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Anti-money laundering regulations and financial sector development

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Abstract

This paper is aimed at establishing the effect of anti-money laundering regulations on financial sector development across the globe. Using data from 2012 to 2018 across 165 economies across different continents, income levels and regulatory environments, we test a number of complex and related hypotheses. (a) We examine the effect of anti-money laundering regulations on financial sector development. (b) We examine if this effect differs across developing and developed economies. (c) We examine the nonlinearities in the anti-money laundering regulations-financial sector development nexus. We use the Prais-Winsten approach and the panel threshold estimation approaches to test our hypothesized relationships. We find evidence that anti-money laundering regulations generally promote financial sector development; however, this positive effect is concentrated in developing economies. We also find evidence of threshold effects of anti-money laundering regulations for our sample. Consistent with the earlier findings, the positive effect of anti-money laundering regulations on financial development is concentrated in countries below the threshold value of anti-money laundering regulations. These countries are mostly developing countries. Our findings suggest that strengthening anti-money laundering regulations will be beneficial to developing countries.

KEYWORDS

anti-money laundering, financial sector development, money laundering, regulations, threshold analysis

1 | INTRODUCTION

A competitive and well-functioning financial sector plays a pivotal role in the economic development of nations across the world (Capasso, 2004; Duisenberg, 2001). The financial market is considered as an important engine of economic growth (Beck & Levine, 2004). However, according to Greenspan (1998), the entire financial system thrives on the trust of customers and a slip in customer confidence could result in devastating consequences for the financial market and the economy as a whole. The financial market is perceived to operate within a high legal framework and adherence to strict professional and ethical standards (Financial Action Task Force [FATF], 2020). However, money laundering has been identified as a major threat to a well-functioning financial system. This according to FATF (2020) is because unchecked money laundering could mean complicity on the part of financial institutions in the crimes that generate illicit funds which affect the trust and

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confidence of customers in the financial market. The European Commission in issuing a directive to its member countries on money laundering indicates that when a financial institution is used as a means of laundering proceeds from criminal activities, then the financial system as a whole could lose the trust of the public and thereby jeopardizing the soundness and stability of the entire financial system (European Economic Community, 1991). Money laundering exploits therefore have a far reaching impact on the whole financial systems of countries (Aluko & Bagheri, 2012).

In 1996, the International Monetary Fund (IMF) estimates that between 2 and 5% of the world's gross domestic product (GDP), that is, somewhere between $1trillion to $2 trillion is laundered annually (Financial Action Task Force [FATF], 2020). The IMF again in 2008 estimates between 3 and 5% of the world's GDP, thus giving us about $2.17–$3.61 trillion was laundered annually (INCSR, 2008). The United Nations Office on Drugs and Crime (UNODC) (2011) indicated that criminals laundered around US$1.6tn, which corresponds to 2.7% of global GDP in 2009. United Nations more recently estimated that the criminal proceeds laundered annually amount to between 2 and 5% of global GDP, or $1.6 to $4 trillion a year (Weeks-Brown, 2018). In as much as there is difficulty in estimating the scale of money laundering over the years because predicate offenses of money laundering are usually very clandestine, the figures prove that the situation is getting worse by the years. However, according to Sarigul (2013), the negative impact of money laundering is more pronounced in the financial system.

In response to the threat of money laundering to the global financial system and the economies of nations, most countries had taken steps to curb the incidence of money laundering. Notable among them is the establishment of the Financial Action Task Force (FATF) in 1989. The FATF was established to promote effective implementation of legal, regulatory and operational measures for combating money laundering, terrorist financing and other related threats to the integrity of the international financial system. Anti-money laundering regulations are expected to enhance the reputation of financial institutions and the global financial system and also promote customer confidence and trust. Again, embedded in any AML regulatory framework is the principle of good governance and prudent management of financial institutions. It is therefore expected that an effective anti-money laundering regulation should promote the development of the financial market. However, despite the promising evidence of projecting the critical role of anti-money laundering regulations in financial sector development, empirical efforts have not been thorough in investigating the influence of AML regulations on financial market development.

In cross country studies Mekpor, Aboagye, and Welbeck (2018) and Yepes (2011) rather accessed the determinants of anti-money laundering (AML) regulations/recommendations compliance while Kemal (2014) assessed the effectiveness of anti-money laundering regulations in Pakistan. Jayasuriya (2009) in a conceptual paper examined how anti-money laundering efforts contribute to good governance and Mekpor (2019) investigated how countries comply with global anti-money laundering regulations. Further, Nobanee and Ellili (2018) explored the differences between Islamic and conventional AML disclosures as well as the effect of AML disclosure on UAE bank's performance while Balani (2018) analysed the impact of the introduction of anti-money laundering on banks stock valuations in the United States. Aluko and Bagheri (2012) in a theoretical paper evaluated the impact of money laundering on economic development, financial stability and political development in Nigeria. Again, Mohammad, Abu, and Rahman (2016) provided some insights into the impact of the Jordanian Anti-Money Laundering and Counter-Terrorist Financing Instructions Number (51) 2010 on Jordanian banking industry.

So far, the literature has not been rigorous in investigating the impact of anti-money laundering regulations on financial sector development. Unlike Nobanee and Ellili (2018) and Balani (2019), our paper comprehensively examines the effect of anti-money laundering regulations on financial sector development across the globe using a better proxy for anti-money laundering regulations and a more current dataset. This study makes two important contributions to literature. First, as argued by Geiger and Wuensch (2007), AML regulations could retard the progress of society toward wealth creation and also burden banks by increasing their transaction costs which affect the development of the financial sector negatively. This means that excessive anti-money regulations may rather retard the development of the financial sector instead of promoting it. We therefore seek to ascertain if there is a threshold for anti-money regulations.

Finally, we examine the influence of AML regulations on financial sector development of developed and developing countries. We expect that the impact of AML regulations on financial sector development in developing countries may differ from that of other developed countries. This is clearly depicted in Figure 1. Figure 1 shows how the AML regulations relate with financial development for our full sample, developed and developing countries. The figure suggests that generally there is a positive relationship between AML regulations and financial development for our full sample and developing countries. However, this relationship is negative for

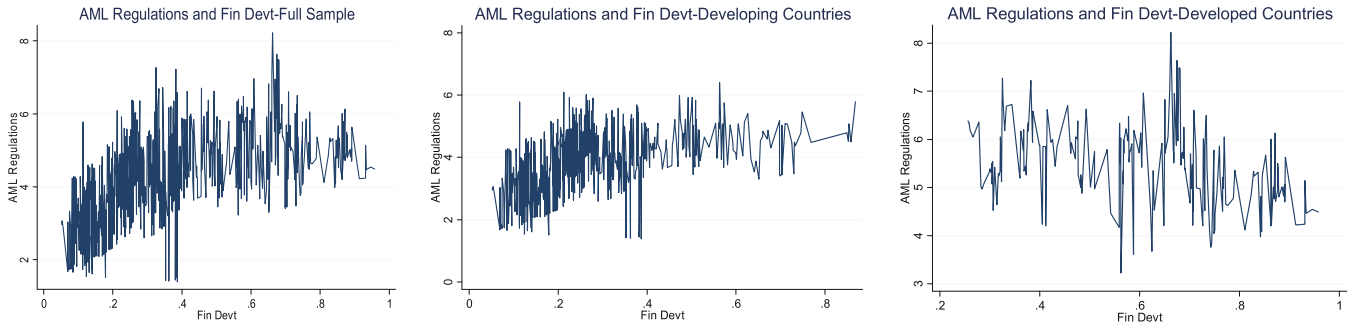

FIGURE 1 AML regulations and financial sector development. *Source:* Authors' own computation. AML regulations data was obtained from the Basel Institute on Governance and the Financial Development Index by the International Monetary Fund [Colour figure can be viewed at wileyonlinelibrary.com]

developed countries. The figure reinforces the fact that there is the need to access differently the impact of AML regulations on financial development for developed and developing countries.

