EDUCATIONAL FACTORS AS DETERMINANT OF INTERNATIONAL RESERVES ACCUMULATION IN ORGANISATION OF PETROLEUM EXPORTING COUNTRIES

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Abstract. There has been tepid growth of international reserves in OPEC economies despite huge chunks of oil revenue with high developmental needs. This study investigated the influence of educational factors using various levels of literacy in stimulating macroeconomic determinants of international reserves in OPEC member states with data between 2008 and 2018 obtained from World Bank Development Indicators across 15 member states. The study employed dynamic panel model and analysed the data using System of Generalised Method of Moment (SGMM). The findings show that educational levels, such as, adult, youth literacy, tertiary school and secondary school enrolment mitigate the adverse effect of exchange rate and stimulate the effect of crude oil prices while tertiary enrolment stimulate the effect of foreign direct investment and reduce the adverse effect of economic crises. In all, youth literacy was most impactful for these economies while economic crises were significantly positive at all levels as a primary determinant of international reserve accumulation. It was therefore concluded that educational enhance the economy to accumulate more reserves. The study recommended among others that national governments should ensure adequate funding is channelled to educational sector to improve the quality of education at institutions youth and secondary education levels in order to harness adequate knowledge and skills to enhance the efficiency of foreign investments.

Key words: macroeconomic factors, international reserves, Sy-GMM, youth literacy.

JEL Classification: F13, F23, F43 F53

Introduction

The desire to accumulate reserves in developing and emerging market economies has often been marred by series of macroeconomic shocks and fluctuation right from the major source of revenue base. This is more acute for economies with exporting crude resources in primary force, epically among Organization of Petroleum Exporting Countries (OPEC) members who export crude petroleum to the world market. In the previous literature, it was observed that macroeconomic factors strongly form the foremost determinants of accumulation of international reserve across the globe. For instance, Nigeria, Angola, Venezuela and UAE experienced a sharp drop of about 20% in their reserves between 2009 and 2015 (Arinze, 2020). In 2015, Nigeria's international reserves dropped from $29billion to $25 billion in a space of few months in 2016, and a slight drop in 2018 to $38.8 billion after an increase in 2017. Angola experienced major decrease in 2015, from $23.8 billion to $16.3 billion in 2018. The shock does not spare Venezuela, who had a decline in 2015 from $16.4 billion to $7.5 billion in 2019. Also, Saudi Arabia had another significant decrease in 2015 from $616 billion to $499 billion in 2018. The non-OPEC member such as China's reserves dropped from $3,406 in 2015 to $3,223 in 2018. Azerbaijan experienced a drop from $7.9 billion to $6.7 billion in 2017, and Oman had a slight decrease from $17.5 billion to $16.6 billion in 2018. One of the reasons for this unstable reserve is that the revenues of OPEC members is tied to a product with volatile prices though some states were characterized with ineffective macroeconomic misalignments and economic crises (Arinze, 2020).

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In order to identify appropriate determinants of international reserves that is not susceptible to shock in the system (Jung & Pyun, 2020), a number of empirical studies have been conducted on various determinable factors influencing international reserves accumulation. However, there are still inconsistencies in their findings and some authors believed that existing literature strictly focused on macroeconomic variables while some strand of the literature argued against the procedure of static method of analysis data. The debate on the most effective determinants of international reserves accumulation among oil exporting countries still remains unsettled in the literature. For instance, Cheung and Ito (2009); Aizenman and Lee (2007); Aizenman, Chinn, and Ito (2013); Aizenman and Ito (2014); and Aizenman and Lee (2019) tested precautionary determinant on international reserves accumulation in various countries while Dooley and Garber (2005); Dooley, Folkerts-Landau, and Garber (2007); Aizenman and Lee (2004); Korinek and Servén (2016); and Choi and Taylor (2018) examined mercantilist determinant yet reserves is not stable and there are no consensus on the strong determinant of reserves as some of the variables indicate a negative relationship with international reserves accumulation in some developing countries.

Similarly, the recent literature and trends of international reserves have shown that most of macroeconomic determinants have failed to effectively support international reserves accumulation in OPEC economies during financial and economic crises. As a result, this study considers educational factors that can mitigate the effect of macroeconomic determinants and stimulate the positive effect of other factors. Educational factors are very essential due to its emphasis on skills acquisition, competencies, knowledge and increase in natural capacities that can enhance productivity (World Economic Forum, 2016). It increases the efficiency of individual workers and enhances entrepreneurial management in order to expand economies productivity beyond minimal production process.

