

Assessing the Impact of Real Exchange Rate Misalignments on Economic Growth in Arab Countries

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Abstract:

In the past few decades, the issue of managing real exchange rate (RER) has attracted considerable attention from academics and policy makers in both developed and developing countries. What impact, if any, have exchange rate regimes had on real exchange rate misalignment and then consequently on economic growth? To investigate the impact of RER misalignment on economic growth in Arab countries¹, the analysis proceeds in two steps. The first measures the exchange rate misalignment using the single equation model, while the second assesses its impact on economic growth. This study uses annual panel data for Arab nations spanning from 1990 to 2022 and employs the Generalized Method of Moments (GMM) approach. Results imply that Arab countries experienced substantial exchange rate misalignments,

¹ UNESCO identifies 21 Arab states, while Wikipedia lists 23 Arab states. This study follows the Arab League definition -the regional organization of these states that was formed in 1945- It currently has 22 members. These 22 countries are located in the Middle East and North Africa: Algeria, Bahrain, the Comoros Islands, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Mauritania, Oman, Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, the United Arab Emirates, and Yemen.

peaking in 2008, 2004 and 2022. The impact of exchange rate misalignment on economic growth is found to be negative and significant. appropriate exchange rate policy to reduce real exchange rate misalignment is recommended.

Keywords: Real Exchange Rate; Arab Countries; Growth; Misalignments; Panel Cointegration, GMM.

1. Introduction:

Over the past decade, exchange rate misalignment and economic growth posed a number of questions to policy-makers and academics alike. The literature on real exchange rate equilibrium goes back to the 1960s (Balassa, 1964) and thereafter. The new century has shown an increase in the number of studies on real exchange rate misalignment and growth². Studies on exchange rate misalignment has not reached a consensus in terms of how misalignment is measured, since part of the literature is based on deviations from PPP, while other studies focus on the deviation of the real exchange rate from some equilibrium level (Edwards and Savastano, 1999; MacDonald, 2007).

The question of currencies misalignments often viewed as a key indicator of external competitiveness. The persistent

² The notion of real exchange rate equilibrium is normally associated with the combination of external (current account sustainability) and internal (intertemporal equilibrium in the goods market) balance.

misalignments may generate instability and are likely to affect the economic performance of countries. As Kaminsky et al. (1997) and Razin and Collins (1997) underlined that an overvaluation of the currencies is often the sign of the inconsistency of the decisions of macroeconomic policies that may lead to an unsustainable current account deficit, increasing external debt and the risk of possible speculative attacks. On the opposite, in case of real exchange rate undervaluation, competitiveness is reinforced, which stimulates investment and exports, the current account is then improved, so is the growth. Consequently, an important question concerns the measure of misalignments, that is the evaluation of equilibrium exchange rates.

Numerous studies have attempted to estimate the equilibrium exchange rate or the deviation from that rate in different countries. For instance, Buchs (2005) showed that the exchange rate in Brazil has been slightly overvalued; or Su et al. (2011) stated that Purchasing Power Parity (PPP) is valid only for some Latin American countries, whereas the majority of the exchange rates in these countries do not follow an equilibrium rule (Giannellis and Koukouritakis, 2013). Similarly, other researchers such as Arize (1995), Aflouk et al. (2010), Vieira and MacDonald (2012) and Sobko and Klonowska (2021) tried to quantify the absolute value of the misalignment in order to understand the nature or historic trend of countries' misalignment.

According to Moosa (2000), international trade is habitually affected by exchange rate variability. Sekkat and Varoudakis (2000) pointed out that mismanagement of economic policies in developing countries has led to exchange rate misalignment and volatility, which may have been damaging for international trade, while also decelerating economic performance.

Mozayani and Parvizi's (2016) results showed the presence of real exchange rate misalignments in all OPEC countries, but in different styles. By focusing on Iran, the historic trend of misalignment could be perfectly explained by its foreign exchange market fluctuations such as the implementation of two exchange rate unification policies which resulted from international sanctions.

Empirical results focusing on Sudan showed that macroeconomic policy variables such as trade openness, taxes and government spending, play a significant role in influencing the real exchange rate in both the short and long-run. The results also revealed that during the period under study, the Sudanese economy suffered from exchange rate misalignment, particularly overvaluation (Nabli et al., 2004).

The aim of this paper is to investigate the relationship between real exchange rate misalignments and economic growth in Arab countries. The choice of Arab countries can be justified

by their influential presence in the world, accounting for approximatively 464.68 million of the world population, with estimated GDP (current US\$) totaling to 3.543 trillion. Furthermore, this allows us to take the context of growing imbalances into consideration.

The rest of the paper is organized as follows. Section 2 highlights the main literature review on exchange rate misalignment and economic growth. Section 3 provides an overview on macroeconomic developments in Arab countries. Section 4 discusses monetary policy and exchange rate arrangements in Arab countries. Section 5 outlines the data and presents the empirical tests. Section 6 is devoted to the growth model by assessing the relationship between economic growth and a set of explanatory variables, paying a special attention to the impact of real exchange rate misalignments. Finally, Section 7 provides some concluding remarks.

2. Literature Review on Exchange Rate Misalignment and Growth Models:

There are many studies have been done to find a robust relationship between exchange rate misalignment and economic growth. One of the early studies on exchange rate misalignment and growth is authored by Razin and Collins (1997). They examined real exchange rate misalignment and economic growth

in both developing and developed countries. They argued that the policy of keeping the real exchange rate undervalued is generally associated with competitive devaluation policies to stimulate a country's export sector. On the other hand, Edwards (1988) investigated the relationship between real exchange rates and growth. One of the main findings was that inadequate (misaligned) real exchange rate is associated with relative price distortions in the tradable and non-tradable goods sectors. The outcome is a suboptimal allocation of resources among different sectors of the economy, resulting in allocative inefficiency which negatively impacts growth.

Gala and Lucinda (2006) examined real exchange rate misalignment on economic growth in 58 developing countries using panel data for the period 1960-1999. An index adjusted for the Balassa and Samuelson effect was used to estimate equilibrium real exchange rate. Real exchange rate misalignment was found to be significant and to have the expected negative sign on economic growth³.