Our aim in this paper is to, therefore, examine generally the effect of AML regulations on financial sector development, and also examine if this effect differs across developing and developed economies. We also aim to test the threshold effect of AML regulations on financial sector development. The rest of this paper is structured as follows: Section 2 reviews the extant literature on AML regulations and financial sector development. In Section 3, we present the empirical methods adopted in this paper. We present results from our empirical analysis in Section 4. Finally, we conclude and provide policy implications of our study in Section 5.

2 | LITERATURE REVIEW

2.1 | Money Laundering

Money laundering is the process of concealing the source of funds acquired through illegitimate means to make it seem as though such funds were acquired by genuine means (Mekpor et al., 2018). Money illegally acquired is passed through a chain of transactions to make them appear to be originating from a legitimate source. According to Raweh, Erbao, and Shihadeh (2017), money laundering has gradually grown with organized crime such as human trafficking, gambling, drugs and weapons trade among others. Money laundering is recognized as the lifeblood of crime (Rahman, 2015). Johnson and Desmond Lim (2003) accentuated that without the means to launder money, organised crime could not flourish as it does now. It is argued also that money laundering promotes corruption antithetical to sustainable economic growth because corrupt officials can conceal the source of their ill-gotten funds and reintegrate it into the systems as though they are from legitimate sources (Sharman & Chaikin, 2009).

Money laundering affects government revenue in that tax evasion is a predicate offense of money laundering (Hendriyetty & Grewal, 2017). A study by Schwarz (2011) revealed that tax evasion and money laundering are complementary suggesting that tax haven countries do not cooperate in applying regulations to detect money laundering. Further, money laundering undermines legitimate private-sector efforts and leads to a loss of control of domestic economic policies as well as destabilizes domestic markets (Fundanga, 2003; McDowell & Novis, 2001; Unger & Den Hertog, 2012). It also leads to policy mistakes on the part of governments and businesses, volatility in exchange rates and interest rates (McDowell & Novis, 2001). It again can destabilize financial institutions and entire financial systems (Aluko & Bagheri, 2012). Money laundering is of critical interest because it is a major obstacle to the operation of an effective international financial system and has a great impact on the global financial system (Buchanan, 2004). Money laundering may lead to the allocation of resources to unproductive sectors of the economy which may affect the economic growth of the country (Bartlett, 2002). Besides, it undermines democratic governance because it leads to political unrest as well as instability of societies (Mohammad et al., 2016).

According to Clark (1993), money laundering involves three (3) stages: the placement, the layering, and the integration stages. The placement is the actual deposit or the introduction of the illicit funds into the financial system or through other money-laundering channels. At the layering stage, the proceeds of the crime are separated from their origin through a series of illusory transactions to conceal the source of the funds. Finally, at the integration stage, the illicit funds are reintroduced into the financial system or the economy as

though they are originating from legitimate sources (Bartlett, 2002; Buchanan, 2004). Funds could however be laundered through front companies, gold dealers, currency exchange houses, insurance companies, shell companies, wire systems, offshore banking, automobile dealerships, casinos, lawyers and accountants among others (McDowell & Novis, 2001).

2.2 | The link between anti-money laundering regulations and financial sector development

The financial system is the major channel of laundering proceeds of criminal activities (Raweh et al., 2017). However, money laundering can destabilize financial institutions and the entire financial system (Mekpor et al., 2018). Van der Zahn et al. (2007) noted that money laundering corrupts the financial market and erodes the confidence and trust of customers in the financial system. Money laundering poses great reputational risks for financial institutions because it results in a loss of reputation or integrity (Bartlett, 2002). This is because unchecked money laundering could mean complicity on the part of financial institutions in the crimes that generate illicit funds which affect the trust and confidence of customers in the financial market according to (FATF, 2020). Therefore, effective money laundering regulations are expected to instill confidence and trust of customers in the financial system and this is expected to promote the development of the financial market. Balani (2018) assessed the impact of the introduction of AML regulations on bank stock valuation in the United States using event studies and cross-sectional regression for four different AML regulations introduced in the United States between 1992 and 2001 and found that AML regulations introduced in 1998 had a positive impact on bank stock valuations.

Further, pervasive money laundering increases the probability of financial institutions as well as their customers to be defrauded (Bartlett, 2002). Again, financial institutions that benefit from money laundering may not be able to endure the test of market competition as they may have challenges in adequately managing their assets, liabilities and operations. For instance, large funds from money laundering may be deposited in a bank account and may disappear overnight (McDowell & Novis, 2001). Aluko and Bagheri (2012) indicated that financial institutions in Nigeria that relied overwhelmingly on ill-gotten capital were unable to endure the tests of market competition and as a result, many of them disintegrated. Again, large capital inflows and outflows accentuated by money laundering would adversely affect the foreign exchange market which would lead to fluctuations of the local currency (Tanzi, 1997). It is therefore expected that an attempt in curbing money laundering should greatly impact the fortunes of the financial market.

Also, Jayasuriya (2009) explained that compliance with AML regimes can help create an environment conducive to the achievement of good governance which is expected to influence the development of the financial sector. Anti-money-laundering policies are a constituent element in the good governance policies and agree with most prudential financial-stability rules. For instance, know-your-customer principles are not only used in combating money laundering but also form an integral part of the prudential management of financial institutions (Bartlett, 2002). This suggests that effective AML regulations should promote financial sector development. However, in sharp contrast, Geiger and Wuensch (2007) posit that AML regulations could retard the progress of society toward wealth creation and also burden banks by increasing their transaction costs which affect the development of the financial sector negatively. Masciandaro (1999) in an attempt to quantify the cost of anti-money laundering regulations in the Italian banking system concluded that AML policies sometimes do not promote banking efficiency. Again, Mohammad et al. (2016) noted that anti-money laundering affects the relationship between banks and their customers because it threatens the principles of bank secrecy. In a study, Buehrer et al., (2005) report that money laundering prevention measures account for 45% of the total regulatory burden and 2% of the total costs in Swiss private banking. They posit that AML regulations may lead to undesirable outcomes because banks and other financial institutions are used as conduits for the implementation of money laundering prevention measures. This affects the profitability of these financial institutions and therefore the development of the financial sector.

According to Financial Action Task Force (FATF) (2020), money laundering is a major threat to a well-functioning financial system because unchecked money laundering could mean complicity on the part of financial institutions in the crimes that generate the illicit funds. Therefore, the implementation of AML regulations in financial institutions is expected to restore confidence in those financial institutions and the entire financial system. However, as noted earlier AML regulations threaten the principles of bank secrecy and increase the transaction cost of financial institutions (Mohammad et al., 2016;Geiger & Wuensch, 2007). We therefore opine that regulating money laundering will restore customer confidence in the financial sector and thereby lead to financial sector development. However, when AML regulations become excessive, it may lead to negative consequences for the financial sector. We therefore hypothesize is a positive effect of AML regulations on

financial sector development below the threshold and a negative effect above the threshold.