However, the recent decline and acute fluctuations in international reserves force a re-examination of the efficiency of these factors. Most of the previous studies on the determinants of international reserves in emerging and developing economies focused attention on macroeconomic variables such as exchange rate, inflation rate, monetary and fiscal policies instruments to reveal whether the self-insurance or the mercantilist motive prevails in determining the adequate level of international reserves accumulation (Lane & Burke, 2001; Jeanne, 2007; Aizenman & Lee, 2007, Cheung & Qian, 2009; Delatte & Fouquau, 2012; and Aizenman et al., 2015). But little is known about the influence of educational factors, among

the factors determining international reserves (Mahraddika, 2019; Komareck and Benecka, 2018; Audu and Okomoko, 2013). The inconsistencies and conflicting results on the previous studies have created gap to be filled in the empirical study, which this study attempts to achieve. The question of whether educational factors contributed significantly and positively to the determinants of international reserves is important in the literature. In light of the above, this study considered dynamic method to investigate the role of educational factors on the determinants of international reserves accumulation in OPEC economies between 2008 and 2018.

1. Literature review: concept of international reserve

The idea of international reserves accumulation could be traced to the end Bretton Wood Systems in 1970s when many countries of the world support the view of holding international reserves in foreign currencies as part of central banks' assets. An international reserve is the assets controlled by monetary authorities to finance payment imbalances and foreign exchange intervention in the markets to influence the exchange rate as well as other relevant and statutory obligations (IMF, 2015). This means that a country's coffer that comprises of gold and foreign currencies collectively constitutes its international reserves. It was meant for meeting foreign payment of certain obligations, such as, commercial and sovereign debts, imports financing, as well as foreign currency intervention in the market during unwarranted fluctuations. It could be used by countries to absorb unexpected capital movement, shocks or contingencies as well as catering for external obligations. This also can be used by monetary authorities to back its liabilities or constitute the financial resources relevant to its international economic relations. With that system, international reserves were maintained in foreign currencies at a fixed exchange rate regime. However, following the collapse of the system ideas shifted the attention of most countries to a free-floating exchange rate regime under which international reserve holdings act like "shock absorbers" during volatility in foreign transactions, like imports variations accrued from trade shocks or capital account variations due to the capital retraction or financial crisis (Pina, 2015; Korinek & Servén, 2016).

Conceptually, international reserves play three major important roles in the world. First, it is the belief of mercantilists' that international trade has a positive relationship with international reserves. This school of thought agreed with the idea of accumulating more reserves to facilitate the expansion of trade across the globe promoting export

and importing a little as possible. Second, international reserves are important to periodically solve the problem of balance of payments disturbances arising from current and capital accounts. Third, international reserves remain necessary if countries are to withstand adverse effect of economic activities or serve as shock absorber against financial crises. Augustine, Antony and Thankgod (2015) stated that countries hold foreign reserves purposely to ensure external financial market stability, stable exchange rate, exchange rate forecasting and targeting, as well as, credit liberty. Therefore, international reserve accumulation remains one of the essential functions of the apex bank of any country. European Central Bank (2006) stated that international reserve holding is self-insurance against currency crisis and most importantly in a case of overvalued currency. Cheng (2015) posits that reserves accumulation is one of the catching-up techniques in an economy characterized by an underdeveloped financial market where the apex institutions engage in the financial intermediary role. This is done to prevent the repetition of the incidence of the financial crisis of the late 1990s.

1.2 Educational factors and macroeconomic determinants of international reserve

Over the decades, the debates on the determinants of international reserves have generated considerable arguments in academic papers. Heller (1966) proposed national product, interest rate and relevant components of money stock as the major determinants of international reserves considering South Africa data. In addition, Aizenman and Lee (2007) categorized determinants of international reserves into two: the mercantilist motives and precautionary concerns. It was stated that trade openness, savings, ratio of external debt to GDP, degree of capital account liberalization, and economic growth jointly influenced the decision of countries to accumulate more reserves in order to achieve both precautionary and mercantilist motives. There are good numbers of empirical studies that have investigated and focused primarily on the most effective determinants of international reserves in developing and emerging economies. Lane and Burke (2001), Aizenman and Marion (2004), Eichengreen and Mathieson (2000), and Romero (2005) identified economic growth, current and capital account vulnerabilities, exchange rate flexibility and opportunity cost as the factors contributing to growth in international reserves. However, Aizenman & Lee, (2007) and Cheung & Qian, (2009) argued that over reliance on the performance of macroeconomics factors had been subjected to constant criticisms during economic down turn and maintenance of adequate level

of reserves. Therefore, this study explored if the difficulties encountered by developing and OPEC members' state to accumulate and stimulate reserves during economic shocks can be explained by lack of quality educational factors.

