



What role public debt plays to moderate the influence of natural resources on financial development? Appraising Resource-Curse Hypothesis in MENA Region

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ABSTRACT

A sound financial structure is one of the imperative macroeconomic goals for developed and developing ones, particularly for resource-abundant countries, which are more vulnerable due to the unexpected shock of COVID-19 and experiencing the financial resource curse (FRC). The literature has extensively discussed the assimilation of natural resources (NR) into a blessing or curse; however, little is known concerning the FRC hypothesis through integrating public debts (PD). Therefore, the present research scrutinizes the FRC in the Middle East and North African (MENA) countries by considering the PD, NR, institutional quality (IQ), and financial development (FD) in an integrating framework from 2001 to 2020. The study employs a cross-section augmented distributed lag (CS-ARDL) estimator to address the concerns of cross-section dependency and slope heterogeneity. The long-run empirical findings elucidate that NR significantly reduces FD and affirms the FRC hypothesis, while IQ positive promotes the FD in the MENA region. Another pertinent factor, PD reduces FD significantly, and the moderating impact of PD through NR reveals the inverse association with FD. Additionally, consistent findings are investigated in the short run with a smaller coefficient magnitude, and the cointegrating term converges towards the steady state equilibrium with a 29.4% adjustment rate in any diverging situation. Similar empirical outcomes are echoed from the alternative panel techniques, and panel causality testing indicates the bi-directional causality among all model variables except IQ and FD. Overall results provide valuable policy implications to the MENA region that should empower the IQ levels in mitigating the adverse impacts of FRC.

1. Introduction

Financial stability and integrity are critical for developing and developed economies (Beck et al., 1999) because a well-organized financial sector accelerates capital formation, mobilizes savings, reduces asymmetric information and transaction costs, ensures risk management, encourages technological innovations, eradicates poverty, and provides financial accessibility to real sectors (Shahbaz et al., 2018). Schumpeter Joseph A. (1934) asserted that efficient financial institutions promote optimum resource allocation and acquire economic prosperity. Besides, natural resources (NR) are national assets and blessings that facilitate a pathway towards economic progression by using as an essential input in production activities, assisting developing countries to reduce the trade deficit and boosting financial development (FD) through exports (Asif et al., 2020). However, extensive resource exploitation and consumption lead to scarcity of resources and justify

natural resource-curse (NRC) depending on optimal NR usage and financial-led economic growth (Su et al., 2022). Concerning the NRC hypothesis, Auty (2002) elaborated that endowed nations confront slow economic growth despite having abundant resources due to various factors, among them poor governance systems, lack of diversification, corruption, political rent-seeking behavior, unsustainable resource management, neglected human capital, and weak institutional performance may cause this curse (Van der Ploeg and Venables, 2009; Sachs and Warner, 1995), and several studies have supported these arguments for negative NR-led growth (Çetin et al., 2023; Zhang and Liang, 2023).

Apart from this, volatile natural resource prices are another influential factor that highlights the financial resource curse (FRC) hypothesis and exhibits the novel connotation between NR and FD. Beck (2011) investigated the negative nexus between NR and FD and validated the FRC in resource-based economies. A handful of studies have elevated the FRC hypothesis to the literature, while this assessment is the key concern for developing resource-intensive economies where financial growth is

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List of acronyms:			
AMG	Augmented mean group	GMM	Generalized method of moment
COR	Corruption	IQ	Institutional quality
CS-ARDL	Cross-section augmented autoregressive distributed lag	KMO	Kaiser–Meyer–Olkin
CSD	Cross-section dependence	MENA	Middle East and North African
ECT	Error correction term	NR	Natural resources
FD	Financial development	NRC	Natural resource curse
FMOLS	Fully modified ordinary least square	PCA	Principal component analysis
FRC	Financial resource curse	PD	Public debts
GDP	Gross domestic product	PS	Political stability
GEF	Government effectiveness	RQ	Rule of Law
		SH	Slope heterogeneity
		V&A	Voice and accountability

impeding due to the FRC paradoxical scenario (Ding, 2023; Tang et al., 2022); thus, FRC postulates the linkage between NR and FD through multiple channels. NR’s extraction shifts away the production factors from the real industrial sector, illustrating that NR abundance tends to restrict exports. Export diversification is crucial for FD; thus, NR hinders FD by reducing exports and shrinking the real sector, referred to as Ditch disease. Moreover, NR offers liquidity and funding accessibility to banks and credit institutions, permitting them to provide loans more efficiently to firms and individuals. Similarly, they are the source of revenues for the government, illuminating higher chances of corruption, rent-seeking, and institutional inefficiencies that impede FD (Dwumfour and Ntow-Gyamfi, 2018). Recently the world has witnessed NR volatile global prices during and after the COVID-19 recovery; the Russia-Ukraine war further exacerbates the energy prices, financial risks, and uncertainty by discouraging capital investment and crowding out the innovative skills from the FD sector (Carrasco and Tovar-García, 2021). In this concern, establishing a sound regulatory and legal institutional system is inevitable in transferring the NR’s revenues efficiently and accurately to potential economic sectors and strengthening credit-debtor agreements (Hadj and Ghodbane, 2021).

Institutions are a collection of rules and principles to minimize political, economic, and social uncertainty (North, 1991). Intuitively, the comprehensive definition demonstrates that institutions contribute to how much the financial sector can influence economic growth. The functionality of the effective financial sector depends on institutional quality (IQ) and economic progress (Cherif and Dreger, 2016; Gazdar and Cherif, 2015). Strong institutional structures ensure private property rights, stimulate regulatory control, eliminate corruption and rent-seeking, and supervise systems by designing policies and laws in both private and public sectors. Moreover, IQ elevates sustainable resource management, accountability, and transparency in financial stability (Abaidoo and Agyapong, 2022). Therefore, the significance of IQ cannot be neglected in ascertaining the association between NR and FD; however, the heterogeneity in institutional reforms and policies across the countries leads to variant economic outcomes (Rahman and Sultana, 2022; Li et al., 2021). Plentiful studies scrutinized the IQ’s enhancing effect on FD, and some studies have used IQ as a moderating factor (Destek et al., 2023; Hussain et al., 2021).

Contrastly, due to inadequate and misleading institutional policies, resource-abundant economies primarily depend on public debt (PD) financing mechanisms to manage resource-related expenditures, including extraction, processing, and consumption, that inhibit their economic growth and lead to a resource curse (Singer, 2012). PD has an asymmetric connotation with FD through asset view and lazy banks phenomenon. One shred of evidence demonstrates that PD is presumed to be the safe asset that facilitates domestic financing to respective nations and, as collateral, maintains investor confidence in risky business conditions. The government collects and allocates NR revenues efficiently to promote FD integrity, and limitless intervention addresses institutional inefficiencies (Kumhof and Tanner, 2005; Porta et al.,

1998). On the flip side, another shred argues that PD negatively influences FD due to crowding out since banks enjoy more profits as involved in PD; however, they are inefficient and reluctant to invest in private sectors, which may increase inefficiency via deadweight loss and demotivates the financial growth. Political incentives may also allocate resources to idle projects and emerge corruption and rent-seeking problems (Hauner, 2009). In such a situation liberalized financial structure moderates the crowding out effects and resource curse concerns (Bui, 2018). Another concept associated with PD and resource-based economies is the external debt trap or debt overhang. According to Prebisch’s hypothesis, sudden NR price volatilities instigated them to provide the future NR revenue windfalls as collateral and obtain foreign funding (Manzano and Rigobón, 2001). Ample studies have proved that whether advanced (Norway and Indonesia) and developing (Mexico and Nigeria) resource-based economies, due to inconsistent policies, improper IQ levels, less diversified markets, misallocated NR revenues windfalls are affected through debt overhang, denoting an inverse relationship between PD and NR (Achua et al., 2022; Ampofo et al., 2021) that ultimately hinder the FD sector.