2.3 | Determinants of financial market development

It is a well-established fact that financial development promotes the economic growth of nations. It is increasingly becoming an axiom that financial market development enhances the economic growth of nations (Ibrahim & Sare, 2018). Therefore, it is important to promote the development of the financial sector. Quality institutions in the form of the protection of property rights, contract enforcement, democratic governance, government effectiveness, quality legal and regulatory framework are expected to promote financial development. Empirically, there is now a consensus that well-developed institutions promote financial market development (Smaoui, Grandes, & Akindele, 2017). A study by Huang (2010) revealed a positive effect of institutional improvement on financial market development while Chinn and Ito (2006) found that institutional quality is important in promoting the trade openness-financial development nexus. Further, Capasso (2004) underscored the fact that for financial markets to allocate resources to productive sectors of the economy there is the need for strong institutions.

Again, foreign direct investment is said to influence financial development. When foreign firms enter the domestic economy they make use of the domestic financial market by opening accounts with local banks which makes funds available to banks for onward lending to finance economic activities. Also, these enterprises are more likely to demand a higher quality of internationally comparable services. Again, some of these foreign enterprises may want to get listed on the stock exchange. The presence of these foreign enterprises is expected to promote the development of the financial sector. Further, FDI in the form of financial services into a domestic economy is expected to promote financial market development as these firms come with superior technology which is often transferred to other financial institutions within the economy (Agbloyor, Abor, Adjasi, & Yawson, 2013). Empirical studies found FDI to promote financial development (Agbloyor et al., 2013; Agarwal & Mohtadi, 2004; Jeffus, 2004).

Further, according to Eryiğit, Yasin Eryiğit, and Dülgeroğlu (2015) the knowledge, skills possessed by individuals as well as their incomes affect their ability to demand financial services. Their study demonstrated that low human capital development is a hindrance to financial market development. Outreville (1999) in a study of 57 developing countries noted that individuals that are more educated tend to save more and therefore human capital development explains financial development. Similarly, Arora and Ratnasiri (2011) showed that human capital development significantly influences financial sector development while Ibrahim and Sare (2018) found that human capital robustly influences financial development. Inflation reduces the present value of future cash flows, leads to higher interest rates and the cost of capital of firms (Agbloyor et al., 2013). This implies that higher levels of inflation hurt the development of the financial market. Aga and Kocaman (2006) and Agbloyor et al. (2013) find inflation to negatively impact financial market development. Finally, higher-income promotes financial market development. Higher incomes encourage people to save for purposes of investment. Again, higher income levels encourage businesses to borrow to meet the increased demand for goods and services. Increased borrowing means more businesses for the financial sector especially banks (Agbloyor et al., 2013). Baltagi, Demetriades, and Hook (2009) found that income levels significantly influence banking sector development. These results are consistent with the findings of (Agbloyor et al., 2013).

Further, capital account liberalization promotes transparency in the financial sector and also reduces adverse selection and moral hazard, hence reducing the cost of transactions in the capital markets (Mishkin, 2009). Again, Chinn and Ito (2006) noted that financial liberalization promote portfolio diversification and also increases the efficiency of the financial system. Baltagi et al. (2009) find financial openness to significantly influence banking sector development. However, in a related study Chinn and Ito (2006) find that the financial openness spurs equity market development only if a threshold level of legal development has been attained. Also, Zhang, Zhu, and Lu (2015) report that financial openness are significantly determine financial efficiency and competition. Also, trade liberalization is expected to promote financial development through the increase in demand for external finance (Le et al., 2016). Again, Rajan and Zingales (2003) noted that the presence of foreign firms in the domestic markets force domestic firms to be efficient and therefore putting pressure on financial institutions to change. Le et al. (2016) find trade openness as key determinants of financial depth in developed economies. Also, Ibrahim and Sare (2018) find that trade openness is a sustainable means of promoting financial development.

3 | METHODOLOGY

This section describes the various methods and procedures that we adopt in the analysis of data. We utilise panel data covering the period 2012–2018 on 165 countries.

3.1 | Empirical model

The theoretical relationship between the underlying variables is expressed in the following equation:

$$FSD_{it} = \beta_0 + \beta_1 AMLR_{it} + \beta_2 INSTQ_{it} + \beta_3 INC_{it} + \beta_4 FDI_{it} + \beta_5 INF_{it} + \beta_6 HCD_{it} + \varepsilon_{it}$$

where FSD_{it} represents the proxies of financial sector development of country i in year t and $AMLR_{it}$represents the anti-money laundering regulations index. Again, $INSTQ_{it}$represents the quality of institutions while INC_{it} represents the income of citizens in the country i in year t. Also, FDI_{it}, represents Foreign Direct Investment, INF_{it} representing inflation and HCD_{it} represents human capital development. The β terms represent the coefficients of the respective variables. $\varepsilon_{it} = \emptyset_i + \delta_{it}$ and $\emptyset_i$ represent individual country effects.

3.2 | Description and measurement of variables

The dependent variable of interest is financial sector development (FSD_{it}) which is represented by the financial development index proposed by the IMF (Svirydzenka, 2016). The financial development index is constructed as a composite index made up of financial institutions and financial markets. Financial institutions include banks, insurance companies, pension funds and non-bank financial institutions while financial markets include stock and bond markets. Financial development is defined as a combination of depth, access and efficiency. The depth of financial institutions or market measures the size and liquidity, access defines the ability of customers to access financial services and efficiency measures the level of activity of the market or the ability of institutions to provide services at a low cost that is sustainable in the long term.

The depth of financial institutions is measured as private-sector credit, pension fund assets, mutual fund assets and insurance premiums (life and non-life) to GDP and access are measured as bank branches per 100,000 adults and ATMs per 100,000 adults. Net interest margin, lending-deposits spread, non-interest income to total income, overhead costs to total assets, return on assets and return on equity are used to generate the efficiency score for financial institutions. Financial market depth is measured using stock market capitalization, stocks traded, international debt securities of government, total debt securities of financial corporations, total debt securities of nonfinancial corporations to GDP. Percent of market capitalization outside of top 10 largest companies and the total number of issuers of debt (domestic and external, non-financial and financial corporations) are used to generate the access index for financial markets while stock market turnover ratio (stocks traded to capitalization) proxies the efficiency of the financial market.

The anti-money laundering regulation index is measured using the Basel Anti-money Laundering Index published by the Basel Institute on Governance. The Basel AML Index is an independent annual ranking that assesses the risk of money laundering and terrorist financing (ML/TF) around the world. The index assesses the effectiveness of the anti-money laundering regulatory frameworks as well as structures put in place to counter terrorist financing in countries. The index covers five main domain weighted as follows; quality of anti-money laundering/Countering Financing of Terrorism framework (65%); bribery and corruption (10%); financial transparency and standards (15%); public transparency and accountability (5%); and legal and political risks (5%). The index ranges from 0 to 10 where 0 indicates the lowest risk level and 10 indicates the highest risk level. For easy interpretation, we follow Agoba et al. (2019) in rescaling the AML regulations index so lower scores now correspond to lower anti-money laundering regulatory effectiveness and higher scores correspond to anti-money laundering regulatory effectiveness. To do this, we use the formula −1*(AMLR-10), where AMRL is the AML regulations Index.

In line with the literature, we include institutional quality (Huang, 2010), income (Baltagi et al., 2009), inflation (Agbloyor et al., 2013), foreign direct investment (Agbloyor et al., 2013) and human capital (Arora & Ratnasiri, 2011; Ibrahim & Sare, 2018) as controls. We use the civil liberties score variable obtained from the Freedom House database. The civil liberties score ranges from 7 to 1, with 7 representing the least rating and 1 the highest. Again, following Agoba et al. (2019), we rescale the original score to range from 0 to 6 where lower scores now represent less quality institutions and higher scores representing high-quality institutions. To do this, we use the formula −1*(CLS-7), where CLS is the civil liberty score as given by Freedom House. We expect that well-developed institutions should promote financial market development.