Asian countries are found to be better than Latin American and African countries in managing their currencies from appreciations or fear of floating. Bereau et al. (2009) investigated

³ The coefficients of real exchange rate misalignment range from 0.0080 to 0.0122. An increase in 10 per cent of real exchange rate devaluation will lead to an increase of 0.0012 in real per capita income average growth.

the relationship between real exchange rate misalignment and economic growth using annual panel data for the period 1980-2007. The sample includes both developed and developing economies. Results of the panel smooth transition regression models showed that there exists a positive and significant relationship between economic growth and exchange rate misalignment when the currency is undervalued and a negative and significant relationship between economic growth and exchange rate misalignment when the currency is overvalued. Exchange rate policy, that is, undervaluation can promote economic growth.

Rodrik (2008) examined real exchange rate misalignment and economic growth in 184 countries using panel data for the period 1950-2004. A time-varying index adjusted for the Balassa and Samuelson effect was used to estimate equilibrium real exchange rate. The main finding was that overvaluation hurts economic growth whilst undervaluation facilitates economic growth. This relationship holds only for developing countries due to weak financial institutions and markets failures. The relationship disappears when the sample is restricted to developed countries. While the empirical findings of Berg and Miao (2010) support those from Rodrik (2008) in the sense that overvaluation impedes growth while undervaluation stimulates economic growth.

The study of Dubas (2009) explored the relationship between exchange rate regimes and real effective exchange rate misalignment for developing and developed countries. The real effective exchange rate misalignment was measured as the difference between the real effective exchange rate and the estimated real effective exchange rate, which is a function of terms of trade, productivity progress, openness, capital flows, government consumption, and excess money growth ⁴. Coudert and Couharde (2008) found the pegged exchange rate regime tends to overvalue its currency than the floating exchange rate regime. The results were robust with the different models and also different classifications of the de facto exchange rate regimes, namely by Levy-Yeyati and Sturzenegger (2003) and by Reinhart and Rogoff (2004). The sample covers a large number of developing and developed countries, that is, 128 countries from 1974 to 2004 ⁵.

On a country level, according to Wong (2013) examined real exchange rate misalignment and economic growth in Malaysia. Result of the ARDL approach showed an increase in

⁴ For developing countries, an intermediate exchange rate regime, that is, a regime falling somewhere between a pure float and a hard peg is most effective in preventing real effective exchange rate misalignment. The choice of an exchange rate regime as a mean to limit real effective exchange rate misalignment matters for developing countries but does not seem to matter for developed countries.

⁵ Two real exchange rate misalignments were used, namely one taking into account only the Balassa and Samuelson effect and the other is adding the impact of the net foreign asset.

the real interest rate differential, productivity differential, the real oil price or reserve differential lead to an appreciation of the real exchange rate in the long run. In contrast to the assumptions of trade partners, it was found that the Chinese economy has not benefited from the lower exchange rate, and no direct linkages exist between the real exchange rate and growth in the long run as investigated by Tang (2015) who applies a cointegrated VAR model. While the empirical results of Elhendawy (2012) indicated that there have been misalignments of the real exchange rate in Saudi Arabia. Based on the estimated model, it was seen that changes in government spending could act as the major force for the adjustment of the Saudi Riyal in the near future. The findings pointed to the fact that the Saudi Riyal has depreciated more compared to the early 1990s or late 1980s.

Unlike previous literature, Habib et al. (2017) examined the impact of movements in the real exchange rate on economic growth based on five-year average data for a panel of over 150 countries in the post Bretton Woods period. Results showed that a real appreciation (depreciation) significantly reduces (raises) annual real GDP growth, more than in previous estimates in the literature. However, results confirmed this effect for developing countries only and for pegs.

Furthermore, A 10% undervaluation would have increased the rate of growth of per capita GDP by almost an additional

1.25% per annum ⁶ as found by Papanikos (2015). On the contrary, Baak measured the extent to which the real effective exchange rate of the Korean won is misaligned from its equilibrium value by estimating the equilibrium value using the behavioral equilibrium exchange rate approach. The economic fundamentals such as the terms of trade, the relative price of non-tradables to tradable goods, net foreign assets and real interest rate differentials were employed to assess the equilibrium exchange rate (Baak, 2012). While empirical ingestion of the dynamic relationships between exchange rate and economic growth in Botswana were conducted through the use of unrestricted vector autoregressive (VAR) modelling consisting of impulse response functions, variance decomposition and VAR Granger causality. Observations revealed how vulnerable the economy of Botswana is to external shocks. Results suggested that exchange rate granger caused economic growth (Koitsiwe and Adachi, 2015). On the other hand, Lee and Yue (2017) investigate the impact of the USD exchange rate on economic growth and the environment in the United States by using a Structural Vector Autoregression (SVAR) model, the result shows that the USD exchange rate is positively related to petroleum consumption.

⁶ This would have made the economic recession less severe. During the crisis years, it seems that the European Central Bank's monetary and exchange rate policy favored particular countries in the Eurozone, and Germany emerges as the big winner.

Whilst on a regional level, generating sustained growth in Sub-Saharan Africa (SSA), Elbadawi et al. (2012) investigated the nexus between foreign aid, exchange rate misalignment and economic growth in SSA. Results highlighted that aid fostered growth but its impact is weaker in countries with overvalued exchange rates. Furthermore, it was found that overvaluation reduces growth but its negative effect is ameliorated by financial development. In order to shed light on the debate concerning the issue of the growth effects of currency misalignments in Sub-Saharan African countries, Owoundi (2016) assessed misalignments and included it in a growth equation while taking into account uncertainty and joint-ness between growth determinants using recent Bayesian inference techniques. More specifically, exchange rate regimes, as well as cross-sectional error dependence. It was demonstrated that the gain related to undervaluation is almost zero regardless of the exchange rate regime.

