-sector credit relative to GDP, the proportion of pension fund and mutual fund assets to GDP, and the share of life and non-life insurance premiums in GDP. Access to financial services is gauged by the number of commercial bank branches and ATMs per 100,000 adults. Institutional efficiency is assessed using metrics such as net interest margin, lending-deposit spread, the ratio of non-interest income to total income, overhead costs relative to total assets, and profitability indicators like return on assets (ROA) and return on equity (ROE).

Regarding financial markets, the index evaluates market depth using measures such as stock market capitalization, stock trading volume, and the value of international and domestic debt securities issued by both government and private entities, all expressed as percentages of GDP. Access is measured as the stock turnover outside the top ten by market capitalization and total number of nonfinancial corporate debt, including financial and nonfinancial corporations. This is a measure of market efficiency derived from the stock turnover ratio, which measures total traded value stocks to its market capitalization. This technique has been widely used by previous research that empirically investigates financial sector development (Antwi et al., 2023; Ofoeda, 2022).

Finally, the study utilized a set of control variables in accordance with previous research, including income level, role of law, political stability, trade openness, and foreign direct investment. Income level, commonly measured as GDP per capita, is often used as a control variable in studies examining economic phenomena because it represents a country's economic well-being and overall economic activity. Higher-income levels can indicate that more developed financial markets and institutions potentially control variables like digital payment, financial sector development, and money laundering risk (Ofoeda, 2022).

The rule of law (ROL) and political stability (PS) are two country-level governance indicators obtained from the WGI's database. Both metrics are evaluated using a measurement range from –2.5 to 2.5, where a score of –2.5 reflects the weakest governance performance and 2.5 represents the strongest. Previous research has argued that high-quality public governance, such as the ROL and PS, can reduce illegal activities and financial crimes, thereby reducing the risk of ML (AlQudah et al., 2022). Bayar and Aytemiz (2015) argued that institutional quality is important for the integrity of the financial sector, as robust legal systems improve financial transparency and promote adherence to AML legislation (Bayar & Aytemiz, 2015). Furthermore, research demonstrates that political stability, along with strong governance frameworks, promotes economic growth and financial resilience, hence diminishing the appeal of illegal financial activities (Afonso & Blanco-Arana, 2024b). Trade openness is defined as the proportion of the sum of exports and imports to GDP. It is assumed that a country with more openness to foreign economies will face more difficulties in applying ML regulations, and higher laundering risks are expected (Mekpor et al., 2018).

Lastly, foreign direct investment (FDIN) is measured as equity investment inflows into a particular economy. The literature suggests that FDIN positively impacts compliance with ML regulations, thereby reducing the risk of ML (Naheem, 2015; Verdugo Yepes, 2011). Moreover, research has shown the importance of institutional quality in providing

an optimal business environment for foreign direct investment, since well-governed countries with robust legal frameworks offer a more stable and transparent investment climate (Daude & Stein, 2007). In contrast, inadequate institutions and governance frameworks dissuade foreign investment due to increased risks, ambiguity, and insufficient contract enforcement (Gani, 2007). Consequently, incorporating FDIN as a control variable in this study permits a more thorough evaluation of the interplay between financial sector development, regulatory adherence, and money laundering concerns. However, Table 1 describes the variables used in this study.

Table 1. Description of the variables

Variable type	Variable	Symbol	Definition	Data source
Dependent variable	Money laundering risk	AML	Basel AML Index	Basel AML
Independent variable	Digital payment	DP	Proportion of population made or received a digital payment (% age 15+)	Global Findex
Mediator variable	Financial sector Development	FSD	IMF Financial Development Index (FDI)	International monetary fund (IMF)
Control variables	Income level	INC	GDP per capita	World development indicators (WDI)
	Foreign direct investment	FDIN	Foreign direct investment refers to direct investment equity flows in the reporting economy.	World bank
	Role of Law	ROL	A rating ranging from –2.5 to 2.5. Role of law is lowest at –2.5 and highest at 2.5.	World governance indicators (WGI)
	Political stability	PS	A rating ranging from –2.5 to 2.5. Political stability is lowest at –2.5 and highest at 2.5.	World governance indicators (WGI)
	Trade openness	Trade	The sum of export and import as proportion of GDP	World development indicators (WDI)