Higher income levels boost business activities and therefore encourage businesses to borrow to meet the increased demand for goods and services. This is expected to promote financial sector development. Income is measured using GDP per capita. When foreign firms enter the domestic economy they make use of the domestic financial market by opening account. Again, FDI in the form of financial services into a domestic economy

TABLE 1 Variable descriptions and data sources

Variable (denotation)	Variable measurement	Data source
AML regulations Index (AMLR)	Basel AML Index	Basel Institute on Governance
Financial Development (FD_x)	Financial Development Index	IMF
Financial Institutions Development (FID_x)	Financial Institutions Index	IMF
Financial Market Development (FMD_x)	Financial Market Development Index	IMF
Inflation (INF)	Consumer Price Index	World Development Indicators (WDI)
Foreign Direct Investment (FDI)	The natural logarithm of net FDI inflows	WDI
Income (INC)	GDP per capita income	WDI
Human Capital (HCD)	Percentage of Secondary school enrolment	WDI
Institutional Quality (INSTQ)	Civil Liberties Scores	Freedom House
Trade openness	Ratio of exports +imports to GDP	WDI
Financial Openness	The Chinn-Ito Index (2008)	The Chinn-Ito Index

introduces superior technology and services in the domestic market which is expected to enhance the development of the financial sector. FDI is measured as natural logarithm of net FDI inflows. Inflation reduces the present value of future cash flows, leads to higher interest rates and the cost of capital of firms. Again, inflation increases the operational cost of businesses. Inflation is expected to hurt businesses, therefore, the financial sector. We use consumer price index to proxy inflation. Again, the knowledge, skills possessed by individuals affect their ability to demand financial services. Therefore, human capital development promote financial sector development. Human capital is measured the percentage of secondary school enrolment. Also, trade liberalization brings foreign opportunities that promote financial sector development. Trade openness is measured as the ratio of imports plus exports to GDP. Finally, we control for financial openness. Liberalization of restrictions on international portfolio flows or capital accounts helps to deepen a country's financial systems. We measure financial openness using Chinn and Ito (2008). The descriptions, measurements of variables and sources of data are shown in Table 1.

3.3 | Empirical strategy

3.3.1 | Prais-Winsten estimation

We use the Prais and Winsten (1954) panel data estimation with panel-corrected standard errors (PCSEs). We first investigate the effects of anti-money laundering regulations on financial sector development using the conventional panel linear regression technique by employing either fixed effects (FE) or random effects (RE). The Hausman test (Appendix A) shows that the fixed effect is appropriate for our dataset. However, in the presence of heteroskedasticity and serial correlation, the fixed effects estimations might be biased (Huang, Liu, Cai, & Hao, 2018). Thus, the Feasible Generalized Least Squares (FGLS) and Prais-Winsten Panels Corrected Standard Errors (PCSE) are possible alternatives. As noted by Beck and Katz (1995), Prais-Winsten estimation is a generalized least square (GLS) estimation that is better than the Feasible Generalized Least Squares (FGLS) because the FGLS produces incorrect standard errors and autoregressive errors. According to Beck and Katz (1995), unlike Prais-Winsten estimation, the FGLS is unusable unless the time dimension of the panel is very large which makes Prias-Winsten estimation more appropriate for our data which has a shorter time dimension.

Further, Prais-Winsten estimation is a linear regression technique that gives room for correcting heteroskedastic and serially correlated residuals. Prais-Winsten Generalised Least Squares estimation is preferred to Cochrane-Orcutt and Ordinary Least Squares for the following reasons. Firstly, Prais-Winsten corrects serial correlation that is closer to 1 as compared with Cochrane-Orcutt. Secondly, in correcting for heteroskedasticity and serial correlation, Prais-Winsten estimation gives more reliable and efficient results as compared to the Cochrane-Orcutt which uses the first observations as lags thereby reducing the number of observations and the efficiency of the estimates. Furthermore, the constant (in a panel form) is suppressed by the use of the Prais-Winsten estimation technique which gives relatively efficient results as compared with the GLS with fixed effect regression. Finally, the Prias-Winsten estimation is a

better estimation within the GLS class of estimators. According to Judge, Hill, Griffiths, Lütkepohl, and Lee (1988), in most applied situations, the asymptotic results of the Prais-Winsten estimation is the best.

3.3.2 | Panel threshold regression

Our study attempts to examine the threshold effects of anti-money laundering regulations on financial sector development. This is against the background that anti-money laundering regulations burden the financial institutions and therefore excessive anti-money laundering could be a disincentive for financial sector development. Again, the impact of AML regulations on the financial sector development may not be constant over time. In examining the threshold effects, the traditional technique is by introducing the quadratic term of the threshold variable (see Aibai, Huang, Luo, & Peng, 2019; Ibrahim & Alagidede, 2018; Taghizadeh-Hesary, Phi, Hong, & Chu, 2019). This approach may be prone to multicollinearity problems and unable to address potential structural breaks that may occur in a relatively long period (Huang et al., 2018). Again, it also fails to identify the exact point where the relationship changes direction, and how (Liu, Islam, Khan, Md Ismail, & Pervaiz, 2020). This study therefore departs from previous studies by employing Hansen (2000) sample splitting estimation technique, which is capable of tracing the turning point or the threshold for policy decisions. Therefore, we apply the panel threshold analysis by Hansen (2000) and applied in recent literature (Huang et al., 2018; Liu et al., 2020; Luan, Huang, & Zou, 2019; Ouyang et al., 2019; Sare, 2019; Taghizadeh-Hesary et al., 2019) in examining the changes in the financial sector following changes in anti-money laundering regulations. We investigate the impact of AML regulations on financial sector development at different levels or intervals of AML regulations. The threshold regression model can be described as follows:

$$FD_{i,t} = \begin{cases} \propto_i + \beta_1 X_{i,t} + \theta_1 q_{i.t} + \mu_{i,t} & q_{i,t} < \gamma \\ \propto_i + \beta_2 X_{i,t} + \theta_2 q_{i.t} + \mu_{i,t} & q_{i,t} \geq \gamma \end{cases}$$

where subscripts i and t refer to country and time, respectively. $FD_{i,\ t}$ is used for the three (3) proxies for financial sector development. $\propto_i$ denotes the country-specific fixed effects while $\mu_{i,\ t}$ is a zero mean, finite variance, i.i.d. disturbance. $X_{i,\ t}$ is the vector of independent variables and β_1 and β_2 represent the coefficients of these independent variables. $q_{i.\ t}$ is the threshold variable, γ is the threshold value and θ_1 is the threshold coefficient when the threshold value is lower than γ, and θ_2 is the threshold coefficient when the threshold value is higher than γ.

3.3.3 | Pre-estimation diagnostics

To ensure consistent, unbiased and efficient coefficients, our study checks for endogeneity, multicollinearity, heteroskedasticity, autocorrelation and normality of variables. We check for heteroskedasticity using the Breusch-Pagan/Cook-Weisberg test and the White (Appendix B) and employing the Wooldridge test for autocorrelation (Appendix C). Considering the violation of the constant variance assumption and the fact that errors are not correlated, we employ the Prais-Winsten estimation technique which corrects for autocorrelation

TABLE 3 Correlation results

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Fin Development	1.000										
(2) Fin Institutions Dev't	0.943*	1.000									
(3) Fin Market Dev't	0.937*	0.767*	1.000								
(4) AML Regulations	0.420*	0.398*	0.391*	1.000							
(5) Institutional Quality	0.343*	0.398*	0.245*	0.451*	1.000						
(6) Income	0.600*	0.497*	0.633*	0.403*	0.381*	1.000					
(7) FDI	0.331*	0.347*	0.275*	0.152*	0.037	0.088*	1.000				
(8) Financial Openness	0.455*	0.423*	0.431*	0.368*	0.280*	0.421*	0.054	1.000			
(9) Inflation	0.011	0.014	0.008	−0.026	−0.101*	−0.056	0.147*	−0.035	1.000		
(10) Human Capital	0.541*	0.573*	0.441*	0.281*	0.251*	0.275*	0.271*	0.210*	−0.021	1.000	
(11) Trade Openness	−0.035	−0.044	−0.022	−0.004	−0.046	−0.016	−0.066*	−0.008	0.135*	−0.032	1.000

*Shows significance at the 0.05 level.