How education interacts with macroeconomic factors to influence the level of international reserves have not generated considerable argument in the literature. However, the debate on how educational factors directly influence economic performance has provided solid arguments. Education remains crucial in the components of human capital development in view of its enablement at human capital performance. Empirical studies have suggested that educational factors are distinctive features of economic system and recent work has established the significant impact of education over economy productivity (WEF, 2016). Sparreboom and Staneva, (2014); Nanok and Onyango (2017); Johnson and Velmurugan (2019) stated that increasing the level of education in developing economies will boost the employability and productivity. In general, earnings tend to increase in accordance with workers' level of educational attainment and those with higher qualifications and/or more work experience can expect to earn more. Returns to education differ widely between workers in paid employment, for whom an additional year of schooling generally results in a higher income, and those in self-generated entrepreneurial activities, for whom significant returns are far less certain. Some empirical studies have shown that developing and developed countries make huge investments on education. Demir, Bilik and Aydin (2018), opined that education index influence foreign direct investment, which in turn affects international reserves of a country. The study carried out in Turkey by Okten and Arslan (2013) confirmed a positive and significant effect of educational conditions on foreign direct investment. Based on these empirical findings, it could be inferred that educational factors may influence foreign direct investment either positively and thereby affecting the accumulation of international reserves of OPEC members.

The World Economic Forum (2016) suggested three channels through which education affects a country's productivity. First, it increases the collective ability of the workforce to carry out existing tasks more quickly. Second, secondary and tertiary education specifically facilitates the transfer of knowledge about new information, products, and technologies created by others (Barro & Lee, 2010). Finally, by increasing creativity, it boosts a country's own capacity to create new knowledge, products, and technologies. Investment in secondary education provides a clear boost to economic development, much more than can be achieved than by universal primary education alone. Hence, the focus of the United Nations Millennium

Development Goals on universal primary education was important but insufficient. Universal primary education must be complemented with the goal of ensuring broad sections of the population have at least completed junior secondary education (IIASA, 2008). The Sustainable Development Goals (SDGs) also have education targets including that 'by 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes'. This shows more of an awareness of the importance of secondary education. Only broad-based secondary education and universal primary education is likely to give poor countries the human capital boost necessary to bring large segments of the population out of poverty. For more industrialised countries, tertiary education of younger adults also plays a key role in economic growth (IIASA, 2008).

1.3 Theoretical review

This study is hinged on the two relevant and related theories that critically explain the ideology behind the international reserves accumulations. First, the Keynes theory of holding cash balances for precautionary purposes was propounded in 1936. This theory postulated that central banks as a custodian of foreign currencies accumulate reserves to fulfil the motives safe guarding against unforeseen circumstances. It also stresses further that the rates of interest as well as the level of national income determine the holding of a certain amount of money. Second, mercantilist theory of reserves originated from Thomas Mun (1571–1641) and Jean Baptiste Colbert (1619–1683). Mercantilism can be viewed as an economic policy designed to maximize a nation's exports. It also is a policy that focuses on accumulating reserves through a favourable trade balance. It was established that a nation's wealth is attributed to the amount of gold acquired. A country will be better off, if it had more gold than the others. This assumption had consequences on the policy of the country's economy. Thus, the most suitable method of achieving prosperity is by embarking on few imports and encouraging huge exports, which thereby create a net foreign exchange inflow and maximizes the gold stocks of the country. Gold accumulation was believed to be very essential for a powerful and strong state and this prompted some countries such as Britain to design and implement policies suitable for protecting their traders and maximize income.