However, unlike the extant literature, Bahol et al. (2016), investigated the role of the exchange rate regime to explore the empirical link between financial crises and economic activity. Symmetries were also explored. While exchange rate regimes of all types can promote positive economic growth, disaggregation by region or country type yields significantly different results. Pegged regimes work best for emerging market economies, while crawling regimes deliver the greatest boost to economic growth in the G20. An important finding was that exchange rate regimes and financial

crises interact. In almost all cases and types of financial crises, pegged regimes exert a negative impact on economic growth even after controlling for several economic factors.

Sallenave et al. (2010) evaluated the growth effects of real effective exchange rate misalignments for the G20 countries over the period 1980-2006. First, real effective equilibrium exchange rates were estimated relying on the behavioral approach, from which misalignments are derived. They found that the magnitude of the misalignments is more pronounced in the case of emerging countries. They also find that the speed of convergence towards the estimated equilibrium exchange rate is slower for industrialized countries. In all cases, misalignments have a negative effect on the economic growth. Consequently, exchange rate policy should aim to close the gap between real exchange rates and their equilibrium level.

On the other hand, several studies explored the impact of real effective exchange rate misalignments, based on determinants including different types of foreign capital inflows, on GDP growth in the EU. For such analysis, a panel of 27 EU countries was used for the period 1994–2012. The misalignments were associated with lower long-run growth and the exchange rate volatilities were not robust in affecting GDP growth, while spillovers and global factors seem to matter in all the specifications both in the short and long run (Comunale, 2017).

Furthermore, an extended model developed by Missio et al. (2017), was built to relate growth, the real exchange rate and sectoral heterogeneity. It was shown that an undervalued real exchange rate has positive effects on economic growth in developing countries. However, results achieved from the complex dynamic model by Gabriel et al. (2016), explicitly incorporating the effects of North–South technology gap and the real exchange rate on economic growth reported that, in the long run the effect of real exchange rate on economic growth was conditional on the size of the technological gap and the level of industry participation in South GDP.

Moreover, recent studies that have assessed the short-run and the long-run effects of exchange rate misalignments on economic growth showed different views. Nourira and Sekkat (2015), Bahmani-Oskooee and Halicioglu (2017), Salisu (2021) showed that the intermediate regime induces higher and more volatile misalignment than both fixed and float, the fixed regime exhibits a pattern of misalignment similar to the float regime, inflation pressures and dependence on oil exports are associated with more misalignment, however, financial development seems to have no impact on misalignment. Rodriguez (2017), Lawal et al. (2022) results revealed that a high degree of financial openness can mitigate the negative effect of exchange rate flexibility on growth. Bordo et al. (2017), Jovic et al. (2019), Hien et al. (2020) argue that

changes in trade costs over time may affect the impact of productivity on the real exchange rate over time.

3. Overview about Macroeconomic Developments in Arab Countries:

Macroeconomic development in Arab countries has been an important focus for governments and international organizations in recent years. These countries, located in an area which possess significant natural resources such as oil and gas, but have also faced various challenges in achieving sustainable and inclusive economic growth. Historically, many Arab countries relied heavily on oil exports as the main driver of their economies. This dependence on oil revenue made these countries vulnerable to fluctuations in global oil prices (Joint Arab Economic Report, 2022). Data trends of Arab countries are presented in Figure 1(a-f).

According to the Arab Economic Outlook (2022), the GDP at current prices in the Arab countries collectively grew by about 6.03% in 2022, reaching about 3543 billion US dollars. It increased for major oil-exporting Arab countries by 4.5%. For Arab countries with more diversified economies, GDP raised by 2.5%. the average per capita share GDP witnesses an increase of about 12%. However, as stated by IMF (2023c), inflation rates increased in 2022 in most Arab countries, driven by several

factors, the most important of which is the rise in fuel prices and energy costs, as well as the rise in food prices in international markets because of the continuous fluctuations in global supply chains, and the rise in demand for goods because of the economic recovery in several regions in the world. Except for Sudan, Lebanon, Syria, and Yemen, which witnessed high inflation rates considering the unfavorable internal developments, the average inflation rate in the rest of the Arab countries was about 3.5% in 2022, compared to 2.7% in 2021.

One of the key strategies pursued by Arab countries is diversification. Governments have implemented policies and initiatives to attract foreign direct investment, promote entrepreneurship and support the growth of non-oil sectors. For example, the UAE has made significant investments in infrastructure, tourism, and finance. Real GDP growth rate reached around 2.8% and forecasted to grow 4.2% in 2024, average inflation contained at around 3% in 2023, down from 4.8% in 2022 (IMF, 2023a). Similarly, Saudi Arabia has launched its (Vision 2030, 2016) plan which aims to diversify the economy and reduce dependence on oil through initiatives such as developing tourism, entertainment and renewable energy sectors. According to IMF report (2023b), GDP growth averaged around 4.5% (non-oil private and government activities). Qatar posted one of the strongest GDP growth rates of 6.8% owing to tourism, hospitality and construction sectors. While growth is

slowing but remaining above 3% in Bahrain and Kuwait and stabilizing above 2%t in Oman.