Although voluminous studies have linked NR and FD with the environment (Saud et al., 2023; Li et al., 2023), economic growth (Li et al., 2023), and green energy (Zhao et al., 2023). Numerous studies have unveiled the direct impact of NR, PD, and IQ on FD separately, and some empirical studies analyze the mediating influence of IQ and NR on FD and affirm the FRC theory (Destek et al., 2023; Hadj and Ghodbane, 2021). Therefore, little attention has been provided by academicians, policymakers, and scholars to integrate all these factors in a multidimensional framework to evaluate the FRC hypothesis in resource-abundant Middle-east and North African (MENA) nations. Fig 1 visualizes the NR and FD trends in 2020 for the MENA region, highlighting the susceptibility and vulnerability of the financial structure despite having intensive resource endowments. Notably, it is imperative

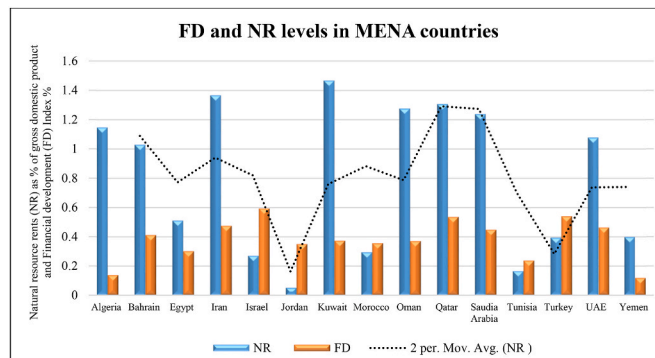


Fig. 1. MENA region’s Natural resource rents (NR) and Financial development (FD) levels in 2020. Source: World development indicators and International monetary fund (2021).

to formulate rational economic policies that accelerate inclusive financial growth by allocating optimum NR revenues and assisting in converting the FRC into a resource blessing.

Against this premise, our study contributes to the extant literature manifold. The present research's core objective is to ascertain the dynamic impact of NR, IQ, and PD on FD in MENA economies from 2001 to 2020. Further, we investigate the moderating influence of PD and NR in mitigating the FRC hypothesis and enhancing NR-led financial growth. In the empirical examination, to evaluate the direct and indirect impact of desired factors on financial integrity, our research emphasizes MENA countries as sample countries and justifies its relevance because NR prices are volatile in the respective region. Moreover, the statistics show that about sixty percent of the world's crude oil reserves and 1/2nd of the total gas reserves are in Gulf countries. Besides, the MENA region entails 42% of total global natural gas reserves and more than 1/5th of the world's oil deposits, highlighting their global resource intensification (British Petroleum Energy *Bp Energy Outlook*, 2019). Moreover, the countries are enriched with human capital resources and comprise about 1/6th of the total population. It is noteworthy that greater than 85% of oil exports contribute to MENA's total exports and indicate their significance in global energy suppliers (Liu et al., 2022). Therefore, it has been observed that the sample nations are more vulnerable due to negative shocks in global prices of energy resources. Due to subjective biases, we construct the cumulative IQ index utilizing the principle component analysis (PCA) to incorporate the relevant information associated with IQ indicators. Worldwide, FD is evolved as a multifaceted phenomenon regarding deepness, efficiency, and accessibility and comprises financial markets and institutions (Svirydzenka, 2016). In this scenario, A number of plethora studies have employed one or more than two measures to indicate the FD level, leading to subjective bias (Hunjra et al., 2022; Cherif and Dreger, 2016). Besides, the study utilizes a cross-section augmented distributive lag (CS-ARDL) model in addressing the issues associated with cross-section dependence and heterogeneous slope parameters. It contributes methodologically to the available pool of knowledge in testing the FRC hypothesis and linkage between the considered variables. In estimating the model, we also confirm the reliability and authenticity of the empirical outcomes by applying the augmented mean group (AMG) and generalized method of moment (GMM) techniques in a robustness check. Finally, we apply the heterogeneous panel causality test to assess the causal relationship between the variables.

The remaining study's structure is organized as follows: section two reviews the prevailing literature regarding the linkage of research variables. Section three demonstrates the econometric methodology and data description, and section four describes the empirical outcomes and discussion. Finally, sections five and four conclude the research's findings with valuable policy recommendations and direction for future studies.

2. Literature review

This segment elucidates reviewing the prevailing empirical evidence regarding the FD and its factors, including NR, PD, and IQ. NR are viable national assets that significantly contribute to improving financial stability, i.e., FD explicitly depends on NR and economic growth level (Guiso Luigi et al., 2004). The empirical assessment between NR and FD is novel, revealing that NR positively and negatively influences FD. Thus, NR has an asymmetric association with FD relying on optimal resource allocation and various social, economic, and political factors crucial to scrutinize the policy structure liable for the expansion of the FD sector (Ding, 2023; Su et al., 2022).

In the late 1980s, existing literature verified the NR's nature as a blessing; however, abundant resources are the threat of unfavorable political and economic turmoil, referred to as the natural resource-curse (NRC) hypothesis, stating that NR-based countries exhibit stagnant economic growth despite having more resource endowments than other

economies. Ditch disease, weak institutional framework, rent-seeking behavior, corruption, lack of exports diversification, crowding out effects, improper resource management system, political commotion, volatile resource prices, and ignorance of human capital investment and other potential sectors may cause dampening economic growth in resource-intensive nations (Sachs and Warner, 1995; Rosser, 2006; Van der Ploeg and Venables, 2009; Caselli and Cunningham, 2009).

Under the theoretical Underpinning besides NRC, Beck (2011) proposed the connotation of the FRC, arguing that NR drives away the investments and innovation skills from the financial sector and reduces the demand saving rate, thus, revealing the negative association between NR and FD. Rajan and Zingales (2003) supported this argument and provided the theoretical justification by introducing the interest group theory of FD, which asserts that existing influential market firms are inherently opposed to FD and must utilize their power to evade market competitiveness. However, empirical studies have critically evaluated that a sound financial sector distributes the NR abundance, which promotes economic growth (Shahbaz et al., 2018).

One school of thought justified the FRC hypothesis concerning NR-led FD nexus in the panel and country-specific studies. For instance, Çetin et al. (2023) analyzed the inverse association between NR and FD by applying the CS-ARDL approach from 1983 to 2019 in 33 developing countries because developing countries are faced with the presence of ineffective institutions confronting corruption and rent-seeking activities associated with NR abundance. The other adverse impact has been observed by Zhang and Liang (2023) for South-Asian countries using bootstrap quantile regression. The authors affirmed the resource curse as NR declines industrial production of real sectors, i.e., manufacturing, etc., because excessive NR extraction discourages the tradeable sector and trade liberalization, damaging FD growth. Similarly, using the moment method of quantile regression, Ding (2023) supported the curse problem in advanced G7 countries from 1990 to 2020. The findings highlight that windfall earnings may cause a wealth transfer from the local financial system to foreign investment firms, non-financial assets, or offshore sovereign wealth funds in the case of inefficient financial sectors (Ozili, 2023).

Additionally, NR's rents lead to increased resource extraction, through which the trading sector may suffer, displacing the non-resource sector and lowering the demand for external funding. Han et al. (2022) employed the fully modified ordinary least square (FMOLS) method, and findings elucidated that NR impedes FD in the top ten resource-rich countries, depicting that sample countries should re-design economic policies to empower financial integrity. In addition, the high exporting of resource products has increased the flow of currencies into resource-abundant nations and appreciated the exchange rate, making their exports expensive for the rest of the economies and may harm the economy's competitiveness. These unfavorable impacts are the consequences of ditch disease, leading to negative macroeconomic conditions caused by the NRC. Apart from this, Tang et al. (2022) justified that price fluctuations in NR prices also lead to an inverse relationship with FD in ASEAN region by applying the CS-ARDL framework from 1984 to 2018. The study explains the significant cost, NR's volatile production and price, and skilled labor employed in resource-dependent industries. Moreover, enriched resource economies are entitled to inefficient spending and borrowing that lead to poor performance of institutions.