The above theoretical reviews are essential because they offer comprehensive explanations on how and reasons for accumulating international reserves by various countries. The mercantilist theory was based on the premise that some countries accumulate reserves for the purpose of export-led growth techniques by undervaluing the of real exchange rate while precautionary motive serves as self-insurance against sudden external shocks. Aizenman and Lee (2007) tested for the comparison between mercantilist motive and precautionary motive of holding international reserves and found the latter to be more suitable. Hence, the promoting exports and enhancing growth can result to the accumulation of reserve for both mercantilist and precautionary purposes. Nevertheless, the reasons may change over time and varies across the countries (Ghosh, Ostry, & Tsangarides, 2014). It was on this premise that the study found the two theories relevant to underpin the study.

1.4 Empirical review

Several studies have been carried out on determinants of international reserves in different countries but studies peculiar to OPEC members and educational factors as determinants are limited. Empirically, the study by Islam (2020), explored the impact of macroeconomic factors to determine the level of reserves in Bangladesh using quarterly data ranging from 1994Q2 to 2016Q4. The Johansen co-integration test for the study of reserves demand function reveals that the current account vulnerability and exchange rate flexibility play a crucial role in Bangladesh's long-term reserve demand policies. The study conducted by Nayak and Baig (2019), estimated a basic buffer stock model of international reserves for India and China, using quarterly data for the period 1993Q1–2015Q4. The study estimated with Autoregressive Distributed Lag (ARDL) to determine the relationship rather than co-integration. The study revealed that GDP or imports, domestic interest rate, volatility of reserves and exchange rate play a significant role in the international reserve accumulation. The research by Muhammad and Muzammil (2019), investigate the impact of macroeconomic indicators on foreign reserves in the context of Pakistan. The Vector Autoregressive (VAR) model was used to estimate Pakistan's foreign exchange reserves demand with current account vulnerability, capital account vulnerability, exchange rate flexibility, and the opportunity cost of holding reserves as independent variables. The results indicated that macroeconomic variables such as remittances, exchange rate, the ratio of current account deficit to GDP, and interest rate differential (measure as proxy for opportunity cost) determined the country's long-run reserves demand function. The Granger causality analysis proved that the various macroeconomic variables fail to cause reverse causality. This implied that in Pakistan, the demand for reserves is driven by macroeconomic stability. The problem with above studies is the concentration on one country without considering cross country data.

Furthermore, Schroder (2017) assessed the effect of mercantilist and precautionary motives on international reserves in China. The study employed quarterly data from 1998Q4 to 2011Q4, which were collated from IMF's and International Financial Statistics (IFS) databases. A dynamic Ordinary Least Square (DOLS) was used to analysis the variable considered for the study. The findings indicated that the mercantilist motives have a significant effect on reserves compare to precautionary motives that has no significant effect on reserves. Pina (2017), considered 75 countries to evaluate the international reserves holding and global interest rate between 2000 and 2013. The international reserve, gold holdings, Special Drawing Right (SDR) and other reserve asset were the variables considered for the study. Multiple regression analysis was considered to determine the association and impact that existed between holding of international reserve and interest rate fluctuation. It was discovered that a percent change in interest rates will positively influence level of reserves. A nearest intention to the current study was indicated by Keskin (2021) which showed that social prosperity wasted by the OPEC members was about 40% while utilising about 60% for the development of their countries. This appeared to a general average as some would have gained more while other would have lot more. This was the more reason to pursue the literacy interaction.

2. Methodology:
theoretical framework and modelling

The study adopted precautionary motive of holding money as postulated by John Maynard Keynes in 1930 was ranked as the most important in this study. The basis for this theory stemmed from the fact that people hold money to offset any emergency or unforeseen contingencies relating to the reason why some developing countries hold and accumulate reserves in form of gold, SDRs and other international financial instruments. Hence, it enables individual to meet unexpected rise in expenditure or unexpected delays in receipt. Based on the Keynes theory, demand for money is a function of revenue. It is believed that there existed a stable and direct relationship between income and transactions money balances. This means that the higher the magnitude of revenues in an economy, the higher the international reserve accumulated. This relationship can be expressed as:

$$M_t = K(PY) \tag{1}$$

where M_t = Amount of reserves demand balances for transaction, precautionary or speculative motives; K = Fraction of revenue, which could be held by the public, P = Price level, Y = Income level. The size of (K) which is fraction of revenue will be a function of

variables conditions and behaviour of some important variables in the economy.