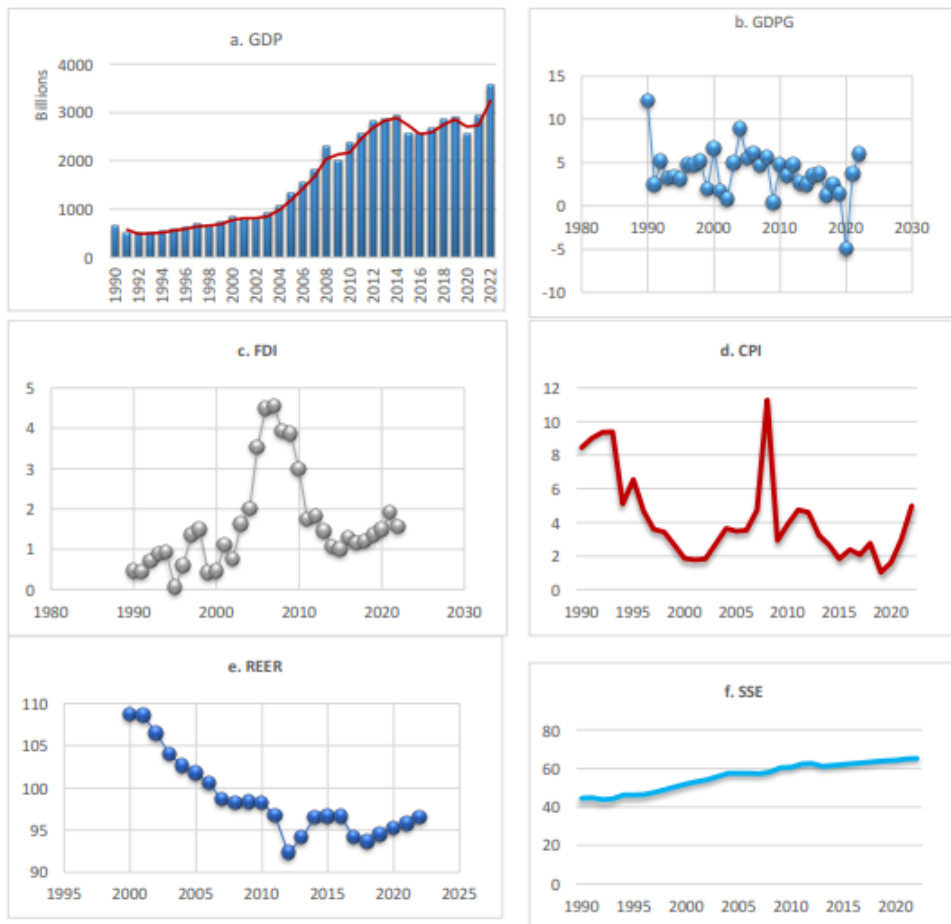
To shed the light on foreign investment, five Arab nations alone attracted 88% totaling approximately \$176.1 billion of the Arab region's overall investment volume in 2022, while the rest accounted for a mere 12% share, according to data from the Arab Corporation for the Guarantee of Investment and Export Credit. A closer examination reveals that this investment surge was primarily driven by five leading Arab nations: Egypt, Qatar, Morocco, Saudi Arabia and the UAE in 2022, the Arab region experienced a significant surge in foreign direct investment projects, witnessing a 74% annual increase, totaling 1,617 projects by year-end. The cumulative worth of these projects reached \$200 billion, marking a remarkable 358% surge from the preceding year. In 2023, the Arab region's appeal to foreign investments continued, with a 28% rise in project numbers during the initial third of the year compared to the corresponding period in the prior year. Moreover, the collective value of these projects rose by 70%.

Another important aspect of economic development in Arab countries is human capital development. Governments have recognized the need to invest in education, skills training, and research and development to build a knowledge-based economy. Efforts have been made to improve the quality of education,

promote technical and vocational training and foster innovation and entrepreneurship. However, as reported by UNHCR (2022) With 19.9 million children currently under the mandate of UNHCR, 7.4 million are of school age, with 4 million unable to access education. Inability of children to obtain identification documents often leads to hindered access to education and access to other crucial services.

Despite these positive developments, challenges remain in achieving sustainable economic development in Arab countries. High population growth, youth unemployment, income inequality and political instability are among the persistent challenges. To address these issues, governments need to focus on inclusive growth, job creation, social development and good governance.

Figure 1: Macroeconomic Developments in Arab Countries (1990-2022)



***Note:** GDP at Current Prices (GDP), Real GDP Growth Rate (GDPG), Foreign Direct investment net inflows as % of GDP (FDI), Consumer Price Index (CPI), Real Effective Exchange Rate (REER), Secondary School Enrollment (SSE)

Source: Author's preparation using World Development Indicators Dataset

4. Monetary Policy and Exchange Rate Arrangements in Arab Countries:

The exchange rate arrangements in most of Arab countries are categorized into two main groups. The first group includes countries that follow pegged exchange rate regimes (where the local currency is either pegged to a single currency, or to currency composites—standardized as in the case of the SDR or other weighted composites formed from the currencies of major trading or financial partners). The second group involves countries adopting more flexible forms of exchange rate regimes (other managed or independent floating).

According to this classification as highlighted in Table 1, most Arab countries belong to the first group as they follow a pegged regime. The majority of countries (ex. Jordan Djibouti, UAE, Iraq and Oman, Qatar) peg to the U.S. dollar. However, because of the maintenance of a relatively stable relationship with the U.S. dollar, these margins are not always observed. On the other hand, under the pegged category, Kuwait pegs to a currency composite, while Morocco pegs within horizontal bands. The currency is fixed daily based on variations in the value of the currencies of the country's principal trading partners where the weights reflect the relative importance of these currencies in the country's trade and financial relations. For instance, greater weights are attached to the U.S. dollar (in the case of Kuwait) and to the euro. Regarding the second group of Arab countries adopting a floating exchange rate regime, the number of countries following a managed float has increased.

Algeria and Egypt more recently switched their exchange rate systems to more floating arrangements.

Table 1: Exchange Rate Arrangements of the 19 Arab countries under study (2022)

COUNTRY	EXCHANGE RATE ARRANGEMENTS
Algeria	Stabilized arrangement
Bahrain	Conventional peg (U.S. dollar)
Comoros	Conventional peg (Euro)
Djibouti	Currency board (U.S. dollar)
Egypt, Arab Rep.	Other managed arrangement
Iraq	Conventional peg (U.S. dollar)
Jordan	Conventional peg (U.S. dollar)
Kuwait	Conventional peg (Composite)
Lebanon	Stabilized arrangement (U.S. dollar)
Libya	Conventional peg (Composite)
Morocco	Pegged exchange rate within horizontal bands
Mauritania	Crawl-like arrangement (anchor to the U.S. dollar) ⁽¹⁾⁽²⁾⁽³⁾ _{SEP}
Oman	Conventional peg (U.S. dollar)
Qatar	Conventional peg (U.S. dollar)
Saudi Arabia	Conventional peg (U.S. dollar)
Sudan	Stabilized arrangement (anchor to the U.S. dollar) ⁽¹⁾⁽²⁾⁽³⁾ _{SEP}
Tunisia	Crawl-like arrangement (anchor to a composite) ⁽¹⁾⁽²⁾⁽³⁾ _{SEP}
United Arab Emirates	Conventional peg (U.S. dollar)
Yemen, Rep.	Stabilized arrangement (Monetary aggregate target)

Source: Author's preparation using IMF Annual Report on Exchange Arrangements and Exchange Restrictions, 2022 (based on De facto arrangement).