3.3. Analytical approach

Given that the analysis is based on panel data, the study employed three static panel estimation techniques: pooled ordinary least squares (POLS), fixed effects model (FEM), and random effects model (REM). POLS estimates regression with a single intercept and slope for all cross-sectional units (i.e., country in our case), thus neglecting individual heterogeneity. On the other hand, the FEM estimates common intercepts and slope but with individual-specific intercepts (i.e., country). The FEM can control for cross-sectional and time effects through the introduction of dummy variables. The rationale behind using FEM is that it controls for all possible unobserved characteristics of each bank in the study. The REM assumes that the variation between individuals is random and not correlated with the explanatory variables. Furthermore, REM assumes the model to be time-invariant, implying that the error term of the current period is not correlated with the past or future (Brüderl & Ludwig, 2015; Gardiner et al., 2009).

3.4. Empirical models

The research seeks to examine the mediating role of FSD in the relationship between DP and the risk of ML. In this regard, the study adopted three equation models as shown in Equation (1) which investigates a linear relationship between digital payment and money laundering risk:

$$AML_{it} = \beta_0 + \beta_1 DP_{it} + \beta_2 INC_{it} + \beta_3 ROL_{it} + \beta_4 PS_{it} + \beta_5 Trade_{it} + \beta_7 FDIN_t + \varepsilon_{it}, \quad (1)$$

where: AML_{it} denotes money laundering risk, measured by the Basel *AML* Index, in country *i* at time *t*. DP_{it} represents the density of digital payment transactions in country *i* at time *t*. INC_{it} is the income level, measured as GDP per capita, in country *i* at time *t*. ROL_{it} represents the rule of law in country *i* at time *t*. PS_{it} denotes political stability in country *i* at time *t*. $Trade_{it}$ is the trade openness in country *i* at time *t*. $FDIN_{it}$ represents foreign direct investment in country *i* at time *t*. β_0 is the intercept of the equation, and β_1 through β_7 are the coefficients of the independent variables. Finally, ε_{it} is the error term.

Equation (2) examines the relationship between *DP* and *FSD*.

$$FSD_{it} = \beta_0 + \beta_1 DP_{it} + \beta_2 INC_{it} + \beta_3 ROL_{it} + \beta_4 PS_{it} + \beta_5 Trade_{it} + \beta_7 FDIN_t + \varepsilon_{it}, \quad (2)$$

where: FSD_{it} represents financial sector development index proposed by the IMF.

Finally, Equation (3) examines the relationship between *FSD* and *ML* risk:

$$AML_{it} = \beta_0 + \beta_1 FSD_{it} + \beta_2 INC_{it} + \beta_3 ROL_{it} + \beta_4 PS_{it} + \beta_5 Trade_{it} + \beta_7 FDIN_t + \varepsilon_{it}. \quad (3)$$

4. Results and discussion

4.1. Descriptive statistics and correlation matrix

Table 2 presents the descriptive statistics of the continuous variables based on the average, standard deviation, minimum, and maximum for the 120 countries for the years (2014, 2017, and 2021). The finding shows that the mean of AML is 5.528 and a standard deviation of 1.322, range from 1.779 to 8.602, as evidence suggesting a moderate level of performance in combating ML. Meanwhile, DP adoption shows an average of 0.575 and a standard deviation of 0.291, reflecting relatively stable usage across countries. FSD records a lower mean of 0.382 and a standard deviation of 0.234. Income levels (INC) exhibit considerable variation, with a mean of $16,856.18, a standard deviation of $20,467.85, and a range from $462.70 to $100,172.08, highlighting significant economic disparities. For rule of law (ROL), the mean is 0.148 with a standard deviation of 0.950, with values between –2.296 and 2.125, indicating diverse levels of enforcement across countries. Political stability (PS) averages –0.070 with a standard deviation of 0.831, ranging from –2.406 to 1.616, further emphasizing variability across regions. Trade openness, with an average of 88.918 and a standard deviation of 57.676, shows wide differences in trade activity. Lastly, foreign direct investment net inflows (FDIN) average 1.678 with a relatively high standard deviation of 5.068, ranging from –1.343 to 4.931, suggesting considerable variation in investment patterns.