Method of data analysis

To investigate the determinants of international reserves in OPEC economies, we introduce a dynamic specification because international reserves show signs of high degree of autocorrelation. This study is modelled after Audu and Okumoko, (2013), Aizenman, Cheung, and Qian (2019) and Mahraddika (2019). The models are adapted because Audu and Okumoko, (2013) assessed the determinants of international reserves while Mahraddika (2019) evaluated international reserves accumulation using the dynamic panel data estimator.

In this study, System Generalised Method of Moment (SGMM) was adopted due to the following reasons; to overcome the endogeneity problem that is associated with long-term determinants of growth. A commonly used estimation method to estimate the parameters in a dynamic panel data model with unnoticed individual specific heterogeneity is to transform the model into initial differences (Arellano & Bond, 1991). When lagged levels of the variables are tools for the endogenous differences and the parameters estimated by GMM, sequential moment conditions are then used. The fact that the GMM estimator in the first difference (DIFF) model may have very low finite sample properties in terms of bias and accuracy when the sequence is persistent as reported by Blundell and Bond (1998), as the instruments are then unreliable predictors of endogenous changes.

In order to achieve the objectives of this study, we assumed that international reserves are influenced by other variables other than macroeconomic factors which are educational factors. Thus, simple reserve demand equation is specified in equation 1.

The Mt will be substituted for International reserves holding in OPEC economies as dependent variable while (PY) will be substituted for other macro-economic determinants of international reserves as independent variables.

We start the study of international reserves accumulation by applying a linear dynamic panel-data regression.

$$Y = F(X) \tag{2}$$

The explicit form of equation 2 is represented below:

$$Y_{it} = \alpha + Y_{it} - 1 + \alpha X_{it} + \mu_{it}$$

Where $Y_{i,t}$ is total international reserves held by country in time t and the lagged dependent variable, is $Y_{i,t} - 1$ included to account for the persistence or inertia of holding of reserves over time.

$$resrs_{it} = \alpha 0 + \alpha \, resrs_{it} - 1 + \alpha TMD_{it} + \mu_{it} \tag{3}$$

The traditional macroeconomic determinants include variables such as economic crises, exchange

rate, inflation rate, trade openness, foreign direct investment, crude oil prices, and natural resources dependence, also, given the mono-cultural nature of

$$resrs = \beta_0 + resrs(-1) + \beta_1 crdpr_{i,t} + \beta_2 exchr_{i,t} + \beta_3 infr_{i,t} + \beta_4 fdi\_in_{i,t} +$$

$$\beta_5 encrs_{i,t} + \beta_6 opns_{i,t} + \beta_7 nrsdpc_{i,t} + \beta_8 gdp_{i,t} + \mu_t \tag{4}$$

Where; *resrs* is foreign reserve, *crdpr* is crude oil prices, *nrsdpc* is natural resources dependence, *fdi* is foreign direct investment, *encrs* is economic crises, *exchr* is exchange rate, *infl* is inflation rate, *topens* is trade openness, *gdp* is Gross Domestic Products, β_0 is Constant term andμ is the error term.

$$resrs = \varphi_0 + resrs(-1) + \varphi_1 exchr_{i,t} + \varphi_2 infr_{i,t} + \varphi_3 opns_{i,t} +$$

$$\varphi_4 (crdpr * H')_{i,t} + \varphi_5 (encrs * H')_{i,t} + \varphi_6 (nrsdpc * H')_{i,t} + \varphi_7 (gdp * H')_{i,t} +$$

$$\varphi_8 (fdi\_in * H')_{i,t} + \varepsilon_t \tag{5}$$

Where H comprises the educational indicator, variables captured using education. H' is a column vector of education variables.

3. Data analyses and results: determinants of interactional reserves

The dynamic panel estimation result is shown in Table 1. It reveals a direct relationship between crude oil price and international reserves, as a unit increase in crude oil price yields about 4.2% increase in international reserves. On the other hand, exchange rate exerts a negative response on international reserves, as a unit increase of exchange rate, depletes resources by 0.24 units. This implies that changes in exchange rate negatively impacts reserves. In addition, the indicator of reserves in time of imports (economic crisis) varies directly with international resources. The expectation is in line of this result, as the larger the reserves, the higher the number of months of imports it can finance. Specifically, a unit increase in the export dynamism leads to about 53.0 units' accumulation in reserves.