Another strand of studies argued the positive influence of NR on FD structure, elaborating that FD provides an effective mechanism for efficient resource allocation to stimulate economic prosperity, thus, confirming the resource blessing. For instance, Hussain et al. (2021) analyze the direct enhancing effect of NR on FD through the existence of human capital and political institutions in high-income countries from 1992 to 2017 using the CS-ARDL technique. Yildirim et al. (2020) applied pooled mean group and dynamic fixed effect methods to determine the relationship between NR and FD in sixteen developing countries. The scholars disaggregated the NR's rents into various

elements and found that oil and forest rents enhance FD because oil is the primary resource and costly input used in the production process; thus, the rise in oil prices increases the oil revenues of these countries and ultimately promotes FD by transferring them. Likewise, in the context of Pakistan utilizing the ARDL method from 1975 to 2017, [Asif et al. \(2020\)](#) ascertained that NR significantly plays the role of a catalyst in promoting FD by expanding the credit creation and money supply. Using the identical estimation method, [Shahbaz et al. \(2018\)](#) documented that suitable economic policies encourage NR's revenues that employ unskilled labor, absorb skilled human capital, and enhance their income. It raises aggregate demand by increasing investment activities, demanding more financial services, and booming the FD sector.

Improved institutions are the pre-requisite while using NR for financial and economic development, depicting that political institutions are significantly critical for NR and FD. [Dwumfour and Ntow-Gyamfi \(2018\)](#) affirmed the resource curse by investigating the negative NR-led FD nexus in 38 African economies. For empirical analysis, the study utilizes data from 2000 to 2012 and a generalized method of moment and found that effective institutions mitigate the curse by encountering corruption in the private credit sector, and improved regulatory control increased the FD sector's performance in the sample economies. [Hadj and Ghodbane \(2021\)](#) checked that NR negatively affects FD in low-income resource nations and positively influences high-income countries, while countries with better institutions control the resource problem effectively, irrespective of threshold level. Besides the moderating factor, several existing studies have unveiled the direct impact of IQ on FD, and the findings are ambiguous subject to IQ indicators such as [Abaidoo and Agyapong \(2022\)](#) determined the enhancing influence of IQ on FD in Sub-Saharan countries from 2001 to 2018 by using likelihood method. The outcomes exhibit that the higher IQ degree stimulates the vibrancy in FD through the proper governance system, enhanced supervisory activities, regulatory controls, property rights, freedom of expression, improved policies, and legal framework. These proxies are employed in the study, which reveal that IQ facilitates FD growth. [Khan et al. \(2020\)](#) used a sample of 15 emerging nations to estimate the decisive role of IQ on FD. The study confirmed that powerful institutions promote transparency, accountability, and controlling corruption in the financial sector. In the United States, [Khan et al. \(2019\)](#) endorsed similar findings from 1984 to 2016, and the researchers described the crucial role of IQ in strengthening FD through optimum capital mobilization and effective trade policies, thus, proving to be a booster in the long run. In contrast, [Aluko and Ibrahim \(2021\)](#) discovered the negligible impact of IQ on FD in the Economic Community of West African states by employing the AMG technique from 1995 to 2015. The results concluded that property rights protections and enforcement of contracts are the essential constituents of IQ, and they do not affect the FD level. Therefore, the above empirical studies reveal inconsistent findings between desired variables that need further investigation.

Besides IQ, another pertinent factor is the accessibility of PD which may assist resource-rich developing countries in promoting FD. The role of PD on FD is asymmetric, and subsequently, there is a nonlinear relationship has been found between PD and FD in the existing literature. [Kumhof and Tanner \(2005\)](#) propounded the concept of the Safe asset view, which elaborates that PD is positively linked with FD. Thus, PD is considered a safe asset in the presence of imperfect institutions when banks refuse to take moveable or real state property ([Libecap, 2001](#)). Second, PB acts as collateral to depositors in the balance sheet, enhancing their confidence in providing funds in risky conditions. [Porta et al. \(1998\)](#) explained the political theory of government ownership that the government must ensure to promote the FD by intervention, collect revenues, and utilizes the financial resources efficiently; thus, conferring to this theory, the government is unrestricted politically to address the institutional problems. Conversely, [Hauner \(2009\)](#) proposed the lazy bank's connotation, stating that PD is detrimental to FD through the crowding out channel. The channel describes that banks involved in

government borrowing are more profitable but less efficient, showing that they are less incentive to develop the private banking sector and create inefficiency in the form of deadweight loss, consequently impeding the FD. Moreover, the concerned authorities may allocate the resources inefficiently to unproductive projects as per their political will, emerging corruption, and rent-seeking evils. The favorable influence of PD promotes FD to a specific threshold level, and after crossing this limit, PD may inversely affect FD. Moreover, the negative impact may turn positive when the financial system is liberalized and financially integrated. For instance, [Bui \(2018\)](#) researched the nonlinear influence of PD on FD in 22 Asian Pacific countries from 1995 to 2015. The study's findings revealed that when there is weak financial freedom and integration, PD oppositely affects FD, while higher independence and integration moderate crowding out the effects of PD.

Regarding NR resource-based economies, substantial reliance on debt financing is another argument for the resource-curse paradox. [Prebisch \(1950\)](#) and [Singer \(2012\)](#) introduced the Prebisch hypothesis, arguing the validation of critical debt overhang for resource-based economies due to sudden fluctuations in NR's prices, restricting economic growth and causing a curse phenomenon. A detailed demonstration is provided by [Manzano and Rigobón \(2001\)](#), in which the authors asserted that the alleged resource curse is linked to debt overhang and argued that endowed resource-intensive countries utilize their perceived resource revenues as collateral due to credit constraint and access funds during adverse shocks in NR's prices. However, the inconsistent and misleading economic policies would further trap the nations in debt overhang and create bottlenecks in achieving economic growth. Previous empirical studies have verified that both developed (Indonesia and Norway) and less developed (Nigeria and Mexico) resource-rich countries experienced the external debt trap due to mis-handling revenue windfalls ([Ampofo et al., 2021](#)). In addition, boom-based borrowing capacity is a phenomenon where abundant NR-based nations need external finance to meet expenditures incurred on resource extraction, processing, and consumption; these foreign fundings meet their budget deficit and discourage private investment and capital formation of the investors in building the FD sector. Utilizing the panel ARDL model from 1990 to 2020, [Wang et al. \(2023\)](#) affirmed the overdependence of 10 African countries on NR to achieve economic growth, which raises their capital expenditures in resource-based industries demanding more PD and demotivating FD. In Nigeria, [Achua et al. \(2022\)](#) confirmed the debt overhang due to a less diversified market, and the Nigerian economy is susceptible to global price volatility. Therefore, Since the wrecked financial system in these in-debted and resource-endowed nations, positive shocks in NR's prices lead to external debt financing and inhibit domestic financial and economic development. Following the prior studies, the current research examines the moderating role of NR and PD on FD in the MENA region. [Table 1](#) describes the summary of the relevant literature.

A bird's eye view of the summary mentioned above in [Table 1](#), we have discovered that prevailing empirical studies have individually elucidated the influence of IQ, NR, PD, and FD ([Ding, 2023](#); [Abaidoo and Agyapong, 2022](#)); however, scant attention has been given to the multidimensional assessment of all these pertinent variables in the MENA countries perspective ([Destek et al., 2023](#); [Belaid et al., 2021](#)). Moreover, previous studies have employed single and more than one indicator to depict the level of FD that produces subjective biases ([Çetin et al., 2023](#); [Asif et al., 2020](#)). Unlike them, our study incorporates a comprehensive IMF's FD index that measures all the FD's dimensions (including financial depth, access, and efficiency) in the most vulnerable MENA region due to NR's price volatilities that emerged from COVID-19 aftershocks. Moreover, we constructed the composite index of IQ using the principle component analysis approach to evaluate the impact of IQ on FD. Thus, the novel contribution of the study is to unveil the direct effect of NR, IQ, and PD and the indirect influence of NR through PD on financial stability in the context of MENA economies using the advanced panel CS-ARDL method and updated data.

Table 1
Summary of literature.