TABLE 2 Descriptive statistics

Variable	Obs	Mean	*SD*	Min	Max
Panel A-Full sample					
Financial development	954	0.347	0.221	0.052	0.958
Financial market dev't	954	0.224	0.256	0	0.903
Financial institutions dev't	954	0.464	0.207	0.102	1
AML regulations	1,014	4.26	1.223	1.39	8.221
Institutional quality	1,148	3.802	1.787	0	6
Income	1,119	14,451.02	19,610.17	315.777	119,000
Trade openness	1,155	84.549	61.674	0	442.62
FDI	981	9.131	1.151	0.754	11.707
Financial openness	1,155	0.399	1.454	−1.917	2.347
Inflation	1,043	126.044	33.257	97.745	382.501
Human capital	677	86.002	26.718	15.434	163.931
Panel B-Developed countries					
Financial development	216	0.61	0.195	0.256	0.958
Financial market dev't	216	0.484	0.27	0.043	0.903
Financial institutions dev't	216	0.723	0.14	0.458	1
AML regulations	250	5.506	0.81	3.219	8.221
Institutional quality	252	5.651	1.032	0	6
Income	245	38,361.6	23,622.82	6,993.78	119,000
Trade openness	252	115.536	71.373	0	416.389
FDI	216	9.393	2.347	0.707	11.707
Financial openness	252	1.684	0.987	−1.210	2.347
Inflation	251	108.328	4.281	97.745	125.229
Human capital	179	109.135	17.816	62.183	163.931
Panel C-Developing countries					
Financial development	738	0.27	0.161	0.052	0.868
Financial market dev't	738	0.148	0.195	0	0.886
Financial institutions dev't	738	0.388	0.155	0.102	0.844
AML regulations	764	3.852	1.047	1.39	6.669
Institutional quality	896	3.282	1.601	0	6
Income	874	7,748.395	11,449.41	315.777	85,076.1
Trade openness	847	77.056	55.644	0	442.62
FDI	770	8.981	0.923	5.279	11.464
Financial openness	847	0.025	1.339	−1.917	2.347
Inflation	792	131.66	36.332	99.105	382.501
Human capital	498	77.687	24.398	15.434	126.054

Note: NB: Financial Development, Financial Institutions Development, and Financial Market Development are measured using the Financial Development Index proposed by IMF. The anti-money laundering regulation index is measured using the Basel Anti-money Laundering Index published by the Basel Institute on Governance. We take the inverse of the index following Agoba et al., 2019. Institutional quality is Civil Liberties scores. We also rescaled the civil liberties scores using Agoba et al., 2019. Income is GDP per capita and Foreign direct investment (FDI) is the natural logarithm of net FDI inflows. Inflation is the consumer price index and Human capital is the percentage of secondary school enrolment. Trade openness is measured as the ratio of imports plus exports to GDP and Financial openness is proxied using Chinn and Ito (2008).

and heteroskedasticity. Given that countries with more advanced financial markets are in a better position to promote the implementation of effective anti-money laundering regulations, a mutual effect could occur between financial market development and anti-money laundering regulations. We, therefore, test for endogeneity using the Du-Wu–Hausman Test (Appendix D). The test showed that endogeniety does not exist in our dataset. We check for multicollinearity using the variance inflation factor (Appendix E) and Pearson's correlation (Table 3). The results show that there is no multicollinearity among our independent variables. The normality of the data was checked using the Shapiro Wilk normality test (Appendix F).The normality test suggests all our variables are not normally distributed.

4 | EMPIRICAL RESULTS

In this section, we present the results from the empirical estimations. We present the summary statistics first, followed by the correlation results and the regression results. The descriptive statistics are presented in Table 2. The composite financial development index which ranges from zero to one, representing the worst to the best financial sector for our full sample reports a mean of 0.35. The mean for the financial market development index is 0.22 while the financial institutions' index reports an average of 0.46. The study reports 0.61, 0.48 and 0.72 for the composite financial development index, financial markets and financial institutions development respectively for developed countries. However, for developing countries, the study reports a mean of 0.27, 0.15 and 0.39 for the composite financial development index, financial markets and financial institutions development, respectively. The full sample mean of less than 50% suggests a relatively low financial sector development globally. However, comparatively, financial markets in developed countries are more developed than that of developing economies.

The mean for anti-money laundering regulations is 4.26. The rescaled index ranges from 0 to 10 where 0 indicates the lowest level of anti-money laundering regulation effectiveness (highest risk level) and 10 represents the highest level of anti-money laundering regulation effectiveness (lowest risk level). Therefore, the full sample mean of 4.26 shows a relatively weak level of anti-money laundering framework worldwide. However, the average for developed countries is 5.506 while the that of developing countries is 3.85. This clearly shows that developed countries have more robust anti-money laundering regulatory framework. The overall civil liberties index which is used to proxy institutional quality registers a mean of 3.8. The developed nations report a mean of 5.65 while developing countries report a mean of 3.28. The rescaled civil liberties index ranges from 0 to 6 with higher levels of the index indicating higher institutional quality. The mean of 3.8, therefore, indicates a high level of civil liberties and institutional quality. Comparatively, developed countries have stronger institutions as compared to developing countries. The overall mean income (per capita income) is $14,451 while the mean developed and developing nations is $38,361.6 and $7,748.40, respectively.

The average FDI for full sample is 9.07 and 9.39 for developed countries while developing countries report a mean of 8.98. Inflation as proxied by consumer price index also reports a mean of 126.04 for overall sample. Developed countries have a mean of 108.33 while developing countries report a mean of 131.66. Further, the average overall secondary school enrolment is 86% and 109.14% for developed countries and 77.69% for developing nations. The results indicate a high level of human capital development globally. As expected, developed countries have better developed human capital than developing countries. Again, the study reports a mean of 84.54% for trade openness for our full sample and 115.54% for developed and 77.1% for developing countries. This indicates a high level of trade liberalization globally. Finally, we report an average of 0.39 for our measure of financial openness for our full sample, 1.684 and 0.025 for developed and developing countries, respectively. The average of 0.39 shows a relatively low level of financial liberalization globally. Comparatively, developed countries have higher levels of financial liberalization than developing countries.

We present the results of Pearson's correlation in Table 3. The correlations show a positive association between anti-money laundering regulations and financial sector development. We also find a positive association between institutional quality and financial development. There is also a positive association between income and financial development. Institutional quality is also positively related to AML regulations. Human capital and FDI report a positive association with financial development. The correlation matrix generally does not suggest that multi-collinearity should be a problem in our data.