Expectedly, the natural resource dependence exerts a considerable large impact on the international reserves of OPEC member states, basically because an average country in the OPEC has commodity export (oil) constituting about 89.2 percent of its entire merchandise exports. In furtherance, the results show that foreign direct investment, though significant but exert a less proportionate effect on international reserves. The diagnostics also show that the specifications do not suffer from second-order serial correlation and the instruments are not over-identified. The Sargan test is not significantly different from zero, meaning that the instruments used are not weak. Likewise, the AR at lag 2 shows no autocorrelation in the residuals, thereby confirming the appropriateness of the model.

most commodities dependent developing economies.

The objective of the study is addressed with equation 4 specified below:

β_1 – β_8 represent the coefficient of explanatory variables.

The model 5 specified below examines the interaction of educational factors with macroeconomic determinants of international reserves accumulation in OPEC economies.

3.1 Controlling for education factors

The interaction between tertiary education and crude oil price, foreign direct investment, natural resource dependence and exchange rate show insignificant impact while that of economic crisis and gross domestic product indicate significant impact on international reserve at 1%. In the same vein, the link between secondary education and crude oil price, exchange rate, economic crisis and gross domestic have positive and significant impact on international reserve at 1%, 5%, 1% and 1% respectively while the interaction between secondary education, foreign direct investment and natural resource dependence are statistically insignificant at 5%. The result in the Table 5 indicates that adult literacy level has negative relationship with FDI and the relationship in insignificant. The same insignificant impact is also noted in dependence on natural resources. The relationships become significant with 0,1 level of confidence with exchange rate, which is also negative. Nevertheless, the impact of adult literacy is significant at 0.01 level of confidence with economic crises and GDP. The impact in these cases is positive. In all, it becomes clear that the impact of this social indicator is negative for these determinants, but the long run determinants remain stable.

The results in Table 5 indicate that youth literacy on the FDI is insignificant but negative with very low coefficient, while it is significantly negative for the natural resource dependence at 5percent level of significance. The variable is also strong still with the negative and significant impact on the natural resource dependence and exchange rate. However, it is positive and significant for economic crises at 0.05 level of confidence. In addition, the youth literacy exerts a positive impact on the GDP that is also significant. The impact of education at tertiary level is insignificant for each of the independent variables

Table 1

Determinants of international reserves

Variables	OLS	Static Panel		Dynamic Panel
	Pooled	fixed effect	Random effect	Sys-gmm
resrs_1, log				0.416***
				(0.0715)
crdpr, log	0.247**	0.293***	0.411***	0.0421
	(0.104)	(0.0799)	(0.0816)	(0.121)
Exhr	0.000298*	-0.00363***	0.000163	-0.00244***
	(0.000159)	(0.000818)	(0.000251)	(0.000922)
Infr	-0.00862***	-0.00342***	-0.00411***	-0.00213**
	(0.00136)	(0.00100)	(0.00119)	(0.000839)
fdi_in, log	0.0128	-0.0528**	-0.0478	-0.123***
	(0.0335)	(0.0257)	(0.0302)	(0.0296)
encrs, log	1.013***	0.873***	0.988***	0.530***
	(0.0444)	(0.0695)	(0.0635)	(0.119)
opns, log	0.949***	0.551**	0.702***	1.622***
	(0.163)	(0.224)	(0.206)	(0.262)
nrsdpc, log	0.229	0.780	-0.547	1.654**

*Source: Output from data. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1*

Table 2

Determinants of International Reserves: Educational Factors Interaction – Education (Adult Literacy)

Interacting Variables	Results	Obs	Wald Test (p)	AR		Hansen J Test	Sargan Test
				1	2		
crdpr*ltcy_adt	0.342 (0.443)	66	0.000	0.002	0.311	0.871	0.912
fdi_in*ltcy_adt	-0.0123 (0.00868)	66	0.000	0.012	0.212	0.814	0.973
nrsdpc*ltcy_adt	-0.117 (0.164)	66	0.000	0.043	0.119	0.771	0.902
exhr*ltcy_adt	-0.0167* (0.00866)	66	0.000	0.005	0.810	0.721	0.897
encrs*ltcy_adt	0.216*** (0.0186)	66	0.000	0.018	0.064	0.825	0.954
gdp*ltcy_adt	0.0557** (0.0284)	66	0.000	0.024	0.082	0.911	0.927

*Source: Authors' Output from data. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1*

Table 3

Determinants of International Reserves: Educational Factors Interaction – Education (Youth Literacy)