Authors	Country and Time	Method	Proxy/measure	Key findings
Çetin et al. (2023)	1983–2019, 33 developing countries	CS-ARDL, FGLS, and PCSE	Total natural resource rent (NR) (% of GDP) and domestic credit to the private sector by banks (DCPS) (% of GDP)	↑NR ↓FD confirms resource curse
Zhang & Liang (2023)	1990–2020, South-Asian countries	BSQR	NR, DCPS	↑NR ↓FD Validates resource curse
Ding (2023)	1990–2020, G7 countries	MMQR	NR, DCPS	↑NR ↓FD confirms resource curse
Han et al. (2022)	1990–2020, top ten natural resource-based countries	FMOLS	NR, DCPS	↑NR ↓FD confirms resource curse
Tang et al. (2022)	1984–2018, ASEAN countries	CS-ARDL	NR, IMF FD index	↑NR ↓FD supports the resource curse problem
Yıldırım et al. (2020)	1994–2017, 16 developing countries	PMG and DFE	NR, DCPS	↑NR ↑FD (resource blessing)
Asif et al. (2020)	1975–2017, Pakistan	ARDL	Forest rent, coal rent, natural gas rent, and oil rent (% of GDP), DCPS, broad money supply (% of GDP), market capitalization (% of GDP),	↑NR ↑FD in the short run & ↑NR ↓FD in the long run
Hussain et al. (2021)	1992–2017, 23 high-income resource-rich economies	CS-ARDL	NR, ICRG constructed political institution’s risk index and IMF multidimensional index	↑NR ↑FD (resource blessing) & ↑IQ ↑FD
Shahbaz et al. (2018)	1960–2016, United States	ARDL	NR, DCPS	↑NR ↑FD (resource blessing)
Dwumfour and Ntow-Gyamfi (2018)	2000–2012, 38 African countries	GMM	NR, IQ index (including political stability, voice, and accountability, control of corruption and regulatory quality, government effectiveness, and the rule of law) and DCPS	↑NR ↑FD in North Africa, ↑NR FD↓ in middle and low-income Sub-Saharan countries, while ↑IQ*NR FD↑
Destek et al. (2023)	1996–2019, MENA countries	OLS, FE	IQ index and FD index	↑FD ↓growth, ↑NR ↑growth, & ↑IQ via NR ↑growth
Authors	Country and Time	Method	Proxy/measure	Key findings
Hadj and Ghodbane (2021)	1984–2016, a panel of 10 countries	Quantile regression	NR, control of corruption, and law and order, FM and FI indices	↑IQ ↑FD, ↑NR ↓FD in low natural-income countries, and ↑NR ↑FD in high natural-income countries
Abaidoo and Agyapong (2022)	2001–2018, 29 Sub-Saharan countries	Maximum Likelihood	IMF FD index, IQ index	↑IQ ↑FD
Khan et al. (2020)	1984–2017, 15 emerging countries	OLS, PVAR	FD and IQ index through PCA	↑IQ ↑FD
Khan et al. (2019)	1984–2016, United States	ARDL	IMF FD index, IQ index by PCA	↑IQ ↑FD
Aluko and Ibrahim (2021)	1995–2015, ECOWAS countries	AMG	ICRG and EFI index, IMF FD index	↑IQ does not affect FD
Bui (2018)	1995–2015, 22 Asian Pacific countries	FE and PSTR	DCPS	↑PD ↓FD in low financial integration and ↑PD ↑FD in high financial integration
Wang et al. (2023)	1990–2020, 10 resource-rich African countries	Panel ARDL	General government debt (% of GDP), Forest rent, coal rent, natural gas rent, and oil rent (% of GDP)	↑NR ↓PD at an aggregate level and ↑NR ↑PD at a country-specific level
Achua et al. (2022)	1970–2020, Nigeria	Nonlinear ARDL	NR, General government debt (% of GDP)	↑ negative shocks in NR ↑PD
Amfofo et al. (2021)	1991–2017, 17 resource-based countries	PMG	NR, General government debt (% of GDP)	↑NR ↑PD in the long run and ↑NR ↓PD in the short run

Abbreviations: FD, Financial development; NR, Natural resources; GDP, Gross domestic product; DFE, Dynamic fixed effect; FGLS, Feasible generalized least square; MMQR, Moment method of Quantile regression; FMOLS, Fully modified ordinary least square; PMG, Pooled mean group; DCPS, Domestic credit to the private sector (% of GDP); CS-ARDL, Cross-section autoregressive distributed lag; IMF, International Monetary Fund; BSQR, Bootstrap Quantile regression; PCSE, Panel correlated standard errors; ICRG, International country risk guide; IQ, Institutional quality; OLS, Ordinary least square; PVAR, Panel vector autoregression; AMG, Augmented mean group; EFI, Economic freedom index; ECOWAS, Economic Community of West African states; PCA, Principal component analysis; ↑/↓, Increase/decrease; PSTR, Panel smooth transition regression; FE, Fixed effects; ARDL, Autoregressive distributed lag; PD, Publics; GMM, Generalized method of moment.

3. Methods and materials

3.1. Model specification and theoretical underpinning

This study assesses the influence of NR, PD, and IQ on FD for sixteen MENA countries¹ by using the annual data from 2001 to 2020. The study follows Çetin et al. (2023), Tang et al. (2022), and Han et al. (2022) to develop the empirical model and modified by including the moderation term (NR*PD) for MENA countries. The model specification of the study can be expressed as follows:

$$FD_{it} = f(NR_{it}, IQ_{it}, PD_{it}, NR * PD_{it}, GDP_{it}) \tag{1}$$

¹ Algeria, Bahrain, Egypt, Iran, Israel, Jordan, Kuwait, Labanon, Morocco, Oman, Qatar, Saudia Arabia, Tunisia, Turkey, United Arab Emirates, Yemen are included as sample states in MENA region and Iraq, Libya, Syria and Palestine are excluded due to data unavailability.

$$FD_{it} = \alpha_{it} + \beta_1 NR_{it} + \beta_2 IQ_{it} + \beta_3 PD_{it} + \beta_4 NR * PD_{it} + \beta_5 GDP_{it} + \epsilon_{it} \tag{2}$$

Whereas in equations (1) and (2), FD represents financial development as the dependent variable, while NR, IQ, PD, and GDP indicate natural resources rent, institutional quality, public debts, and economic growth as explanatory variables. The acronyms α , β , ϵ , t , and i denote intercept term, variable’s coefficients, stochastic term, time, and panel identities included in the model.

As described in the literature review, the study considers the theoretical foundation of the resource curse theory and Ditech theory that abundant-resource nations experience an economic slowdown by neglecting the real trade sector and trade liberalization due to extensive dependency on resource-based industries (Sachs and Warner, 1995; Auty, 2002). Moreover, lack of diversification, price volatility, inefficient institutions, improper resource management, political instability, corruption, and ignorance in human capital investments are justified arguments behind the FRC phenomenon (Rahim et al., 2021; Hadj and

Ghodbane, 2021). Beck (2011) initiated the idea of the FRC, contending that NR lowers the demand for saving rates, hinders investments, crowds out innovations from the financial sector, and has a detrimental association between NR and FD. Therefore, we predict that NR negatively affects FD, i.e., $\beta_1 = \frac{\partial FD_t}{\partial NR_t} < 0$. In contrast, some studies claimed that the strong institutional framework mitigates the negative influence of NR in improving FD-led growth (Abaidoo and Agyapong, 2022; Khan et al., 2020). Thus, efficient economic and institutional policies address the corruption and rank-seeking evils and promote FD through regulatory quality, transparency, rules and regulations, and accountability that is $\beta_2 = \frac{\partial FD_t}{\partial IQ_t} > 0$. According to Prebisch hypothesis, these developing resource-rich nations primarily used resource revenues windfalls as collateral in getting foreign debt funding to meet the budget deficit and expenses incurred in resource-based activities to acquire economic growth, while the unsudden nature of NR's price volatility and misleading economic policies, the countries could not properly manage their future windfalls and trapped into debt overhang. The unlimited government borrowing demotivates private investors to developing the FD sector, and we follow Ampofo et al. (2021) and anticipate that PD is inversely associated with FD, i.e., $\beta_3 = \frac{\partial FD_t}{\partial PD_t} < 0$.