Further, this study aims to examine the impact of AML regulations on financial sector development for countries under different economic conditions as well as testing the nonlinearity in the AML regulations-financial development nexus. Table 4 presents the impact of AML regulations on financial sector development (proxied as financial development index, financial institutions' index and financial market development index) using countries in developed and developing regions. We use the United

TABLE 4 The impact of anti-money laundering regulations on financial sector development

	Full Sample			Developing			Developed		
	1 FD	2 FID	3 FMD	4 FD	5 FID	6 FMD	7 FD	8 FID	9 FMD
AML regulations	0.012**	0.010**	0.015**	0.011*	0.007**	0.015**	−0.011	−0.012**	−0.015
	(0.005)	(0.004)	(0.007)	(0.006)	(0.004)	(0.007)	(0.011)	(0.006)	(0.015)
Institutional quality	0.018***	0.030***	0.008***	0.001	0.021***	−0.017***	0.012	0.005	0.009
	(0.004)	(0.006)	(0.003)	(0.002)	(0.004)	(0.006)	(0.009)	(0.007)	(0.012)
Income	0.066***	0.063***	0.054***	0.028***	0.030***	0.023***	0.026**	0.011	0.036**
	(0.015)	(0.017)	(0.019)	(0.005)	(0.007)	(0.008)	(0.012)	(0.007)	(0.016)
Trade openness	0.002***	0.002***	0.001***	0.001	0.001**	0.001	−0.001***	0.001**	−0.001***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FDI	−0.001	−0.002	0.001	−0.001	−0.003**	0.001	0.001	0.001	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Financial Openness	0.052***	0.043***	0.057***	0.023***	0.018***	0.026***	0.061***	0.022***	0.086***
	(0.005)	(0.006)	(0.005)	(0.003)	(0.004)	(0.004)	(0.010)	(0.004)	(0.016)
Inflation	0.001**	0.001***	0.001**	0.001**	0.001	0.001	−0.003***	−0.002***	−0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Human capital	0.001**	0.001***	0.001**	0.001***	0.001***	0.001**	0.001	0.001	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	−0.059	0.033	−0.105	−0.028	0.010	−0.068	0.582***	0.836***	0.451***
	(0.089)	(0.100)	(0.093)	(0.068)	(0.093)	(0.074)	(0.097)	(0.053)	(0.128)
Obs.	1,155	1,155	1,155	847	847	847	252	252	252
R-squared	0.823	0.898	0.628	0.77	0.879	0.452	0.928	0.971	0.838
Chi-Square	17,124.05	450,672.56	2053.27	16,685.28	270,068.67	1,157.062	32,746.91	418,536.42	49,681.748
Prob-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Country Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: SEs are in parentheses.
*Significant at 10%.
**Significant at 5%.
***Significant at 1%.

Nations country classifications to classify countries into developed and developing countries. In models 1–3, we present the results for all countries in our sample and models 4–6, we present the results for developing countries. Finally, we present the results of developed countries in models 7–9. We use the composite financial development index as a proxy for financial sector development in models 1, 4 and 7. The financial institutions' index is used in models 2, 5 and 8 while the financial market index is used in models 3, 6 and 9.

From Model 1–3, it is evident that AML regulations promote financial sector development across all proxies of financial sector development. The results suggest that anti-money laundering regulations promote the development of both financial institutions and financial markets. Anti-money laundering regulations promote good governance as well as enhance the reputation of financial institutions. This is expected to promote financial sector development. Further investigations in models 4–9 to establish the impact of AML regulations on financial development in developing and developed countries provided interesting results. Models 4–6 reveal that AML regulations promote financial sector development across all proxies of financial sector development. This is because developing countries are noted to be highly exposed to money laundering therefore the financial system responds positively to any attempt to curb money laundering in developing countries.

Further, AML regulations show a negative impact on financial sector development for developed countries as presented in model 7–9. However, this relationship is only significant in model 8. The results show that AML

regulations does not promote the development of financial institutions such as banks and non-bank financial institutions in developed countries. This is because developed countries as evidenced in data presented in Appendix G have robust regulatory and supervisory systems in place to ensure full compliance with AML regulations. Regulators in developed countries add strong controls in their AML legislation and are willing to impose heavier fines as a result of non-compliance on the part of financial institutions. Financial institutions are compelled to significantly invest in their AML processes which are not mostly rewarded by increased business from clients. Increasing compliance costs for these institutions in developed countries negatively impact their development. The evidence shows that excessive AML regulations is not helpful the development of financial institutions.

Also, we find that institutional quality is positive and significantly related to financial sector development in our full sample (in models 1 and 2) and in developing countries (in models 4 and 5). However, we find a negative impact of institutional quality on financial sector development in developed countries (in models 7, 8 and 9). Our findings suggest that institutional quality promote financial sector development in developing countries. Again, income has a positive and significant impact on financial sector development across all models. Higher-income levels mean an increased demand for goods and services which means more need for finance thereby promoting the financial sector. Also, higher income levels mean citizens can save more in banks and also invest in financial instruments that are expected to promote the financial sector. Our finding is akin to Agbloyor et al. (2013) and Baltagi et al. (2009). Further, the study reports a negative impact of inflation on financial sector development (in models 1, 2, 7, 8 and 9). This implies that higher levels of inflation hurt the financial sector.

Inflation negatively affects businesses because it reduces the present value of future cash flows and also leads to the increased cost of capital for firms. This is expected to negatively impact the financial sector. Agbloyor et al. (2013) and Aga and Kocaman (2006) find similar results. Again, we find evidence of a positive impact of human capital on financial sector development across all models except for models 7, 8 and 9. Individuals that are more educated tend to save more and are also able to make use of financial products and services. Therefore, human capital development positively explains financial development. This result is corroborated by Ibrahim and Sare (2018). Further, we provide evidence of a positive impact of trade openness on financial development for all proxies of financial development for our full sample (models 1, 2 and 3) and on financial institutions for our developing country sample (model 5). We however, find a negative effect of trade openness on financial development for all proxies of financial development for developed countries. The results of our study largely indicates that trade openness promote financial sector development. A liberalized economy promote financial development through the increase in demand for external finance. The findings of our study are confirmed by Le et al. (2016). Finally, we find that financial openness significantly impact financial development for all proxies of financial development for all our samples (full sample, developed, developing countries). Financial liberalization is expected to increase efficiency in the financial system. Zhang et al. (2015) confirm the findings of our study.

4.1.1. | Panel threshold regression analysis

Given that one of the aims of this study is to examine nonlinearity in AML regulations-financial development nexus as well as the impact of AML regulations on financial development when the level of a country's AML regulations is above or below the threshold, our first step here is to determine whether or not the relationship is monotonic. Therefore, we hypothesize that there is a threshold effect (i.e., nonlinear relationship) between AML regulations and financial development. Accordingly, we test the null hypothesis of linearity, where $\theta_1 = \theta_2$ against the alternative hypothesis of a threshold model, that is, $\theta_1 \neq \theta_2$. If the null hypothesis holds, it implies a threshold does not exist, otherwise, it implies that the threshold effect exists. The bootstrap method is employed to obtain an approximation of the *F*-statistics and *p*-values. For each of the bootstrap tests, 2000 bootstrap replications and 15% trimming percentage are used. A rejection of the null hypothesis means that a threshold exists and therefore our sample should be split based on a unique threshold value of our threshold variable. We test the threshold effect for each of the proxies of financial sector development (financial development, financial institutions development and financial market development). In Table 5, we present the results on the existence of threshold test.

As demonstrated in Table 5, the test for threshold shows a 1% significant level for all proxies of financial sector development (financial development index, financial institutions index and financial market index). This is demonstrated by *p*-values far less than .01 as well as a rather large LM-test statistic. Therefore, we reject the null hypothesis of no threshold and conclude that there is a threshold effect in the AML regulations-financial sector development nexus. Our findings suggest that the sample

TABLE 5 Testing for the existence of threshold dependent

	Financial development	Financial institutions dev't	Financial market dev't
LM-test for no threshold	84.123	75.598	89.206
Bootstrap *p*-value	.000	.000	.000
No. of bootstrap replications	2000	2000	2000
Trimming percentage	0.15	0.15	0.15

Note: Two thousand (2000) bootstrap replications are employed with 15 percentage trimming for the threshold tests. ***, ** and * denote that variables are statistically significant at 1, 5 and 10%, respectively.