Interacting Variables	Results	Obs	Wald Test (p)	AR		Hansen J Test	Sargan Test
				1	2		
crdpr*ltcy_adt	-1.256*** (0.463)	66	0.000	0.008	0.717	0.981	0.970
fdi_in*ltcy_adt	-0.0135 (0.00824)	66	0.000	0.032	0.112	0.874	0.974
nrsdpc*ltcy_adt	-0.283** (0.144)	66	0.000	0.044	0.529	0.8761	0.952
exhr*ltcy_adt	-0.0172** (0.00845)	66	0.000	0.025	0.850	0.881	0.899
encrs*ltcy_adt	0.208*** (0.0182)	66	0.000	0.044	0.564	0.985	0.9564
gdp*ltcy_adt	0.0289 (0.0390)	66	0.000	0.024	0.082	0.977	0.927

*Source: Output from data. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1*

of FDI and exchange rate but positive for economic crises and GDP. The level of significance recorded for the two variables is 0.01 indicating the level of impact of tertiary education on the two variables. The results above show the interactions of the variables with secondary school education among OPEC members on the determinants of international reserve among the countries. Four of the variables are significant while two are not. The positive significant variables are crude oil dependence and GDP. The two variables exert impact of at least 0.05 level of confidence. Exchange rate is moderately significant at 0.05 and this is positive.

4. Discussion of findings

The study revealed that all the variables considered are normally distributed and correlation test for multi-collinearity shows no forms of autocorrelation in the model. The basic system generalised methods of moments regression revealed that exchange rate, inflation rate, foreign direct investment, economic crises, and natural resources dependence significantly influence international reserves in OPEC economies.

The interaction section revealed the role of adult literacy, youth literacy, tertiary education, and secondary education in enhancing the determinants of international reserves. The interaction of crude oil price with educational factors proxied by adult literacy, the dependence of international reserves on crude oil price diminished moderately suggesting that education dependence mitigates the extreme dependence of reserves on crude oil price proceeds.

This scenario plays out such that as an economy with developed human capital can easily harness relevant knowledge, innovation and expertise required to initiate and develop dynamic products and services that are internationally competitive and command good price in the international market. The evidence is visible in some OPEC economies, prominent among these is the structural transformation witnessed in Abu Dhabi and a host of South-eastern Asian countries where commitment to education development has earned the economies a significant economic transformation in the past decades. In the same manner, controlling for education in the nexus

Table 4
Determinants of International Reserves: Educational Factors Interaction – Education (Tertiary)

Interacting Variables	Results	Obs	Wald Test (p)	AR		Hansen J Test	Sargan Test
				1	2		
crdpr*ltcy_adt	0.0194 (0.0349)	59	0.000	0.015	0.271	0.891	0.903
fdi_in*ltcy_adt	0.00683 (0.00862)	59	0.000	0.012	0.142	0.812	0.914
nrsdpc*ltcy_adt	-0.173 (0.118)	59	0.000	0.031	0.189	0.910	0.952
exhr*ltcy_adt	0.00642 (0.0102)	59	0.000	0.011	0.059	0.837	0.925
encrs*ltcy_adt	0.314*** (0.0206)	59	0.000	0.038	0.274	0.924	0.915
gdp*ltcy_adt	0.0180*** (0.00476)	59	0.000	0.041	0.091	0.982	0.927

*Source: Output from data. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1*

Table 5
Determinants of International Reserves: Educational Factors Interaction – Education (Secondary)

Interacting Variables	Results	Obs	Wald Test (p)	AR		Hansen J Test	Sargan Test
				1	2		
crdpr*ltcy_adt	0.325*** (0.111)	65	0.000	0.015	0.271	0.891	0.903
fdi_in*ltcy_adt	-0.00279 (0.00600)	65	0.000	0.012	0.142	0.812	0.914
nrsdpc*ltcy_adt	-0.130 (0.105)	65	0.000	0.031	0.189	0.910	0.952
exhr*ltcy_adt	0.0166** (0.00654)	65	0.000	0.011	0.059	0.837	0.925
encrs*ltcy_adt	0.228*** (0.0132)	65	0.000	0.038	0.274	0.924	0.915
gdp*ltcy_adt	0.0904*** (0.0198)	65	0.000	0.041	0.091	0.982	0.927

*Source: Output from data Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1*

between international reserves and foreign direct investment also mitigates the adverse effects of FDI on reserves in the OPEC member states. This implies that FDI can yield more impact on reserves if the education infrastructure is well designed and developed such that the spillovers (in terms of financing and expatriates' knowledge) can be easily adopted, assimilated, and reproduced domestically. For some resource rich countries, especially African economies, despite appreciable FDI inflow, the economy has remained worse-off. This is not unconnected to the reality that most FDIs to these institutionally weak economies are rent-seeking and extractive in nature and are for industrial support and consumption of investors' home countries.