Table 2. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
AML	359	5.528	1.322	1.779	8.602
DP	352	.575	.291	.043	1
FSD	360	.382	.234	.065	.957
INC	360	16 856.181	20 467.851	462.7	100 172.08
ROL	360	.148	.95	–2.296	2.125
PS	360	–.07	.831	–2.406	1.616
Trade	357	88.918	57.676	22.577	425.976
FDIN	360	1.678e+10	5.068e+10	–1.343e+11	4.931e+11

Next, a correlation test was performed. The findings in Table 3 demonstrate that the correlation is low, less than 0.80, indicating no issues with multicollinearity (Kennedy, 2008).

Table 3. Matrix of correlations

Variables	–1	–2	–3	–4	–5	–6	–7	–8
(1) AML	1							
(2) FSD	–0.495	1						
(3) DP	–0.615	0.674	1					
(4) INC	–0.546	0.698	0.747	1				
(5) ROL	–0.65	0.682	0.748	0.821	1			
(6) PS	–0.595	0.499	0.629	0.631	0.757	1		
(7) Trade	–0.274	0.204	0.346	0.349	0.397	0.438	1	
(8) FDIN	–0.112	0.375	0.263	0.335	0.277	0.138	0.078	1

4.2. Regression results

Table 4 shows the results on the association between DP and ML risk (H1). The findings on the relationship between DP and FSD (H2) are presented in Table 5. Finally, Table 6 shows the findings regarding the association between FSD and ML risk (H3). Panel static estimators, POLS, FE, and RE models were employed. Initially, the Breusch and Pagan LM test was conducted to determine the better model between POLS and RE. The test result was statistically significant, suggesting that POLS should be rejected in favor of the RE model. The Hausman test was used to compare FE and RE models. The test result was not significant, indicating that the FE model should be rejected, making the RE model the preferred choice, as shown in Tables 4, 5 and 6. Studies have employed various econometric models, including pooled POLS, FE, and RE, to analyze the relationship between DP, bank profitability, and ML risks (Adekeye et al., 2021; Unger & Van Waarden, 2009). Consequently, the findings of RE model in Tables 4, 5, and 6 are used to support or reject the current study hypotheses.

As mentioned earlier, Table 4 displays the findings regarding the relationship between DP and the risk of ML (H1). The results indicate that DP negatively and significantly impact ML risk ($p < 0.01$). This suggests that the density of DP transactions reduces the risk of ML. Research suggests that DP and financial technologies have a complex relationship with ML and financial crime. While some studies indicate that digitalization and electronic payments are

negatively associated with ML risks (Khelil et al., 2023), others highlight potential challenges. The effectiveness of digital technology to counter financial crime also relies on other factors, such as capacities in terms of a skilled workforce (Vaithilingam et al., 2015) and efficiency in tax systems or institutional environments. As such, the effectiveness of digital money payment systems as a tool to counteract ML risks is promising yet contingent upon enabling infrastructure and regulatory oversight addressing potential weaknesses.

Additionally, the coefficient on income level is positive but insignificant. Based on these data, this can be interpreted to mean that income level changes make a limited difference in money laundering risk. ROL is the determinants that have a significant and negative impact on ML risk ($p < 0.01$). This demonstrates that a stronger ROL is associated with decreased chances of being a money launderer as demonstrated by the evidence presented here. Consistent with prior research, this indicates a positive effect of the ROL on money and terrorist financing. Higher ROL is connected to lower ML risk (Ghulam & Szalay, 2023). An important organization in the development of international standards and norms for financial institutions to obviate ML has been the Financial Action Task Force (Alexander, 2001). The risk associated with ML is significantly influenced by financial confidentiality, auditing regulations, and business openness (Ghulam & Szalay, 2023). Additionally, there is a strong correlation between the ROL Index and corruption indicators (Koeswayo et al., 2024), underlining the importance of completeness in supporting various financial crimes. Therefore, the ROL becomes central to any global efforts against money laundering and financial integrity.

The PS is also highly significant in the case of risk and its significance level ($p < 0.05$). This indicates that a better political environment is less likely to cause ML. Results show that PS has adverse impact on ML of an economy (Mejri et al., 2022). ML weakens economic expansion, disrupts financial system stability, and hinders political progress, especially in developing nations (Aluko & Bagheri, 2012). It further jeopardizes financial stability by damaging the reputation of banks and eroding public trust (Basaran-Brooks, 2022). However, factors such as trade openness and foreign direct investment net inflows (FDIN) do not demonstrate statistically significant impacts on the risk of ML based on the evidence provided. Therefore, maintaining and enhancing PS emerges as a substantial factor in mitigating the risk of ML globally.

