



## ARTICLE

# Analysis of Factors Affecting the Performance of Moroccan Exports

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## Abstract

This study uses the autoregressive distributed lag (ARDL) technique and the error correction model (ECM) to investigate the long-run and short-run associations between export performance and macroeconomic variables in Morocco. These macroeconomic variables are GDP growth, real effective exchange rate (REER), consumer price index (CPI), foreign direct investments (FDI), and gross capital formation (GCF). Using data that covers the period between 1990 and 2020, empirical results support a negative long-run association between exports and REER, and a negative long-run relationship between exports and CPI. At a 10% significance level, results also support a positive long-term relationship between exports, FDI, and GCF. The results derived from the ECM model suggest that the short associations are between exports and GCF at a 5% significance level, and between exports and REER at a 10% significance level, which accounts for a positive coefficient and a negative one, respectively. The findings reveal insightful policy implications to enhance Moroccan exports through controlling REER, encouraging foreign investments, and enhancing GCF.

**Keywords:** Exports performance, Morocco, ARDL, ECM, Macroeconomic variables

**JEL classification:** C01, F10, F14

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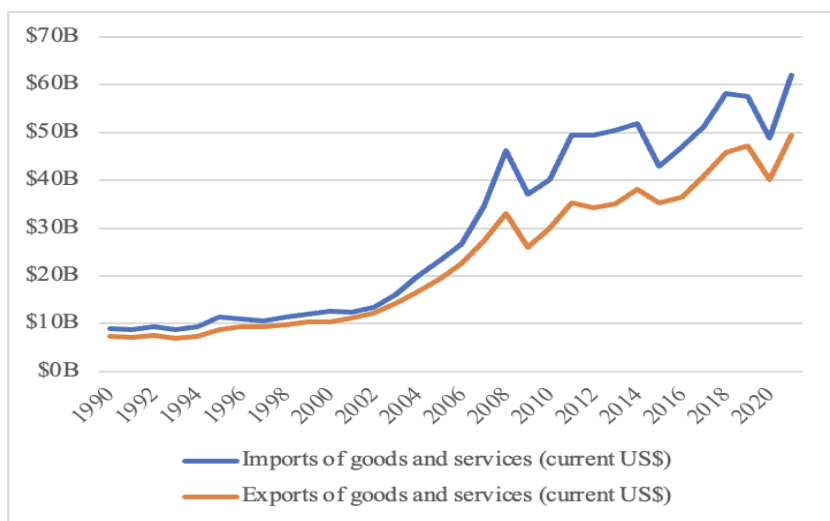
## 1. Introduction

For decades, the international trade perspective on economic growth has been investigating the role of exports in sparking economic growth (Tan et al., 2020). This theory, which is also referred to as ‘export-led growth’, is supported by many academics and scholars. Higher levels of exports enhance economic growth through the reallocation of resources from sectors that are less productive to more productive ones, the inclusion of positive externalities, as well as many other means (Balassa, 1978; Keesing, 1967; Marin, 1992). In addition to that, exports are among the main constituents of the balance of payment that is widely used as a proxy measure to assess a country’s health (Udoidem et al., 2017). This balance of payment variation is a foremost apprehension for developing countries with a chronic trade deficit (Keho, 2021) such as Morocco. This economy has been suffering continuously from a chronic trade deficit with the most recent values of -159.5 and -206 billion MAD in 2020 and 2019, respectively (Office des changes, 2020).

Enhancing the export performance can be a significant driver of economic growth (Blavasciunaite et al., 2020) as it will reduce the trade deficit of the balance of payment in Morocco. Moreover, international trade enables achieving higher levels of economic growth by promoting efficient resource allocation, enabling the realization of economies of scale, enhancing the knowledge diffusion process, developing competition within the domestic as well as international markets, encouraging technological advancement, and encouraging product innovation (Blavasciunaite et al., 2020).

In the 90s, the Moroccan government decided to enter the international competition by changing the underlying tariff policies, and gradually establishing free trade agreements with the European Union, United States, Turkey, and other economies (Office des changes, 2020). While these strategies brought considerable benefits to Morocco such as increasing foreign direct investment and exports, it still did not achieve the intended sustained growth acceleration (Berahab & Dadush, 2020). This is explained by the sluggish export growth rate compared to imports (Figure 1).