5. Data and Model Description:

To investigate the impact of real exchange rate misalignment on economic growth in Arab countries, the analysis proceeds in two steps. The first measures the exchange rate misalignment. Two common methods have been widely used to measure exchange rate misalignment: purchasing power parity (PPP) estimates and the single equation model. The second step assesses its impact on economic growth using panel data spanning from 1990 to 2022. In what follows, the definitions and sources of data used in the empirical evaluation are described.

5.1 Real Exchange Rate Misalignments Estimation

To estimate the RER misalignments, the study follows the single equation approach by employing the modified version of Baffes et al. (1997) and Elbadawi et al. (2012). Since RER misalignment is a deviation of the actual RER from its equilibrium level, equilibrium RER is computed by empirically estimating the RER equation. This can be illustrated by the following single equation model:

$$RER_{it} = \alpha + \beta_1 TOT_{it} + \beta_2 GOV_{it} + \beta_3 NFA_{it} + \beta_4 GCF_{it} + \mu_i + \nu_{it}$$

Description of the variables and data sources are shown in Table 2. Before embarking on the use of the time-series method, it is appropriate to test for a unit root process. A tacit assumption

in time series regression is that the relevant variable series are stationary. This means that the mean variances and auto-covariance do not change over time. Consequently, the study follows the standard procedure of unit root testing by employing the Augmented Dickey Fuller (ADF).

Table 2: Descriptions and Sources of Data

Symbols	Descriptions	Sources
RER (Dependent Variable)	Real Effective Exchange Rate: Ratio of the domestic CPI to United States CPI (as world proxy) multiplied by nominal exchange rate	World Bank Database
TOT	Terms of Trade: Unit value of exports divided by unit value of imports indices	UNCTAD
GOV	Government Size: Government expenditure as a percent of GDP	World Bank Database
NFA	Net Foreign Assets: Sum of foreign assets held by monetary authorities and deposit money banks, less their foreign liabilities to GDP	World Bank Database
GCF	Gross Capital Formation: Gross capital formation as a percentage of GDP	World Bank Database
I	Country Index	
T	Time Index	
α and β	Parameters to be estimated	
μ_i	Country-Specific Effect Term	
v_{it}	Idiosyncratic Error Term	

The above model employs the cointegration and Error Correction Model (ECM). The former is used to examine the long-run equilibrium relationship between the variables, while the latter approach captures the short-run dynamic.^{[1][2]} After determining the short-run and long-run determinants of RER, it is imperative to delineate the variables influencing RER in order to estimate misalignments. The extent of such misalignments can be estimated by calculating the spread between the actual and the equilibrium RER. Arberola (2003) noted that an estimate of the equilibrium rate is obtainable from a cointegration relationship between the RER and its determinants only if the equilibrium level of the determinants could be observed. This implies that calculating the long run equilibrium RER involves the prior determination of the long- run values influencing it. This could be done in several ways. Therefore, this study follows Hodrick and Prescott (HP) approach (1997) to work out the long-run values of the RER determinants.

These long run values are then plugged into the estimated model to calculate the equilibrium RER. Normalizing equilibrium RER would set misalignment equal to zero in the long-run. To obtain the size of RER misalignment at any point in time, the spread is calculated between actual RER and its long-run equilibrium value which amounts to computing the following equation:

$$ERM = \frac{ERER - RER}{ERER}$$

Where ERM is exchange rate misalignment, $ERER$ denotes the long-run equilibrium value of RER derived from equation. The currency is perceived to be over (under) valued if the ERM is positive (negative).

5.2 Real Exchange Rate Misalignment and Growth: System GMM Estimation

After measuring the RER misalignment indicator, its impact on economic growth in Arab countries is investigated. Thus, the constructed ERM series is added to the growth model along with control variables such as growth. This study employs the Generalized Method Moments (GMM) model, this model can be illustrated by the following equation:

$$GDP_{it} = \alpha GDP_{it-1} + \beta_1 ERM_{it} + \beta_2 CVS_{it} + \mu_i + v_{it}$$

Where GDP_{it} (Gross Domestic Product per capita at PPP) is used as an indicator of the economic growth of the countries under study. GDP_{it-1} lagged value of the dependent variable GDP per capita is used as one of the regressors. CVS_{it} is the control vector composed of variables that affect economic growth. The vector consists of FDI_{it} , net inflow of foreign direct investment, CPI_{it} , inflation measured by consumer price index,

SSE_{it} secondary school enrolment as a proxy for human capital and MC_{it} , market capitalization of listed domestic companies as a proxy for financial sector development. This addresses concerns of endogeneity accruing from these variables.

In this model, both GDP_{it} and GDP_{it-1} are functions of μ_i the unobserved country-specific effect that contains time-invariant heterogeneity such as geographic variables. Hence, GDP_{it-1} is correlated with the error term which violates the assumptions of the classical regression model, thereby biasing the estimates, as a result, both variables are endogenous. Baltagi (1995) stated that in the existence of endogenous and dynamic regressors fixed effects estimators and Generalized Least Square (GLS) estimators do not result in consistent estimates, resulting in misleading estimates. Arellano and Bond (1991) suggested a GMM estimator as an instrumental variable where the lags of endogenous regressors and the current values of exogenous variables are used as instruments. This process starts with making difference of variables which explains the name Difference Generalized Method of Moments (Difference GMM).

6. Results and Discussion:

To estimate real misalignments and growth equations, annual data from 1990 - 2022 period was employed for the the Arab countries. However, Somalia, Syria and Palestine were

excluded due to data unavailability. Using such panel is a critical point to properly assess the impact of exchange rate misalignments on growth.

Before examining the exchange rate misalignment, the time series properties of the RER and its fundamentals were checked, employing unit root and cointegration tests. To investigate whether the variables are stationary and to determine the order of integration of the variables, the Augmented Dickey–Fuller (ADF)- Fisher test is employed. Variables are tested in both level and 1st difference forms, with intercept and with intercept and time trend.