TABLE 6 Threshold of effect of AML regulations on Financial Sector Development

	Financial development			Financial institutions dev't			Financial market dev't		
Variables	**10 Global OLS**	**11 Low (<5.878)**	**12 High (>5.878)**	**13 Global OLS**	**14 Low (<5.878)**	**15 High (>5.878)**	**16 Global OLS**	**17 Low (<4.159)**	**18 High (>4.159)**
AML regulations	0.0089 ***	0.0104***	−0.0296	0.0056	0.0061*	−0.0560*	0.0120***	0.0195***	−0.0431***
	(0.0028)	(0.0027)	(0.0296)	(0.0036)	(0.0035)	(0.0295)	(0.0029)	(0.0030)	(0.0130)
Institutional quality	0.0042	0.0053	−0.0103	0.0205***	0.0211***	0.0106	−0.0120***	−0.0092**	−0.0104*
	0.0033	(0.0032)	(0.0299)	(0.0036)	(0.0036)	(0.0308)	(0.0035)	(0.0036)	(0.0058)
Income	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Trade openness	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
FDI	0.0129***	0.0155***	−0.0032	0.0150***	−0.0175**	0.0014	0.0107***	−0.0074***	0.0111***
	(0.0016)	(0.0016)	(0.0040)	(0.0019)	(0.0020)	(0.0048)	(0.0017)	(0.0012)	(0.0028)
Financial Openness	0.0306***	0.0232***	0.1878***	0.0324***	0.0235***	0.2155***	0.0277***	−0.0002	0.0620***
	(0.0037)	(0.0036)	(0.0193)	(0.0039)	(0.0038)	(0.0213)	(0.0041)	(0.0036)	(0.0087)
Inflation	0.0001	0.0001	−0.0011	0.0001	0.0001	−0.0014	0.0001	0.0001	0.0003**
	(0.0001)	(0.0001)	(0.0010)	(0.0001)	(0.0001)	(0.0015)	(0.0001)	(0.0001)	(0.0002)
Human capital	0.0016***	0.0016***	0.0004	0.0020***	0.0019***	0.0006**	0.0012***	0.0007***	0.0012***
	(0.0001)	(0.0001)	(0.0003)	(0.0002)	(0.0002)	(0.0003)	(0.0001)	(0.0002)	(0.0002)
Constant	−0.0360**	−0.0630***	0.0695	−0.0060	0.0299	0.6204**	−0.0662***	−0.0506***	0.1753**
	(0.0150)	(0.0156)	(0.0827)	(0.0191)	(0.0193)	(0.2807)	(0.0150)	(0.0123)	(0.0625)
Observations	1,155	1,061	95	1,155	1,061	94	1,155	609	546
R-squared	0.63	0.62	0.69	0.55	0.52	0.68	0.53	0.40	0.52
Threshold Value	**5.8780**			**5.8780**			**4.1591**		
Confidence Interval	**[5.87802, 5.87805]**			**[5.87802, 5.87805]**			**[4.0693, 5.8781]**		

*Significant at 10%.
**Significant at 5%.
***Significant at 1%.

can be split into two unique regimes, where one regime is above the threshold value and the other regime is below the threshold value. Therefore, the impact of AML regulations on financial sector development is determined by the level of AML regulations of a country. Thus, AML regulations impact financial sector development in a nonlinear fashion. The implication is that the impact of AML regulations on financial development is conditioned on the AML regulations attaining a unique threshold point above which the impact of AML

regulations on financial sector development changes. Given the evidence, we classify the country's level of AML regulations into high and low with regimes below the threshold values as low and regimes above the threshold values as high for all proxies of financial sector development. We present the results of the panel threshold analysis following Hansen (2000) in Table 6. For each of the proxies of financial sector development, we present the global ordinary least squares regression (OLS) and the regime below the threshold (low) and the regime above the threshold (high).

We find threshold values of 5.878, 5.878 and 4.159 for the composite financial development index, financial institutions development index and financial market development index respectively. For the financial development index, the study reports a positive coefficient of 0.0104 at a 1% significance level below the threshold value while the study reports an insignificant negative coefficient of (−0.0296) above the threshold value. We also report a negative significant coefficient of (−0.0061) at 10% significance level below the threshold and a significant negative coefficient (−0.0560) at 10% significant level above the threshold for financial institutions development index while we report a significant positive coefficient (0.0195) below the threshold and a significant negative coefficient (−0.0431) above the threshold for financial market development index.

This means that AML regulations impact financial sector development positively below the threshold but this relationship disappears in the case of high AML regulations regimes. This implies that the financial sector of countries with highly rigorous AML regulations might not benefit from AML regulations. This suggests that extensive AML regulations do not promote financial sector development. This is because AML regulations impose an additional cost burden on the financial sector. After all, banks and other financial institutions are at the centre of implementing anti-money laundering regulations. It is important to note that high-AML regulations regimes which imply economies with highly rigorous AML regulations are less likely to promote their financial sector. This goes to show that in as much as AML regulations promote financial sector development, excessive regulations may not have the desired outcomes. Therefore, for the financial sector of countries to benefit from the AML regulations, then the AML regulations index must not go beyond the threshold values for the various proxies of financial sector development. This result is consistent with our earlier results because as noted in Appendix G, developing countries are usually below the threshold and developed countries are usually above the threshold.

5 | CONCLUSION AND POLICY RECOMMENDATIONS

Money laundering has been identified as a major threat to the global financial system and the economies of nations around the world. It leads to a loss of public trust in the financial system and could jeopardize the soundness and stability of financial institutions and the entire financial system. In response to the threat of money laundering to the global financial system and the economies of nations, most countries had taken steps to curb the incidence of money laundering. Anti-money laundering regulations are expected to enhance the reputation of financial institutions and the global financial system and also promote customer confidence and trust. It is, however, opined that excessive AML regulations could lead to undesirable outcomes since it leads to an increase in transaction costs of financial institutions. In this paper, we examine the impact of anti-money laundering regulations on financial sector development. In addition, examine if this effect differs across developing and developed economies. We also examine the nonlinearities in AML regulations-financial sector development nexus. The examination of the threshold effect is against the backdrop that the impact of AML regulations on financial sector development depends on the level of AML regulations.

This study finds evidence that AML regulations generally promote financial sector development. However, AML regulations does not promote development of financial institutions in developed economies. Again, the study finds evidence of threshold effects of AML regulations suggesting that the precise impact of AML regulations on financial sector development is threshold- specific given the various proxies of financial sector development. The main finding is that AML regulations promote financial sector development to the threshold value beyond which it does not impact financial sector development.