The African Development Bank Group (2012) indicates that some Moroccan international trade strategies include the reduction in customs duties to increase Moroccan firms' competitiveness, enhance Moroccan exports, increase domestic market competition, and send a positive signal to investors. However, positive results were only confirmed for some limited industries. This suggests that trade policies will have a limited impact on achieving the desired results unless they are accompanied by new domestic reforms. Simultaneously, this highlights the importance of understanding the long-term and short-term factors that have a direct influence on Moroccan exports. It is essential to note



Source: World Bank Data

**Figure 1.** Moroccan Imports And Exports Between 1990 And 2021

that investigating the macroeconomic factors that have an impact on export performance has been massively studied in many economies (Epaphra, 2016). This includes the impact of some variables such as domestic/foreign income, real exchange rate (Epaphra, 2016; Keho, 2021), money supply, and others (Alhanom, 2016). However, the nature of the impact of these macroeconomic variables is country-specific. In the Moroccan context, few authors attempted to explain the determinants of Moroccan exports using macroeconomic variables. For instance, El Agri et al. (2020) assessed the relationship between the real effective exchange rate, non-price competitiveness, and Moroccan exports using a qualitative method. But Lotfi, Karim (2016), El Aynaoui, and Aormar (2014) attempted to explain the competitiveness of Moroccan exports by industry or product group. However, all these prior studies have many limitations. First, the contributions rely on macroeconomic variables

of the importing countries, they use only a limited number of independent variables, they fail to assess the long-term or short-term associations between the variables, and some of them are outdated as they concern periods that do not reflect current policies (e.g., the study of El Aynaoui and Aormar (2014) studies the determinants of Moroccan exports between 1980 and 1998).

For this, and because of the lack of conclusive evidence, the goal of the current study is to investigate the main driving macroeconomic factors of exports in Morocco. More specifically, this paper aims at assessing the long-run and short-run associations between macroeconomic variables and exports in the period between 1990 and 2020 using the autoregressive distributed lag (ARDL) approach to cointegration and the error correction model (ECM).

The rest of this paper is organized as follows. Section 2 reviews the literature relating to the macroeconomic determinants of export performance. Section 3 outlines the data and methods used. Section 4 discusses the empirical findings and section 5 discusses and concludes the paper.

## 2. Literature Review

Several studies highlight the importance of exports in achieving economic growth (Kalaitzi & Chamberlain, 2020), mostly in developing countries (Levine et al., 2000). This is through their direct positive influence on economies of scale, achieving higher levels of capacity utilization, acquiring advanced technologies, and many direct as well as indirect impacts (Abou-Stait, 2005; Vohra, 2001). In addition to that, many prior contributions support the existence of a unidirectional causality of exports on economic growth in many economies, which supports the export-led growth theory (Abou-Stait, 2005; Ahmad et al., 2018; Osabohien et al., 2019). Another significant number of studies also support either the existence of unidirectional causality from economic growth to exports, or a bidirectional causality between the two variables (Kalaitzi & Cleeve, 2018; Temiz Dinç & Gökmen, 2019). Due to the variety of findings in terms of the relationship between economic growth and exports from one country to another, it is important to highlight the importance of understanding the key macroeconomic determinants that have a direct impact on export performance (Epaphra, 2016). This is because understanding the link between macroeconomic variables and exports for a given economy will ensure the establishment of appropriate policies that will foster economic growth.

In the most recent decades, investigating the macroeconomic determinants of exports has been enormously studied by many economies (Abolagba et al., 2010; Albiman & Suleiman, 2016; Cheung & Sengupta, 2013; El Aynaoui & Aormar, 2014; Mehta, 2015; Sabuhi-Sabouni & Piri, 2008; Tan et al., 2020; Thangamani, 2016; Turan & Karamanaj, 2014). However, the literature related to investigating the impact of domestic demand and domestic pressure on export performance is almost non-existent (Esteves & Rua, 2013). For this, and to solve for the lack of data related to domestic demand like price-competitiveness (Schmitz et al., 2012), other widely available data such as the consumer price index, or CPI, can be used (Esteves & Rua, 2013). Hence, this contribution will use the CPI as a proxy measure of domestic demand and investigate its relationship with Moroccan exports.