Table 4. Digital payment system and money laundering risk

Variables	(POLS) AML	(FEM) AML	(REM) AML
DP	–1.323***	–1.070***	–1.436***
	(0.284)	(0.300)	(0.285)
INC	4.10e–06	3.66e–06	2.67e–06
	(4.67e–06)	(4.66e–06)	(5.82e–06)
ROL	–0.500***	–0.542***	–0.430***
	(0.114)	(0.115)	(0.144)
PS	–0.306***	–0.322***	–0.244**
	(0.0964)	(0.0960)	(0.121)
Trade	0.000707	0.000705	0.000670
	(0.000979)	(0.000973)	(0.00142)

End of Table 4

Variables	(POLS) AML	(FEM) AML	(REM) AML
FDIN	0*	0*	0
	(0)	(0)	(0)
Constant	6.154***	6.022***	6.264***
	(0.174)	(0.181)	(0.204)
Observations	349	349	349
R-squared	0.484	0.484	
Number of Years	3	3	3
Breusch-Pagan LM test (POLS vs. REM)			131.93 (0.000)***
Hausman test (FEM vs. REM)		6.61 (0.1581)	

Note: The dependent variable in these models is the money laundering risk, measured by the Basel AML Index. DP denotes digital payments. INC is the income level, measured as GDP per capita. ROL represents the rule of law. PS is political stability. Trade represents trade openness. FDIN denotes foreign direct investment. Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 5 shows the findings of the relationship between digital payment (DP) and financial sector development (FSD). The results reveal a strong positive association between PD usage and FSD, as indicated by the FSD index ($p < 0.01$). Expanding the use of DP enhances financial inclusion, improves operational efficiency, and supports economic development (Mavlutova et al., 2022; Veronicah et al., 2022). Financial performance is positively influenced by digital marketing and payments in companies (Al Kurdi et al., 2023). Cryptocurrencies and internet and mobile phone use are positively linked to financial inclusion and sector development in developing countries. These results suggest that digital transformation is critical in promoting sustainable FSD (Vincent & Evans, 2019). While the first indicator just shows that an increase in digital payment transaction usage has a positive effect on FSD.

The ROL also shows a strong positive impact on FSD ($p < 0.01$). There is strong evidence that the ROL has a large, positive effect on FSD across studies. Banking sector development, stock market efficiency and overall financial development all benefit from institutional quality – the ROL (Akisik, 2020; Dima et al., 2018; Khan et al., 2022). This means that a strong and impartial enforcement of the ROL is conducive to the improvement in FSD, as it provides for an environment with high degree legal certainty which is essential for finalizing those transactions and contracts in finance.

While PS, income level, trade openness and FDIN have non-significant relationship with FSD. On the one hand, some research shows that trade openness and financial openness have weak or inconsistent effects on financial development in sub-Saharan Africa (Bandura, 2022), while others indicate strong positive impacts of trade openness together with institutional factors are significant among SAARC countries (Ellahi et al., 2021). PS and ROL have exhibited limited impact on the financial system outcomes in a number of different countries (Ter-Mkrtchyan & Franklin, 2020). Economic growth is positively linked to natural resource abundance, but human development does not have much of a relationship with it (Redmond & Nasir, 2020). Private sector credit threshold between foreign direct investment and growth is reported to be insignificant (Osei & Kim, 2020). This might imply that while these factors may be relevant ingredients in other areas of finance, the legal system has a much more direct effect on how financial sectors evolve.

Table 5. Digital payment system and financial development

Variables	(POLS) FDI	(FEM) FDI	(REM) FDI
DP	0.232*** (0.0457)	0.0364** (0.0165)	0.0635*** (0.0182)
INC	3.00e–06*** (7.53e–07)	–1.62e–06*** (5.13e–07)	7.54e–07 (5.00e–07)
ROL	0.0677*** (0.0183)	0.000270 (0.0137)	0.0644*** (0.0127)
PS	–0.0103 (0.0155)	–0.00746 (0.00961)	0.00257 (0.0101)
Trade	–0.000379** (0.000157)	–0.000211 (0.000193)	2.43e–06 (0.000171)
FDIN	0*** (0)	0 (0)	0 (0)
Constant	0.212*** (0.0281)	0.411*** (0.0208)	0.323*** (0.0234)
Observations	350	350	350
R-squared	0.585	0.349	
Number of Years	3	3	3
Breusch-Pagan LM test (POLS vs. REM)			289.51 (0.000)***
Hausman test (FEM vs. REM)		2.86 (0.582)	