The ADF-Fisher test results in Table 3 strongly reject the null hypothesis of a unit root which means the variables are stationary for 1st difference since the absolute value of the t-statistics is higher than critical values at 5% level and $P < 5\%$. This alleviates concerns of running a spurious regression. It is clear that the variables must be integrated of order one ($I(1)$) because the unit root test indicates that the first difference results are statistically significant at the 5% level.

Table 3: Results of Unit Root Test

Variable	Level		First Difference	
	<i>Intercept</i>	<i>Intercept and Trend</i>	<i>Intercept</i>	<i>Intercept and Trend</i>
RER	32.2489	34.0628	113.671*	103.290*
TOT	34.8195	24.6110	177.502*	148.450*
GOV	46.1741	44.1686	171.141*	154.931*
NFA	53.5704	35.2678	100.505*	84.7359*
GCF	63.0601*	67.7972*	190.511*	145.209*

***Result is significant at 5% level.**
Source: Authors’ estimation (statistical work is performed using E-views software version 12).

6.1 Exchange Rate Misalignment:

Having identified the order of integration of the variables, the next step is to test whether a long-run relationship exists between the variables, by using the cointegration test. In addition, the cointegration analysis allows for the identification of the long-run determinants of the RER. Hence, this study employs Johansen-Fisher panel cointegration test. The results of trace and maximum eigenvalue statistics are presented in Table 4. The results of Johansen- Fisher panel cointegration test indicate that under the trace statistics, there are cointegration relations between the RER and its determinants. Therefore, it is concluded that there is a long-run relationship between the RER and its major fundamentals.

Table 4: Results of Johansen Fisher Panel Cointegration Test

Johansen Fisher Panel Cointegration Test

Series: RER TOT GOV NFA GCF

Sample: 1990 2022

Trend assumption: Linear deterministic trend

Lags interval (in first differences): 1 1

Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Prob.	Fisher Stat.* (from max-Eigen test)	Prob.
None	184.2	0.0000	184.2	0.0000
At most 1	336.2	0.0000	241.3	0.0000
At most 2	152.2	0.0000	106.1	0.0000
At most 3	78.26	0.0000	56.91	0.0000
At most 4	61.58	0.0000	61.58	0.0000

*Probabilities are computed using asymptotic Chi-square distribution

Source: Authors' estimation (statistical work is performed using E-views software version 12).

After establishing the long-run relationship between the variables, the cointegration equation can be used to identify the long-run coefficients of the RER, deriving the equilibrium RER. Therefore, RER equation is normalized and RER is extracted as a dependent variable using the following equation:

$$D(RER) = 0.031152080055 * (RER(-1) + 26.8724076068 * TOT(-1) + 226.705449823 * GCF(-1) - 963.291629202 * GOV(-1) - 5.0913850391e-09 * NFA(-1) + 13294.9981014) - 0.120581718206 * D(RER(-1)) + 0.121310829702 * D(RER(-2)) + 6.18655226619 * D(TOT(-1)) - 2.38848856036 * D(TOT(-2)) - 211.219797033 * D(GCF(-1)) + 155.781812284 * D(GCF(-2)) + 372.098789858 * D(GOV(-1)) + 1151.34589593 * D(GOV(-2)) + 2.5691328697e-10 * D(NFA(-1)) + 6.44992490169e-10 * D(NFA(-2)) + 207.333000856$$

Results of the long-run cointegration vector coefficients of RER are presented in table 5. Having identified the long-run determinants of the RER, the next step is to use the Error Correction Model (ECM) to identify the short-run determinants of the RER. The ECM allows for an examination of how fast the RER adjusts to changes in its underlying equilibrium. Results of the ECM analysis, impulse response function and vector decomposition are presented in table 6, figure 2 and table 7 respectively.

The analysis shows that most of the variables hold the expected signs, and the findings go with existing literature on the RER. All the variables are statistically significant except the gross capital formation. Government expenditure negatively influences the RER in the short run. The coefficient of lagged dependent variable is positive, indicating that the short-run dynamics of the RER is positively influenced by the previous situation of the RER.

Table 5: Results of long-run (normalized cointegration coefficients)

Dependent Variable: D(RER)				
Method: Panel Least Squares				
Sample (adjusted): 1993 2022				
Periods included: 30				
Cross-sections included: 19				
	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.031152	0.007864	3.961582	0.0001
C(2)	-0.120582	0.06129	-1.967391	0.0501
C(3)	0.121311	0.065679	1.847027	0.0658
C(4)	6.186552	11.82159	0.523327	0.6012
C(5)	-2.388489	13.22383	-0.18062	0.8568
C(6)	-211.2198	69.36224	-3.04517	0.0025
C(7)	155.7818	72.00098	2.163607	0.0313
C(8)	372.0988	215.9384	1.723171	0.086
C(9)	1151.346	200.5513	5.740904	0.000
C(10)	2.57E-10	1.18E-10	2.177403	0.0303
C(11)	6.45E-10	1.64E-10	3.941776	0.0001
C(12)	207.333	351.6095	0.589668	0.5559