Due to less diversification and crowding-out effects, endowed resource nations have over-reliance on NR's sectors and exports, generating adverse economic consequences during sudden variations in global NR prices. Thus, insisting economies towards external debts to fulfill the current financing requirements, in this way, the economies are trapped in the debt overhang. Excessive high indebtedness and resource curse paradox collectively damage the local financial markets and institutions, and therefore by following Wang et al. (2023), we estimate that moderating factor NR*PD exerts negative influences on FD that is $\beta_4 = \frac{\partial FD_t}{\partial NR_t \cdot PD_t} < 0$. In addition, economic growth (GDP) as a controlling variable is incorporated into the model that stimulates FD through increased production in resource-based countries that demand more financial services; following Han et al. (2022), we predicted that rational economic policies encourage FD by developing the hypothesis, i.e., $\beta_5 = \frac{\partial FD_t}{\partial GDP_t} > 0$. Fig. 2 displays the proposed direct and indirect association in the model's variables.

3.2. Sample and variables description

Our study specifically focuses on MENA countries due to their relevance because more than one-fifth share of the world's oil reserves and forty-two percent of total natural gas deposits are located in this region (British Petroleum Energy Bp Energy Outlook, 2019). Besides, the MENA countries have a six percent share of the total population; thus, the region is aggregately intensified resource-abundant and provides essential energy resources to world economies for economic prosperity.

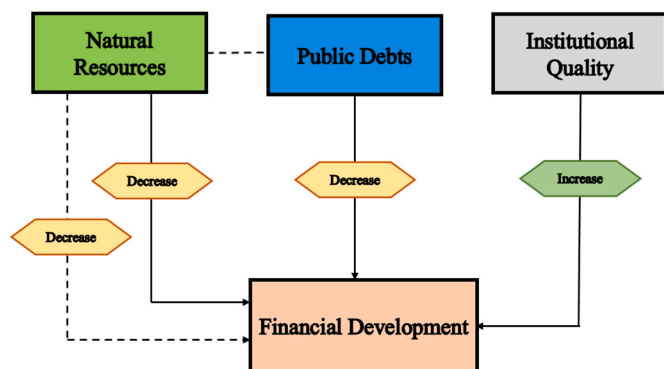


Fig. 2. Depiction of the direct and indirect channels in variables. Note: → indicates direct effects; — shows moderating impact. Source: Author's drawings.

Notably, the MENA region's exports account for more than eighty-five percent of oil export revenues; therefore, the region is highly vulnerable to the price volatilities in global energy prices, particularly experienced after the COVID-19 pandemic and the Russia-Ukraine war crises (Liu et al., 2022). Despite these resources, the sample countries depend on external debt, and economic-financial growth is impeding due to various significant political, social, cultural, and economic factors; therefore, evaluating the relevant factors for reducing the resource curse and fostering sustainable growth is indispensable (Hao et al., 2023; Wu et al., 2023). Fig. 1 displays the trend of NR and FD in the MENA region, highlighting the significance of rational policies.

In our model, the explained variable is financial development (FD), a cumulative index sourced from International Monetary Fund (2021). Explanatory variables include Natural resource (NR) measures (the total resource rent as % a share in the gross domestic product), institutional quality (IQ) measures (corruption, government effectiveness, regulatory quality, political stability and absence of violence, the rule of law, and voice and accountability), economic growth (GDP) (per capita GDP constant \$ 2015 million) and public debts (PD) expressed as total government debts (% of GDP) while all the data has been retrieved from World Development Indicators (2021) and World Governance Indicators (2021) except public debts, that is extracted from World Economic Outlook (2021). All variables are transformed into logarithmic form except the IQ index for standardization units and eliminating the heterogeneity and outliers (An et al., 2021). Table 2 represents the details and sources of model variables.

Several past studies employed the rule of law and corruption (Hadji and Ghodbane, 2021), International country risk guide (Aluko and Ibrahim, 2021; Hussain et al., 2021) to depict the actual IQ level; however, these studies may produce subjective biases and affect the parameter consistency. Therefore, our study accompanies Destek et al. (2023) and Abaidoo and Agyapong (2022) in using Principal component analysis (PCA) to construct a composite IQ index from government effectiveness, political stability, the rule of law, voice, and accountability, absence of violence and regulatory quality. The benefit of employing PCA is integrating the different dimensions and collecting the most pertinent information regarding the indicator into a unique single weighted index (Razzaq et al., 2021). Table 3 exhibits the results of the PCA index of IQ, which discloses the eigenvalues greater than one and more than 70% respective proportion of total explained variation by the first principle component (PC1). The IQ indicators show the positive factor loading values and affirm an equivalent positive weight for these six distinctive IQ indicators in measuring PCA. Moreover, the last row displays the positive correlation values between the weighted IQ index and each IQ-associated construct that validates the IQ index's reliability.

3.3. Empirical research framework

The current section demonstrates the econometric procedure followed in this study to estimate the empirical outcomes.

3.3.1. Slope heterogeneity and cross-section dependency

The core aim is to ascertain the long and long-run parameters of NR, PD, and IQ with FD; however, before estimating them, it is imperative to determine the panel data properties before employing various methods. Slope heterogeneity (SH) and cross-section dependence (CSD) are the foremost problems that inherently exist in panel data. The rapid financial integration and globalization, the countries are compactly linked and dependent on each other. Thus, a shock in one economy may cause variation in other economies. As we have seen in global financial (2007–2008) and Asian financial crises, the COVID-19 pandemic and the Russian invasion of Ukraine caused these issues and distorted the results. Therefore, our study investigates the heterogeneous slope parameters using the SH test of Hashem Pesaran and Yamagata (2008) and the CSD problem by applying Pesaran's CD test (2004), respectively. If we ignore these issues, the outcomes do not report an accurate picture and produce

Table 2
Variables description.

Description	Acronyms	Variable	Measurement units	Source
Financial Development	FD	Dependent	Cumulative Financial Development Index (0–10)	International Monetary Fund
Public Debt	PD	Core Independent	total government debts (% of GDP)	World Economic Outlook
Institutional Quality	IQ	Core Independent	PCA Index uses political stability, the rule of law, government effectiveness, voice, accountability, regulatory quality, and absence of violence.	Self-estimated from World Governance Indicators and World Development database
Natural Resources	NR	Core Independent	Total natural resource rent (% of GDP)	World Development Indicators
Economic Growth	GDP	Control	GDP Per Capita (constant 2015 \$)	World Development Indicators

Source: Author’s Estimations

Table 3
PCI index of institutional quality (IQ).

PCI-eigenvalue	Proportion explained by PCI	PCI-factor loading					
		COR	GEF	PS	RQ	RL	V&A
4.284	0.714	0.46	0.46	0.33	0.45	0.47	0.21
Kaiser–Meyer–Olkin (KMO)		0.96	0.94	0.64	0.91	0.97	0.38
Correlation with weighted PCA index		0.91	0.99	0.56	0.87	0.91	0.43

Abbreviations: COR, corruption; GEF, government effectiveness; PS, political stability; RQ, rule of law; V&A, voice and accountability; PCI, principal component index; IQ, institutional quality; KMO, measures sample adequacy.

biases (Chien et al., 2021; Ulucak et al., 2020). The empirical equations of SH and adjusted SH are as follows:

$$\Delta_{SH} = (N)^{\frac{1}{2}}(2k)^{\frac{1}{2}} \left(\frac{1}{N}S - k \right) \tag{3}$$

$$\Delta_{ASH} = (N)^{\frac{1}{2}} \left(\frac{2k(T - k - 1)}{T + 1} \right)^{-\frac{1}{2}} \left(\frac{1}{N}S - 2k \right) \tag{4}$$

In equations (3) and (4), delta-adjusted ASH and delta SH are represented by Δ_{ASH} and Δ_{SH} , respectively.