Note: The dependent variable in these models is financial sector development, measured as FSD index by the IMF. DP denotes digital payments. INC is the income level, measured as GDP per capita. ROL represents the rule of law. PS is political stability. Trade represents trade openness. FDIN denotes foreign direct investment. Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Lastly, Table 6 presents the findings on the relationship between FSD and the risk of ML. The results show that FSD, measured by FSD index, negatively and significantly impacts ML risk ($p < 0.05$). While financial development generally stimulates economic growth, AML regulations can have a threshold effect on this relationship (Ofoeda, 2022). FSD has been found to have a detrimental effect on environmental risk, but this can be mitigated by financial sector development (Yiadom et al., 2023). However, FSD flows are positively linked with trade-based ML, particularly in export-oriented economies. The results indicate that advances in the FSD reduce the risk of ML. A well-developed financial industry typically has better regulatory frameworks, stronger supervision mechanisms, and more effective AML policies, all of which help to lower ML risks. This can be justified by the assumption that a well-developed financial sector has these characteristics.

The ROL significantly impacts the risk of ML ($p < 0.01$). AlQudah et al. (2022) investigated how public governance mediates the impact of a nation's culture on ML, finding that effective public governance can fully offset cultural effects on ML risks. AML regulations have a significant positive effect on banking sector stability, irrespective of how effectively they are implemented (Issah et al., 2022). Amara et al. (2020) examined the relationship between SARS and ML, concluding that a stronger application of auditing effectively decreases ML and reverses the positive relationship between corruption and ML. This suggests that countries with a more robust implementation of the rule of law considerably lower

level of money laundering risk by ensuring that rules and regulations are efficiently applied and enforced.

Additional results reveal a significant negative relationship between PS and the ML risk ($p < 0.05$). Research also shows that PS is significantly negative to ML risk (Amjad et al., 2021). As a result, lower levels of PS are associated with higher ML risk. PS likely helps give rise to a predictable and secure atmosphere, thereby discouraging ML.

Lastly, the data do not reveal evidence that either income level, trade or foreign direct investment prove to be significant influence factors regarding ML risk as their explanatory power is statistically insignificant. This indicates that while income, trade and FDIN matter in terms of risk associated with ML their direct effect is dwarfed by other institutional and financial determinants.

Table 6. Financial development and money laundering risk

Variables	(POLS) AML	(FEM) AML	(REM) AML
FSD	–0.777** (0.332)	–0.773** (0.326)	–0.979** (0.468)
INC	1.14e–07 (4.72e–06)	1.68e–06 (4.65e–06)	–2.33e–06 (5.98e–06)
ROL	–0.595*** (0.117)	–0.621*** (0.115)	–0.483*** (0.152)
PS	–0.335*** (0.0971)	–0.345*** (0.0952)	–0.261** (0.123)
Trade	0.000234 (0.00101)	0.000285 (0.000988)	–0.000163 (0.00145)
FDIN	0** (0)	0** (0)	0 (0)
Constant	5.821*** (0.160)	5.792*** (0.157)	5.985*** (0.226)
Observations	356	356	356
R-squared	0.462	0.476	
Number of Years	3	3	3
Breusch-Pagan LM test (POLS vs. REM)			131.08 (0.000)***
Hausman test (FEM vs. REM)		4.1 (0.178)	

Note: The dependent variable in these models is money laundering risk, measured by the Basel AML Index. FDI denotes the financial development index, measured by the IMF. INC is the income level, measured as GDP per capita. ROL represents the rule of law. PS is political stability. Trade represents trade openness. FDIN denotes foreign direct investment. Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

5. Conclusions

The current study applies to see whether financial sector development mediates the relationship between digital payments and money laundering risk. Using a sample covering 120 countries for the years of 2014, 2017 and recently in spite (2021), the main results present that DP, the ROL, and PS reduce ML risk. The results also indicate that FSD can

mediate the ROL and DP transaction density. They also show that FSD, the ROL and PS reduce the risk of ML.