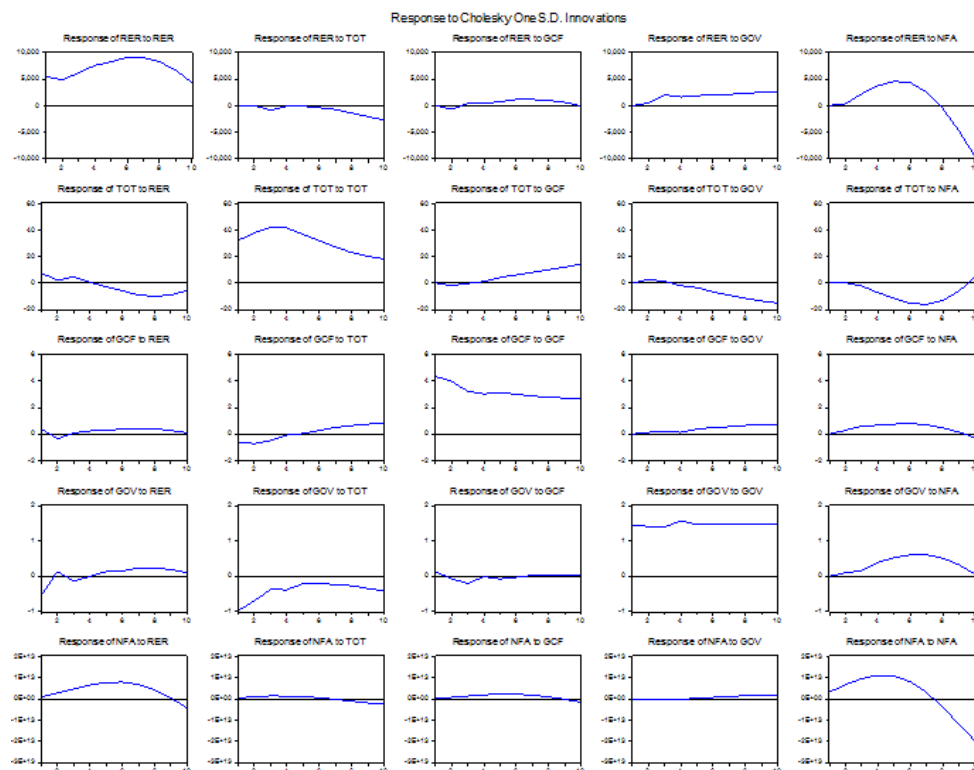
Source: Authors' estimation (statistical work is performed using E-views software version 12).

Table 6: Results of Vector Error Correction Estimates

Dependent Variable: RER	
Vector Error Correction Estimates	
Sample (adjusted): 1993 2016	
Variable	Coefficient Standard errors in () t-statistics in []
TOT	0.582652 0.28432 [2.04926]
GOV	0.001268 - 0.00037 [-3.38713]
NFA	41567357 4815488 [8.63201]
GCF	6.24E-14 9.50E-14 [0.65421]
Adjusted R ²	0.64

Source: Authors’ estimation (statistical work is performed using E-views software version 12).

Figure 2: Results of Impulse Response Function



Source: Authors' estimation (statistical work is performed using E-views software version 12).

Variance decomposition (VD) of reveals the relative significance of certain shocks on the set of the endogenous variables presented in the model. In this regard, it could be used to provide specific quantitative information about the degree of responsiveness of every endogenous variable to a certain shock that hits the whole system of equations. In this respect, see table 7 below.

Table 7: Variance Decomposition of RER

Variance Decomposition of RER:						
Period	S.E.	RER	TOT	GOV	NFA	GCF
1	5466.909	100.0000	0.000000	0.000000	0.000000	0.000000
2	7394.100	92.13951	0.015647	2.325032	4.086660	1.433156
3	10092.72	85.92306	2.600810	4.151607	6.540043	0.784481
4	13221.27	80.05424	4.350368	5.041353	9.993147	0.560892
5	16320.22	75.29116	6.254019	4.276226	13.77681	0.401789
6	19235.58	60.57760	7.189276	9.538391	19.40412	3.290614
7	21487.64	71.99843	5.152153	6.980625	13.63497	2.233820
8	23174.69	72.84570	5.153256	6.772530	13.02693	2.201577
9	24843.85	66.02334	6.219753	8.482858	17.09140	2.182654
10	27361.71	55.45132	6.340645	10.604877	25.42076	2.182404

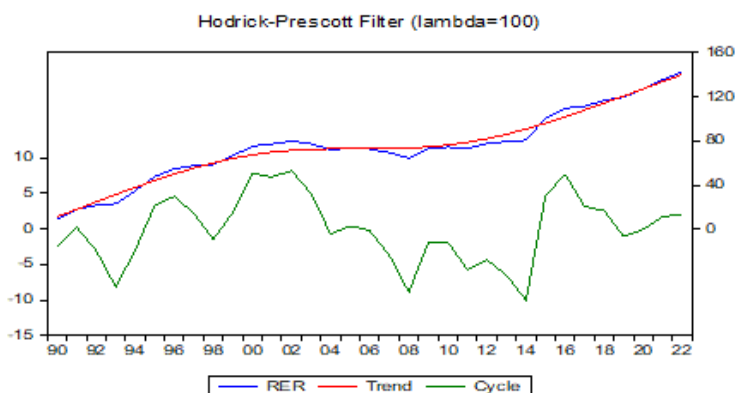
Source: Authors' estimation (statistical work is performed using E-views software version 12).

Results show that RER is the most factor affecting itself in first period. By setting aside the effect of RER on itself, it is found that if RER changes by 100%, about 6% of the change in period 3 can be accounted from NFA. However, this ratio increases over time with the highest shift in the rate of change in late periods. In period 5, the relative contribution of either GCF or GOV is relatively small compared to the effect of NFA. Despite the continuous increase in the contribution of each of TOT and GOV on RER over time, the dominating effect in the long run is NFA as in year 10, around 25% of the change is due to NFA relative to around 10% contribution for GOV. On the

other hand, the relative importance of TOT is comparatively moderate in the intermediate to long term.

After identifying the RER determinants, the computation of the RER misalignment using previous identified equation is conducted. Regarding the RER equation, from which measures of misalignments are derived, the dependent variable is the real effective exchange rate, it is expressed such that when it rises (falls), it corresponds to an appreciation (depreciation) of the considered currency in effective terms. The actual RER series are generated through multiplication of the long-run parameters by sustainable values of the fundamentals obtained by the Hodrick-Prescott filter (detrended value) as in Goldfajn and Valdes (1999). The filtered series represents the predicted equilibrium real exchange rate and captures the permanent changes in the series as presented in Figure 3.

Figure 3: HP Filter Result



Source: Authors' preparation (performed using E-views software version 12).