3.3.2. Testing of unit root

After performing CSD and SH tests, we evaluated the integration order of variables utilizing unit root tests. In our study, the second-generation unit root test of cross-section augmented Im, Pesaran, and Shin (CIPS) has been applied to investigate the order of integration. Pesaran (2007) introduced the CIPS unit root test. Unlike the conventional unit root tests, CIPS permits the CSD problem by adding the lags and taking the first difference while estimating the variable’s stationary properties. However, the CSD and SH presence may yield disruptive results; therefore, we applied this panel unit root test; the CIPS equation can be written as follows:

$$\Delta W_{i,t} = \varphi_i + \varphi_i Z_{i,t-1} + \varphi_i \overline{W}_{t-1} + \sum_{i=0}^p \varphi_{i1} \Delta \overline{W}_{t-1} + \sum_{i=1}^p \varphi_{i2} \Delta W_{i,t-1} + u_t \tag{5}$$

Where W indicates the cross-sections averages as follows:

$$W^{it} = \varphi^1 \overline{NR}^{it} + \varphi^2 \overline{PD}^{it} + \varphi^3 \overline{IQ}^{it} + \varphi^4 \overline{NR * PD}^{it} + \varphi^5 \overline{\ln GDP}^{it} \tag{6}$$

The statistic of the CIPS test is expressed as follows:

$$\widehat{CIPS} = N^{-1} \sum_{i=1}^n CDF_i \tag{7}$$

In equation (9), CDF stands for cross-sectionally augmented dickey fuller.

3.3.3. Panel cointegration test

After examination of CSD, SH, and unit root analysis, it is essential to determine the long-run association between the FD and its determinants,

including NR, PD, and IQ. The traditional cointegration tests are inefficient in considering the CSD problem and produce misleading results; for instance, Pedroni and Kao cointegration tests as first-generation cointegration testing are inappropriate. Against them, Westerlund’s (2007) cointegration test addresses CSD in examining the long-run equilibrium association between the variables. Therefore, we applied second-generation Westerlund cointegration testing that proposes four statistics values (Pa, Pt, Ga, Gt) and signifies the null hypothesis of no cointegration tested against the alternative hypothesis. The generalized form of the test is as follows:

$$ai(L)\Delta yit = \gamma 1i + \gamma 2it + \beta i(yit - 1 - \acute{a}ixit - 1) + \gamma i(L) \acute{v}it + \eta i \tag{8}$$

$$\text{Where } \delta 1i = \beta i(1)\delta_{2i} - \beta_i \lambda_{1i} + \beta_i \delta_{2i} \text{ and } \gamma_{2i} = -\beta_i \lambda_{2i} \tag{9}$$

Equation (9) shows the cointegration vector among variables. In contrast, βi indicates an error correction coefficient. The expressions mentioned below are the test statistics:

$$G_t = \frac{1}{N} \sum_{i=1}^N \frac{\acute{a}i}{SE(\acute{a}i)} \tag{10}$$

$$G_a = \frac{1}{N} \sum_{i=1}^N \frac{T \acute{a}i}{\acute{a}i(1)} \tag{11}$$

$$P_T = \frac{\acute{a}}{SE(\acute{a})} \tag{12}$$

$$P_a = T \acute{a} \tag{13}$$

In the above equations, the acronyms G_t and G_a show mean group statistics, and symbols P_t and P_a indicate panel statistics.

3.3.4. Regression estimation through CS-ARDL

In regression analysis, we apply the CS-ARDL model to estimate the short and long-run elasticities between FD and its factors after the preliminary analysis. Chudik and Pesaran (2015) presented the CS-ARDL model to estimate the dynamic relationship among the variables. Voluminous studies have employed first-generation cointegration and regression estimators that assume cross-section independence, do not address the CSD problem in panel data, and yield biased and inaccurate findings. However, there is a plausible prediction that the FD level is influenced by the unobserved common factors that may generate the stochastic terms dependent on each other across the countries. Moreover, due to global economic shocks in price volatilities, regional integration and socio-political reforms may generate CSD in the MENA panel. In this scenario, unexpected common factors disturb the coefficient’s efficiency due to possible correlation with explanatory variables. Therefore, CS-ARDL is preferred over the other traditional methods because it encounters the CSD and SH issues in the data and produces robust and reliable results by incorporating the lagged dependent variables. The equation of the CS-ARDL method can be expressed as follows:

$$FD_{2it} = \sum_{i=0}^{pw} \gamma_{1,i} FD_{2it-1} + \sum_{j=0}^{pz} \beta_{1,i} Z_{i,t-1} + u_{i,t} \tag{14}$$

$$FD_{2it} = \sum_{i=0}^{pw} \gamma_{1,i} FD_{2it-1} + \sum_{j=0}^{pz} \beta_{1,i} Z_{i,t-1} + \sum_{j=0}^{px} \alpha_i \bar{IX}_{it-1} + u_{i,t} \tag{15}$$

Where $\bar{X}_{t-1} = (\overline{FD_{2it-1}}, \overline{Z_{i,t-1}})$.

The mean group estimator and the long-run parameter are given as follows:

$$\hat{\pi}_{CS-ARDL,i} = \frac{\sum_{t=0}^{pz} \hat{\beta}_{1,i}}{1 - \sum_{t=0}^{pw} \gamma_{1,i}} \tag{16}$$

3.3.5. Robustness tests

For unbiased outcomes, the study must perform a robustness analysis to check the reliability and consistency of the estimated results. Therefore, the study employs the GMM because our model has a maximum possibility of endogeneity issues due to resource curse dependency in MENA countries. Moreover, correlation and autocorrelation between the error terms and country-fixed effects may also exist in the model. Arellano and Bond (1991) developed the GMM that utilizes the first difference of the independent values to handle the fixed effects and the lagged value, thus solving the variables' reverse causality and endogeneity issues. In addition, we apply the AMG estimator proposed by Eberhardt and Teal (2010) to confirm the estimated findings endorsed by the CS-ARDL method. AMG deals with heterogeneous panel data, unobserved factors, outliers, and endogeneity concerns that exist in the variables; therefore, due to these benefits, AMG is an efficient econometric technique for estimation (Murshed et al., 2022).

3.3.6. Panel causality test

Our study employed the panel causality test presented by Dumitrescu and Hurlin (2012) to examine the causal association between the model's variables in the heterogenous panel data in empirical analysis. It is appropriate when the stochastic terms are dependent across the cross-sections. Additionally, this method permits all the variant model parameters in panel identities. The proposition contains the null hypothesis of homogeneous causality, which is tested against the alternative hypothesis across the countries. Several studies have adopted this technique to determine the causal association among the factors for different economies (Lingyan et al., 2022; Han et al., 2022).

4. Empirical findings and discussion

The summary descriptive properties of the model's variables are reported in Table 4. The results indicate that all the variables have positive average scores, whereas GDP has the highest maximum value and NR has the minimum value. Although all factors, such as FD, IQ, PD, NR, and GDP, have lower standard deviation values; however, NR contains the largest dispersion, while PD exhibits the lower volatile value in the data. After describing the panel data statistical values, the study initiates its empirical investigation by applying the SH test of Pesaran (2007) testing to ascertain the heterogeneous slope parameters. Table 5 denotes the SH outcomes, confirming the SH issue in the variables through the significant delta and adjusted delta values; therefore,

Table 4 Descriptive statistics.

Statistics	FD	IQ	PD	NR	GDP
Mean	0.362	0.018	3.542	1.416	9.204
Median	0.37	0.108	3.808	2.713	9.031
Maximum	0.64	1.886	5.211	4.079	11.205
Minimum	0.09	-2.771	0.432	-6.960	7.086
Std. Dev.	0.135	0.978	0.977	2.838	1.094
Skewness	-0.327	-0.370	-0.811	-1.560	0.151
Kurtosis	2.337	3.091	3.108	4.693	1.671

Note: Author's Estimation.

Table 5 Results for slope heterogeneity.

Model-1	
Slope Heterogeneity Test	Statistics
$\tilde{\Delta}$	14.931***
$\tilde{\Delta}^{\text{Adjusted}}$	16.168***

Note: Significance level is denoted by *** for 1%, ** for 5%, and * for 10%.

the null hypothesis of slope homogeneity is significantly rejected at a 1% significance level.

While analyzing the estimation, CSD is another essential issue that must be identified. In this perspective, the study employs the Pesaran (2004) cross-dependence test to examine the CSD concern, and the outcomes are presented in Table 6. The findings affirm the CSD presence in the data by rejecting the no cross-section independence as the null hypothesis at a 1% significance level. Thus, all the model's variables contain the CSD issue due to financial, economic, and political integration and resource abundance in the MENA region.