Unless directed and monitored, FDIs can be unhelpful for development. Put differently, a larger proportion of the returns on investment are repatriated to the investors' home country under the guise of payments for imported production-machinery, equipment, consumables, expatriate payments and royalties. It is necessary to note that among the education categories controlled for, tertiary education yielded the largest impact on the relationship between FDI and international reserves. While other education categories mitigated the adverse effects of FDI on reserves, the relationship becomes positive after controlling for the role of tertiary education. Following the interaction of tertiary education, FDI inflows exert a positive and significant influence on international reserves. This implies that tertiary education tends to be more prominent in equipping the skills set required to stimulate a competitive drive of the economy and equip it with the capacity required to assimilate and further initiate knowledge spillover from FDI for domestic sufficiency and attain trans-border and export gains. The outcome is not surprising, as the technological prowess, scientific knowledge, and entrepreneurial skills to stimulate development, drive economic competitiveness and develop internationally competitive dynamic products can only be attained at the tertiary level.

It is necessary to note that Gross Domestic Product (GDP) becomes a significant determinant of reserves following interaction with education development. Recall from Table 1, prior to the interaction, GDP indicator was not significant – a situation that can be linked to the fact that an appreciable number of OPEC member states depend heavily on foreign exchange from crude oil proceeds (exported in its raw forms with no or little value addition) for financing consumption expenditure. As rightly emphasized in the preceding discussion, human capital development via education and training drives competitiveness and enhances the creation of value-addition – via human development, technology and innovation and dynamically enhances export baskets diversification thereby ensuring supply-side elasticity and value in the international market.

Proliferation of knowledge helps in the development of other latent sectors of the economy and mitigates the manifestation of the popular Dutch Diseases, hence, attracting foreign exchange inflows from multiple sources and alleviates the undue concentration on crude oil proceeds for budgetary, fiscal and macroeconomic management. This corroborates the evidence obtained following the interaction of education development with natural resource dependence. The results, readily available in Table 2-5 show that on controlling for education development, the erstwhile strong link between natural resource dependence and international reserves dwindled considerably. This further indicates that education development is capable of spurring growth in other sectors of the economy and equally promotes international competitiveness, hence, mitigating the dependence on natural resource exports and reducing the susceptibility of the national economy to market vagaries. The diagnostics also show that the specifications do not suffer from second-order serial correlation and the instruments are not over-identified.

5. Conclusion and recommendations

The study investigated the role of educational factors on the determinants of international reserves accumulations in OPEC economies. Specifically, the study disaggregated educational factors into various levels, such as adult literacy, youth literacy, tertiary education and secondary education. The results show that adult literacy, youth literacy, tertiary education, and secondary education positively influence international reserves and have significant impacts on its accumulation. In all economic crises remain highly significant across the various levels of education, while crude dependence (as a variable) was highly negatively significant in the regressions just as exchange rate management was moderately negatively significant in the regressions. This simply means that education is all through important for accumulation of international reserves in most of the OPEC member states while depending on the resource is negatively impactful for international reserves accumulation. The study concludes that education is a significant factor in the future development and accumulation of international reserve in these countries. Therefore, the study concluded that educational factors play a significant role on the determinants of international reserves accumulation in OPEC economies within the period under consideration.

Based on the interactions of the new variables, the study recommends among others that governments of the OPEC member states should place a high

premium on funding education and shift attention to the development of human capital which can easily harness relevant knowledge, innovation, and expertise required to initiate and develop dynamic products and services that are internationally competitive and command a price in the international market. The adult literacy level seems most unresponsive to interaction than any other of the levels. The secondary and youth education sector seems to produce more positive significant results than other levels. These should be given immediate attention in these countries for more impactful outcomes. Furthermore, government of each country should ensure that adequate funding is channelled to educational sector to improve the quality of education in secondary institutions in order to harness adequate knowledge and skills to enhance the efficiency of inflow of foreign investments.

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