It is observed that the RER varies from one period to another, confirming high standard deviation of the RER. In the first sample years, the RER misalignment accounted for a low level of volatility. The economic crisis of 2008 had accounted for high deviation of RER. However, 2014 reported the highest rate of misalignments, this can be explained by the political turmoil in the region. Lately, during the last sample years the RER misalignment indicator recorded relatively high levels, this is attributed to COVID-19 crisis combined with Russia-Ukraine tension. Therefore, it is concluded that during the entire period of the study (1990–2022) Arab countries experienced substantial exchange rate misalignments.

6.2 Exchange Rate Misalignment and Economic Growth:

Turning to the growth equation, the dependent variable is the GDP per capita and the independents variables are the initial value of the GDP per capita, ERM, FDI, SSE, MC and CPI. To examine the impact of RER misalignment on economic growth as explained previously, preliminary tests should be conducted:

6.2.1 Preliminary Tests

Two preliminary tests to detect both heteroscedasticity between disturbance term and the autocorrelation have to be conducted.

a. Heteroscedasticity Test:

First, by applying the Likelihood-Ratio (LR) test that was presented in 2003 by Wiggins and Poi for heteroscedasticity detection. It is found that the degree of freedom is (70) and the p-value is (0.000). According to the LR test, the probability is less than 5%, meaning the null hypothesis is rejected, indicating that the data is subject to the hypothesis test is heteroscedastic.

b. Autocorrelation Test:

Since lagged values of GDP are used as one of the regressors in this model, the DW (Durbin Watson) statistic to check serial correlation will not be valid. Wooldridge (2002) presented a diagnostic test for autocorrelation in panel data in which the disturbance term follows first order autoregressive (AR (1)) process. Results denote that the null hypothesis of non-existence of first order autocorrelation between the disturbance terms of the regression model is rejected. As the degrees of freedom and p-values are (1, 73) and (0.000) respectively, it can be concluded that the error term suffers from first order autocorrelation.

6.2.2 Estimation of GMM

To investigate the effect of exchange rate misalignments on economic performance of the Arab countries, Difference GMM

(AB-1step) is used, employing lagged values of the variables as instrument variables. Results are shown in Table 8 below.

Table 8: Results of the Difference 1-step GMM

Dependent Variable: GDP				
Method: Generalized Method of Moments				
Sample (adjusted): 1991 2022				
Periods included: 32				
Cross-sections included: 19				
2SLS instrument weighted matrix				
Instrument list C GDP(-1) ERM FDI SSE GCF MC CPI				
Variable	Coefficient	Std. Error	t-Statistic	p-value
C	6.949178	0.132807	52.32529	0.0000
GDP(-1)	2.83E-05	1.03E-06	27.49432	0.0000
ERM	-3.32E-06	6.67E-07	-4.978863	0.0000
FDI	0.008837	0.006278	1.407622	0.1602
SSE	0.022619	0.001254	18.03235	0.0000
MC	0.001871	0.000727	2.574814	0.0105
CPI	-1.74E-05	0.000765	-0.022721	0.9819
Sargan Test		0.460		
First order serial correlation (p-value)		0.000		
Second order serial correlation (p-value)		0.211		

Source: Authors' preparation (performed using E-views software version 12).

According to GMM estimation, results show that GDP per capita is positively affected by its lagged values. The coefficient of lagged GDP is also significant. The impact of exchange rate misalignment on economic growth is found to be negative (ERM coefficient = -3.32) and significant (p-value = 0.000) as well, implying that misalignment of the RER has a detrimental impact

on growth rates in Arab countries. Various empirical studies on RER misalignment and economic performance reached the same conclusion (Nabli and Venganzones, 2002; Elbadawi et al., 2012; Elhendawy, 2012; Aslam, 2016; Verheuvél, 2016; Umanu et al., 2018; An et al., 2020; Hien et al., 2020; Lawal, et al. 2022; Usman, 2023; Jayathilaka, 2023) and others.

It can also be concluded that the coefficient of education explained by SSE is positive and significant. This finding is explained by the fact that an improvement in education levels and recent female empowerment push growth in the region. Unexpectedly, to find that FDI is insignificant implies that investment does not play a considerable role in encouraging growth in Arab countries. Results suggest that the coefficient of MC holds a positive and significant sign (0.0018) indicating that financial development influences economic growth and hence the overall economic conditions in the same direction in Arab region. Expectedly, inflation (measured by CPI) reported a negative and insignificant impact on growth performance.

Concluding Remarks:

This study provides empirical evidence on the misalignment of the real exchange rate from its equilibrium path in Arab countries using data spanning from 1990 to 2022. Johansen Fisher Panel technique is used to estimate the long-run

relationship between the real exchange rate and a selected number of macro variables. A cointegration relationship is found among the variables and the estimation results are consistent with the theoretical predictions. Sustainable values of the economic fundamentals were multiplied and the estimated coefficients from the cointegrated equation were used to compute the equilibrium real exchange rate. The estimated equilibrium exchange rate is adopted to calculate the misalignment of the real exchange rate. The misalignment results indicate that Arab countries experienced episodes of misalignment over a long period, peaking at 2008, 2014 and 2022. The persistence of misalignment may worsen the position of the economy. In this regard, this study attempts to model the relationship between real exchange rate misalignment and economic growth. This relationship is found to be negative and significant. More generally, the results amplify the view that exchange rate policies continue to play an important role in economic growth and an appropriate exchange rate policy to reduce real exchange rate misalignment is recommended.

To achieve this, policymakers should consider implementing a combination of monetary and fiscal measures. Additionally, it is important for policymakers to prioritize structural reforms that enhance competitiveness and productivity in the economy. This includes investing in infrastructure development, promoting innovation and technological

advancement, and improving the business environment. These reforms can help improve the overall economic fundamentals and reduce the likelihood of exchange rate misalignment. Furthermore, regional cooperation among Arab countries can also play a significant role in addressing exchange rate misalignment. Collaboration in areas such as trade facilitation, monetary integration, and harmonization of economic policies can contribute to greater exchange rate stability and coordination. It is suggested that further work is needed to investigate the asymmetric effect of exchange rate on economic growth, once recent time series data become available. Continued research and analysis in this area are essential to further enhance our understanding of the complex relationship between exchange rates and economic growth and to inform evidence-based policy decisions in the future.

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