After assessing SH and CSD problems, the next step is to evaluate the stationary properties of the considered variables, which is imperative before regression analysis. As the pre-requisite analysis, our research already examined the SH and CSD concerns; thus, second-generation unit root testing is the most preferred technique that resolves them. Table 7 demonstrates the CIPS results, denoting that FD, IQ, PD, NR, and GDP are not stationary at the level while significantly confirming their stationarity at the first difference and allowing the study to check the long-run association among the variables.

In the next stage, the confirmation of the long-run cointegration is assessed by employing Westerlund's cointegration test. Table 8 reports the cointegration estimation outcome through the Westerlund method, affirming that all the variables (FD, NR, PD, IQ, and GDP) are cointegrated. Thus, four significant Ga, Gt, Pt, and Pa statistical values accept the alternative hypothesis at a 1% significance level, permitting the study to perform the regression estimation of variables.

After conducting the preliminary testing, the research investigates the long and short-run variable's coefficients using the CS-ARDL estimator. Table 9 highlights the CS-ARDL findings that NR is inversely associated with the FD sector at a 5% significance level, stating that a one percent increase in NR discourages FD by 0.19% and affirms the FRC paradox for the MENA countries. The findings concurred with Zhang and Liang (2023), where the authors confirmed the FRC hypothesis by examining the negative linkage between NR and FD in South Asia due to elevated corruption and rent-seeking social evils. Moreover, ignorance of the potential sectors replaces the production from the manufacturing sectors towards the resource-based sectors, shrinking the FD sector through declining exports and denoting the Ditch disease. In our study, these arguments are justified for the MENA countries; despite being resource-intensive, the sample economies are still backward in fostering economic progression due to limited export diversification. Moreover, the MENA countries are susceptible to unexpected shocks in energy prices, as we have witnessed during the COVID-19 pandemic and Ukraine-Russia war, because the region comprises more than 85% of total export revenues are primarily linked to NR-based exports (Liu et al., 2022). Moreover, inefficient institutional reforms, low

Table 6 Results for cross-section dependence.

Cross-Section Dependence	
FD	12.174***
NR	17.672***
PD	10.083***
IQ	13.557***
GDP	15.920***

Note: Significance level is denoted by *** for 1%, ** for 5%, and * for 10%.

Table 7
Results for unit root testing (CIPS).

Variables	Intercept and Trend	
	I(0)	I(1)
FD	-2.835	-4.696***
NR	-2.108	-3.657***
PD	-1.094	4.138**
IQ	-2.415	-3.892***
GDP	-2.324	-3.950***

Note: Significance level is denoted by *** for 1%, ** for 5%, and * for 10%.

Table 8
Co-integration-integration test (westerland).

Statistic	Value	Z-value	P-value
Gt	-4.640	-1.845	0.029
Ga	-8.044	0.510	0.438
Pt	-3.957	-1.210	0.017
Pa	-6.542	0.006	0.852

Table 9
Results of the CS-ARDL method.

Variables	CS – ARDL outcome	
	Long – run	Short run
ECT _{t-1}	-	-0.294***
NR	-0.195**	-0.051**
PD	-0.083***	-0.010*
IQ	0.125**	0.064**
NR*PD	-0.262**	-0.153
GDP	0.435**	0.396***
C	1.048**	0.957*

Note: FD is the dependent variable, and the significance level is denoted by *** for 1%, ** for 5%, and * for 10%.

productivity, highly volatile NR prices, and political-economic issues are obstacles to NR-led growth and cause the FRC in the region (Saud et al., 2023). It implies that MENA countries should promote the diversification in resource-based products and encourage investments in potential sectors to mitigate the FRC problem (Jin, 2023).

In contrast, IQ enhances FD substantially by 0.125% if a one percent stimulation in IQ which shows a positive nexus between the desired variables. Our outcomes adhere to Abaidoo and Agyapong (2022) for 29 Sub-Saharan countries, where the authors found a direct relationship between IQ and FD. The authors claimed that regulatory institutions and improved governance structures formulate rational and stringent policies regarding the financial markets and their development and guarantee efficient resource management. Likewise, Destek et al. (2023) verified the mitigating impact of IQ when the MENA countries are empowered with sound institutional systems; they efficiently allocate the financial resources received from NR exports and enhance FD-led growth. Better political institutions encourage private property rights while conducting credit contracts in financial markets and corporate sectors. Moreover, transparency and accountability are other remarkable features of IQ that assist and would capable the MENA states in the future to alleviate the corruption, bribery, and political rent-seeking incentives associated with FD-led inclusive growth. The findings suggest the sample countries that should strengthen the FD sector through improved IQ levels. Apart from this, IQ disseminates the education and technological innovations that stimulate the NR quality through skilled human capital in resource-based activities and generates spillover effects in the FD sector in the form of higher future returns, less-risky diversified markets, and increased economic growth. Thus, the empirical outcomes suggest that the government must empower the

institutions to execute effective policies to limit the FRC paradox.

Another imperative factor is PD, exerting a prominent negative influence on FD, indicating that a one percent rise in PD tends to reduce FD by 0.08%. The model’s empirical results are consistent with previous studies and justified. For instance, Achua et al. (2022) proved the negative connection between PD and financial-led GDP growth in Nigeria because the uncertain NR price fluctuations insist the Nigerian economy access the funds through PD and experience economic slow-downs. Similarly, Bui (2018) researched Asian Pacific economies to elucidate the nexus between PD and FD; the study’s findings checked that PD restricts FD due to crowding-out effects and discourages private investors from augmenting financial resources. In this way, the local FD sector does not grow smoothly due to outflows of funds into foreign offshore companies. Henceforth, the findings recommend enhancing technological inflows and foreign direct investments by providing lucrative incentives to foreign and private investors.

Our study’s novel contribution is incorporating the moderation term NR*PD into the model, which substantially reveals the adverse impact on FD and denotes a 0.262% reduction in FD when a 1% augmentation in NR*PD respectively. The finding unveils the joint effect of NR and PD on financial stability. It illuminates that MENA countries have sophisticated resource-based products through which they have less capacity to generate future NR windfalls, compelling the nations to depend on PD to reduce the negative effects of NR price volatility. Thus, the collective influence of NR and PD in highly indebted and resource-rich MENA economies restricts FD growth due to inefficient resource allocation, misleading economic policies to manage future NR revenues and crowding-out effects. In the literature, Wang et al. (2023) found that NR promotes PD levels in resource-based African nations, damaging the respective countries a financial integrity. The estimated results highlight that concerned economies should formulate diversified and resilient economic policies to upsurge resource efficiency and enhance financial stability by curbing the debt overhang.

Economic growth (GDP) as a controlling variable positively influences FD, demonstrating that a one percent increase in GDP boosts the FD by 0.435% at a 5% significance level when other factors remain unchanged. Our results are identical to Han et al. (2022), where the authors ascertained profound findings for the United States because more production in the resource-associated sectors demands more financial services. Besides, rational economic policies have liberalized and integrated the financial sector globally by providing leverage on taxes, regulation, and trade openness, increasing US competitiveness in foreign markets. Likewise, the findings are similar to Atil et al. (2020), in which the scholars assessed the GDP’s positive impact on FD in Pakistan and explained the demand-side effects that higher economic activities and developments fortune the FD structure through using more financial services.

The short-run estimates are also displayed in Table 9, endorsing the identical empirical parameters of FD’s determinants with similar signs; however, the magnitudes are smaller than the long-run coefficients. NR and PD prominently discourage FD by 0.05% and 0.01%, respectively, while IQ stimulates FD by 0.06%. In addition, the interaction variable NR*PD collectively declines FD by 0.153%. Moreover, GDP also positively affects FD by 0.396%, and the error correction term (ECT-1) converges the model towards the steady state equilibrium position by 29.4% each year if any disequilibrium deviates MENA region in the short run. Fig. 2 displays the direct and indirect association of the model endorsed by the CS-ARDL method.

In the empirical exploration, the study employed the AMG and GMM estimators for the robustness analysis, and the findings are mentioned in Table 10. There are plausible reasons for endogeneity and autocorrelation issues among the model’s variables due to resource over-dependence; thus, these issues must be addressed for unbiased and consistent outcomes. Both AMG and GMM techniques confirm the CS-ARDL estimated outcome that NR reduces FD and affirms the FRC hypothesis by 0.164% and 0.117%, respectively. Similarly, IQ is the

Table 10
Robustness regression.