The findings contain the following key implications for multiple stakeholders. To begin with, they claim that it safeguards against money laundering due to their digital nature. Hence, governments and regulatory bodies need to encourage digital payments as they have been less exposed in money laundering risk. This could also be realized by giving incentives, upgrading the digital infrastructure, and making it accessible to all citizens. Moreover, policymakers, governments, and regulators should introduce financial literacy programs to educate the public about the advantages of digital payment.

In other results, the rule of law decreases money laundering risk and encourages digital payment transactions. To this end, strict implementation and enforcement of laws and regulations are critical. Policymakers ought to develop better legal frameworks and efficient judicial systems for reducing money laundering risks but promoting digital payments. Also, political stability plays a significant role in reducing money laundering risk. An attempt should be made to maintain stability in a country's political system so that customers can trust its financial institutions and regulatory bodies. Moreover, governments can work together on a global level to exchange ideas and policies for improving the rule of law as well as political stability. This includes international treaties, joint investigations and mutually organized training.

Finally, given that financial sector-developed positively impacts the digital payment density DPD and reduces money laundering risk, reforms should be oriented towards establishing a robust and inclusive financial system. These may be approaches to promotion of financial innovation or other solutions contributing towards improvement in the levels of financial inclusion. Moreover, the bank regulator and its safety equipment should always keep in mind programming to help develop safe banks while at all times adopting high technology like blockchain, artificial intelligence, and machine learning to enhance financial sector developments.

This study faced several limitations, providing room for further research. First, the study sample includes 120 countries worldwide. Missing data is the main issue that this study faced in expanding the sample to include all countries. Therefore, the results of this study cannot be generalized to other countries that are not included in the sample. Second, the study examined the relationship between digital payments, measured by the density of digital payment transactions, and money laundering risk. Further research could examine other important domains of digital payments, such as digital payment system infrastructure (internet accessibility, availability of digital facilities like smartphones and computers), digital payments regulation (e.g., RegTech), and financial literacy regarding digital payments. Finally, the study investigates the mediation impact of financial sector development on the relationship between digital payments and money laundering risk. Future research could investigate the mediation or moderation effect of other important factors in this relationship, such as customer trust in the safe use of digital payment services and service providers, and the quality of digital payment services.

Disclosure statement

The authors declare no conflict of interest.

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APPENDIX

Table A1. List of the study sample

High Income	Saudi Arabia	Mexico	Lao PDR
Australia	Singapore	Moldova	Mauritania
Austria	Slovak Republic	Namibia	Mauritius
Bahrain	Slovenia	North Macedonia	Mongolia
Belgium	Spain	Panama	Morocco
Canada	Sweden	Peru	Myanmar
Chile	Switzerland	Romania	Nepal
Croatia	United Arab Emirates	Russian Federation	Nicaragua
Cyprus	United Kingdom	Serbia	Nigeria
Czech Republic	United States	South Africa	Pakistan
Denmark	Uruguay	Thailand	Philippines
Finland	Upper Middle Income	Turkey	Senegal
France	Albania	Lower Middle Income	Sri Lanka
Germany	Argentina	Algeria	Tajikistan
Greece	Armenia	Bangladesh	Tanzania
Hong Kong SAR, China	Azerbaijan	Benin	Tunisia
Hungary	Bosnia and Herzegovina	Bolivia	Ukraine
Ireland	Botswana	Cambodia	Uzbekistan
Israel	Brazil	Colombia	Venezuela, RB
Italy	Bulgaria	Cote d'Ivoire	Vietnam
Japan	China	Egypt, Arab Rep.	Zambia
Korea, Rep.	Costa Rica	El Salvador	Low Income
Kuwait	Dominican Republic	Estonia	Burkina Faso
Latvia	Ecuador	Ghana	Guinea
Lithuania	Georgia	Haiti	Liberia
Malta	Guatemala	Honduras	Malawi
Netherlands	Jamaica	India	Mali
New Zealand	Jordan	Indonesia	Mozambique
Norway	Kazakhstan	Iran, Islamic Rep.	Niger
Poland	Lebanon	Kenya	Sierra Leone
Portugal	Malaysia	Kyrgyz Republic	Uganda
Total number of high income countries			41
Total number of upper middle income countries			31
Total number of lower middle income countries			39
Total number of low income countries			9
Total number of countries			120