An important implication of the study is that, for the most part, AML regulations promote financial sector development and therefore policies aimed at developing an effective AML framework will go a long way to promote financial sector development. However, excessive AML regulations may not have the required outcomes. Policymakers and regulators must be mindful of the fact that beyond a certain threshold of AML regulations, its impact on financial sector development is no longer felt. Again, there is a need for developed economies to revisit their AML regulatory framework to make them cost-effective for financial institutions. Further, policies aimed at promoting the quality of institutions, improving the income levels of citizens, promoting quality human capital will help promote financial sector development across

the globe. We do recognize that using the composite Basel AML index does not allow us to examine the effects of the various components of AML regulations on financial sector development. Again, the shorter period does not allow us to investigate the impact of AML regulations on the financial sector development of the individual countries in our sample. We do recognize the fact that countries may have a unique AML framework and therefore an investigation of the AML framework of each country on its financial sector development would have been enriching. These limitations notwithstanding, we believe that our work provides an important first step in assessing the impact of anti-money laundering regulations on financial sector development.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in World Development Indicators at http://datatopics.worldbank.org/world-development-indicators/ and the Basel Institute of Governance at https://www.baselgovernance.org/basel-aml-index/public-ranking

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APPENDIX A: Fixed and Random Effects Regression

	FE	RE
AML regulations	−0.005*	0.001
	(0.003)	(0.003)
Institutional quality	0.005	0.016***
	(0.007)	(0.004)
Human capital	0.001***	0.001***
	(0.000)	(0.000)
FDI	−0.005***	−0.003***
	(0.001)	(0.001)
Inflation	−0.000***	−0.000***
	(0.000)	(0.000)
Income	−0.000***	0.000***
	(0.000)	(0.000)
Constant	0.393***	0.195***
	(0.036)	(0.024)
Obs.	1,155	1,155
Pseudo R^2	.z	.z

SEs are in parenthesis
***$p < .01$, ** $p < .05$, * $p < .1$.

Hausman Test

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi^2 (12) = (b-B)′[(V_b-V_B)ˆ(−1)](b-B) = 121.29

Prob > chi^2 = 0.0000

(V_b-V_B is not positive definite)

APPENDIX B: Heteroscedasticity Test Breusch-Pagan/Cook-Weisberg and White Test

Breusch-Pagan/Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of financial development index

chi^2 (1) = 91.21

Prob > chi^2 = 0.0000

estat imtest, white

White's test for Ho: homoscedasticity

against Ha: unrestricted heteroskedasticity

chi^2(27) = 470.97

Prob > chi^2 = 0.0000

APPENDIX C: Autocorrelation Test Wooldridge

Wooldridge test for autocorrelation in panel data

H0: no first-order autocorrelation

F (1, 164) = 22.668

Prob > F = 0.0000

APPENDIX D: Du-Wu–Hausman Test of Endogeniety

estat endog

Tests of endogeneity

Ho: variables are exogenous

Robust score chi^2(1) = .680278 (p = .4095)

Robust regression F(1,982) = .663727 (p = .4154)

APPENDIX E: Variance Inflation Factor

	VIF	1/VIF
AML regulations	1.410	0.711
Institutional quality	1.370	0.732
Income	1.300	0.768
Human capital	1.210	0.826
FDI	1.120	0.893
Inflation	1.040	0.965
	1.240	

APPENDIX F: Normality Test. Shapiro–Wilk W Test for Normal Data

Variable	Obs	W	V	z	Prob > z
Financial development	1,155	0.951	35.388	8.883	0.000***
Financial market dev't	1,155	0.821	128.917	12.104	0.000***
Financial institutions dev't	1,155	0.987	9.125	5.507	0.000***
AML regulations	1,155	0.930	50.579	9.773	0.000***
Institutional quality	1,155	0.982	12.639	6.319	0.000***
Income	1,155	0.706	211.268	13.334	0.000***
FDI	1,155	0.672	235.678	13.606	0.000***
Inflation	1,155	0.761	171.859	12.820	0.000***
Human capital	1,155	0.931	49.470	9.718	0.000***

APPENDIX G: List of Countries with AML Regulations Above and Below the Threshold using Financial Development Index (Threshold value = 5.878)

Country	AMLR	Country	AMLR	Country	AMLR
Developed countries-above threshold					
Finland	7.176	New Zealand	6.352	Malta	5.978
Estonia	6.811	Norway	6.184	Denmark	5.932
Slovenia	6.564	Sweden	6.181		
Lithuania	6.36	Bulgaria	6.118		
Developed countries-below threshold					
Iceland	5.776	Romania	5.392	Italy	4.754
Portugal	5.757	Slovakia	5.348	Germany	4.754
Hungary	5.707	Latvia	5.311	Switzerland	4.538
Belgium	5.626	Spain	5.138	Japan	4.3504
Ireland	5.584	Netherlands	5.103	Greece	4.339
France	5.568	Cyprus	5.095	Luxembourg	4.2234
Czech Republic	5.559	Canada	4.966	Russia	4.0407
Australia	5.456	United States	4.923	Nicaragua	3.9178
Croatia	5.439	Qatar	4.897		
United Kingdom	5.4	Austria	4.791		
Developing countries-below threshold					
Chile	5.766	Uruguay	5.081	Belarus	4.584
Poland	5.74	Jamaica	5.03	Hong Kong Sar, China	4.551
Montenegro	5.473	Taiwan, China	4.98	Serbia	4.549
Colombia	5.442	Korea, South	4.97	Uzbekistan	4.539
Israel	5.403	Georgia	4.947	Albania	4.531
Peru	5.356	El Salvador	4.945	Djibouti	4.516
Macedonia	5.296	Jordan	4.908	Mauritius	4.502
Oman	5.295	Egypt	4.884	Azerbaijan	4.478
South Africa	5.275	Saudi Arabia	4.883	Grenada	4.846
Dominica	5.249	Barbados	4.856	St. Lucia	4.745

(Continues)

Country	AMLR	Country	AMLR	Country	AMLR
Singapore	5.205	Kosovo	4.854	St. Vincent And The Grenadines	4.733
Tunisia	5.182	Malaysia	4.622	Moldova	4.677
Armenia	5.133	Mexico	4.59		
Bahrain	4.44	Samoa	4.164	Ecuador	3.955
India	4.389	Kuwait	4.101	Honduras	3.945
Bosnia-Herzegovina	4.37	Brunei	4.093	Timor-Leste (East Timor)	3.91
Senegal	4.335	Morocco	4.081	Trinidad And Tobago	3.909
Brazil	4.327	Kazakhstan	4.07	China	3.852
Belize	4.325	Syria	4.033	Turkey	3.846
Guatemala	4.307	Ghana	4.029	Bahamas	3.807
Botswana	4.277	United Arab Emirates	3.969	Guyana	3.805
Malawi	4.261	Costa Rica	3.963	Indonesia	3.801
Bangladesh	3.798	Rwanda	3.206	Paraguay	2.573
Cote D'ivoire	3.78	Mauritania	3.187	Guinea	2.509
Mongolia	3.763	Argentina	3.143	Maldives	2.498
Seychelles	3.756	Benin	3.134	Haiti	2.414
Vanuatu	3.755	Vietnam	3.072	Nepal	2.388
Philippines	3.755	Cape Verde	3.058	Myanmar	2.317
Kyrgyzstan	3.734	Zimbabwe	3.02	Laos	2.24
Suriname	3.727	Comoros	3.013	Kenya	2.21
Papua New Guinea	3.707	Nigeria	2.976	Sudan	2.207
Algeria	3.638	Yemen	2.967	Uganda	2.187
Marshall Islands	3.602	Niger	2.953	Swaziland	2.109
Gambia	3.594	Togo	2.95	Mozambique	2.006
Venezuela	3.579	Ethiopia	2.911	Cambodia	1.941
Ukraine	3.531	Bolivia	2.902	Guinea-Bissau	1.825
Thailand	3.501	Tanzania	2.88	Iraq	1.797
Angola	3.488	Sierra Leone	2.875	Tajikistan	1.748
Sri Lanka	3.441	Lesotho	2.82	Afghanistan	1.549
Pakistan	3.427	Mali	2.788	Iran	1.437
Dominican Republic	3.401	Sao Tome And Principe	2.673		
Panama	3.399	Liberia	2.619		
Lebanon	3.379	Zambia	2.614		
Namibia	3.298	Burkina Faso	2.61		