Variables	AMG and GMM estimators	
	AMG	GMM
FD _{t-1}	–	0.680***
NR	–0.164**	–0.117***
PD	–0.102**	–0.139***
IQ	0.084***	0.095**
NR*PD	–0.210*	–0.268***
GDP	0.350***	0.420**
C	1.254*	1.395**
AR [II]	–	[0.382]
Hansen Test [p-value]	–	[0.427]

Note: FD is the dependent variable, and the significance level is denoted by *** for 1%, ** for 5%, and * for 10%.

stimulator of FD by 0.084% and 0.095%, while PD declines FD by 0.102% and 0.139% in both methods, respectively. The interaction term NR*PD is inversely linked to FD by 0.210% and 0.268%, while the control variable GDP is directly related to FD by 0.350% and 0.420% in the respective AMG and GMM estimators.

Finally, concerning the panel estimation, the study applies the panel causality test in the last step to determine the causal relationship between the studied variables. The results are displayed in Table 11, which asserts that bi-directional causality prevails among all model variables except IQ and FD, which indicates the uni-directional causal connection from IQ to FD. In other words, the outcomes demonstrate that all these indicators have profound impacts and implications in the development of financial markets and institutions; thus, any policy-oriented change in NR, PD, GDP, and NR*PD causes changes in the policies concerning the FD sector. Similarly, the reverse effect exists as any transformation in FD-associated strategies changes the mentioned indicators. However, the one-way causality association from IQ to FD denotes that a better institutional framework is the imperative policy requirement to develop a well-organized FD structure. The current findings are consistent for NR and FD (Ding, 2023), GDP and FD (Han et al., 2022), and PD and FD (Bui, 2018). Fig. 3 visualizes the outcome of the Dumitrescu-Hurlin panel causality test among the variables.

5. Conclusion and policy implications

Natural resources are the instruments to augment economic progress and financial stability, while the adverse effects of the resource-curse paradox dampen the economic development of resource-intensive nations, and it is one of the most debated topics in the existing literature. However, ascertaining the role of NR in inclusive financial-led growth is scant. Recent global uncertainties (including COVID-19 and Russia-Ukraine war crises) have elevated energy prices worldwide, and these sudden price volatilities impede the financial sector of the MENA region, particularly. Therefore, the present study emphasizes the MENA countries and ascertains the influence of NR, PD, and IQ on financial integrity from 2001 to 2020. The study assesses the SH and CSD issues concerning

Table 11
Dumitrescu-hurlin panel causality.

H ₀	Z _{stats}	p – value
NR ⇌ FD	5.930	0.000
FD ⇌ NR	4.128	0.000
PD ⇌ FD	6.765	0.000
FD ⇌ PD	3.428	0.001
IQ ⇌ FD	7.835	0.000
FD ⇌ IQ	2.040	0.430
GDP ⇌ FD	6.582	0.000
FD ⇌ GDP	8.951	0.000

Note: Significance level is denoted by *** for 1%, ** for 5%, and * for 10%.

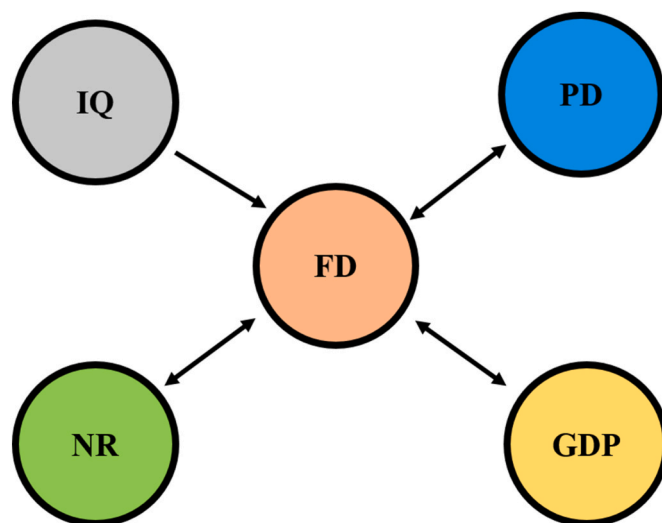


Fig. 3. Graph of Granger causality findings between variables. Note: FD = Financial development; IQ = Institutional quality; NR = Natural resources; GDP = Economic growth; PD = Public debts; ↔ denotes bi-directional causality; → represents uni-directional causality. Source: Author’s drawing.

panel data for empirical analysis. After confirming their presence, unit root analysis is performed by utilizing the CIPS unit root testing that checks the stationary conditions of all factors at first difference. Moreover, the long-run cointegration is affirmed by applying the Westerlund cointegration method, which reports that the factors are cointegrated in the long run. Thus, the cointegration analysis permits the study to employ the CS-ARDL estimator to investigate the short and long-run relations between FD and its determinants.

The CS-ARDL outcomes show that NR profoundly reduces the FD and validates the FRC phenomenon in MENA member states. On the other side, IQ facilitates the FD by revealing its positive connection with FD. Besides, PD demotivates the FD sector in sample countries due to inadequate institutional policies and crowding out effects and thus exhibits the inverse association with FD. Along these indicators, mediating factor NR*PD also exerts negative effects on FD and suggests fascinating policy implications to the selected MENA economies. Moreover, the short-run parameters are also aligned with long-run outcomes; however, the indicators’ lower magnitude in the short run highlights their relevancy for the longer-term strategies. ECT’s coefficient adjusts the model’s variables towards the long-run equilibrium position in any divergence by 29.4% per annum.

In addition, the current exploration applies the alternative panel estimators of AMG and GMM to check the robustness and validity of the estimated outcomes. Furthermore, the panel causality test analyzes the causal linkage that shows the two-way causal association among NR, PD, GDP, and FD, while one-way causality appears between IQ and FD. After utilizing all the panel data techniques, based on empirical outcomes, FD is an indispensable pioneer, and our study provides valuable policy insights for practitioners, governments, and policymakers in MENA countries to empower the FD sector.

The policymakers should scrutinize the FRC mechanism and redesign the inclusive economic policies concerning NR-led financial improvements. In this dimension, diversified export markets, skilled human capital, and sound institutional structure are the main fundamentals that efficiently expand NR’s revenues in contemporary sectors rather than the traditional (resource-based) sectors. Apart from this, the potential revenues from NR must be effectively transferred to the financial sector through resource efficiency, transparency, and accountability. Improved regulatory and legal institutional system is the pre-requisite measure that controls corruption, rent-seeking, and unproductive NR revenue allocation in resource-rich countries. Moreover,

the government disseminates technological innovations and skilled human capital by investing in education, research, and development. It generates positive value addition and competitiveness and reduces the dependency on traditional resource-intensive exporting products in the global markets. In addition, the MENA region's policymakers should provide attractive financial incentives to foreign investors that facilitate foreign investments in these economies through capital accumulation and technology deployment. All these initiatives build up and strengthen the FD sector enough to mitigate the FRC problem due to NR's prices volatilities. Further, the nations could generate the potential NR revenues that decline the need for foreign public funds to meet their current expenditures and deficit and save them from the debt overhang.

6. Directions for future investigation

Although the present research explores the financial resource curse (FRC) process in MENA countries by focusing on NR, IQ, and PD factors in an integrating framework, the study still encompasses certain limitations to variables, sample countries, and data scope. Therefore, our study sheds light on the potential future exploration that provides a new dimension to researchers in the literature. The study emphasizes only NR, PD, and IQ; however, other substantial factors may influence FD, such as fiscal decentralization, export diversification, digitalization, globalization, etc (Zhang et al., 2023). Moreover, the study merely considers the MENA region and ignores the other regions and groups; for instance, ASEAN, BRICS, G-10, G7, OECD, and panel cross-section identities. Including these nations and blocks provides a comparative and comprehensive empirical analysis in the future and suggests integrating policies to mitigate the FRC curse in developed and developing rich countries.

Credit author statement

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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