Scholars and academics also attempted to investigate the relationship between the real effective exchange rate (REER) and the export performance of many economies (Guechari, 2012; Nguyen et al., 2019). To note, the REER measures the value of an economy's currency in relation to the weighted average of foreign currencies of trade partners (Goswami & Sarker, 2011). Prior literature suggests that a depreciation of the REER leads the host country's export prices to decrease, which leads to enhancing export competitiveness (Bernard & Jensen, 2004; Staiger & Sykes, 2010). For instance, the empirical findings of the contribution of Wondemu and Potts (2016) indicate that the undervaluation of the real exchange rate enhances the export performance in Tanzania and Ethiopia. In the case of Russia, results highlight the existence of a robust negative long-term relationship between the REER and non-oil exports (Algieri, 2004). Also, similar results are found in the case of

Iran (Sabuhi-Sabouni & Piri, 2008), Nigeria (Abolagba et al., 2010), South and South-East Asian countries (Chaudhary et al., 2016), India (Cheung & Sengupta, 2013), and many other economies (Adam et al., 2017; Afshan & Batul, 2014). Finally, in the contribution of Tan et al. (2020) the authors found that the depreciation of the exchange rate is positively associated with exports in Indonesia while its volatility depresses exports. In this study, the long-term and short-term relationships between the REER and the performance of Moroccan exports are investigated.

Another determinant of export performance that was studied in the existing literature is economic growth which is proxied by either GDP or GDP growth (Abdulkadir Ali et al., 2017). In addition to the short-term association between economic growth and exports, many contributions confirm a long-run relationship between these two variables as well (Bakari & Mabrouki, 2017). The first group of authors confirmed the existence of unidirectional causality from exports to economic development, such as the case of Tunisia (Saaed & Hussain, 2015), Libya (Elbeydi et al., 2010), Sri Lanka (Velnampy & Achchuthan, 2013), Albania (Turan & Karamanaj, 2014), Malaysia (Albiman & Suleiman, 2016), and Saudi Arabia (Altaee et al., 2016). But for other authors, results support a unidirectional positive relationship that goes from economic growth to exports. This last relationship concludes that the higher the economic development, the higher the export performance (Bakari & Mabrouki, 2017), and is found in the contributions of Sahoo et al. (2014) and Mehta (2015) in the Indian context. While scholars also found a bidirectional relationship between economic growth and exports in many countries (Hye, 2012; Khan et al., 2012; Ramos, 2001; Shihab et al., 2014), some of them did not support any association between the two variables (Abugamea, 2015; Ajmi et al., 2015). Since the relationship between economic growth and exports is inconclusive, this study will investigate the same relationship in the Moroccan context.

The existing literature also assessed the link between foreign direct investment (FDI) and exports in many economies (Zhanje & Garidzirai, 2018). Net FDI inflows can exhibit a long-term positive impact on economic growth through fostering long-term capital with new technologies and upgrading local skills, which in turn enhance export performance (Barro & Sala-i-Martin, 2004; Romer, 1986).

In the contributions of Koroci, Deshati (2016), Zhanje, Garidzirai (2018), Li, Park (2016), Akoto (2016), Davaakhuu et al. (2015), Kutun, and Vukšić (2007), the authors indicate that FDI has a direct positive impact on exports performance in the long-run, the short-run, or both in Albania, Zimbabwe, China, South Africa, Mongolia, and Central Eastern European countries. This supports the complementary view between these variables (Karimov, 2019). However, other academics indicate that the linkage between FDI and exports is either substitutive (Kuntluru et al., 2012) or neutral (Singh & Tandon, 2015). These mixed results show that the long-run and the short-run associations between FDI and exports are still ambiguous, which emphasizes the need for empirical investigations in the case of emerging economies (Babu, 2018) such as Morocco.

Finally, and among the main macroeconomic determinants of export performance, academics investigated the relationship between exports and gross domestic capital formation (Syekh & Zainuddin, 2021). Gross capital formation, also referred to as a gross domestic investment, is the addition to the fixed assets for a given country in addition to the levels of inventories (Meyer & Sanusi, 2019). Prior literature suggests that gross capital formation has a direct influence on economic development (Adams, 2009; Batrancea et al., 2021) through the enhancement of the domestic country's physical capital stock directly (Plosser, 1992), and the promotion of technology indirectly (Dritsakis et al., 2006; Levine & Renelt, 1992).

Findings indicate that gross capital formation strongly influences Jambi's exports. This aligns with the contribution of Rajni (2013) who found a unidirectional influence of gross domestic capital formation on exports in India, and the contribution of Feddersen et al. (2017) who found a positive long-run association between the two variables in South Africa. The positive association between these two variables is found in the case of many other economies (Albiman & Suleiman, 2016;

Mukhtarov et al., 2019). Therefore, this study will investigate the significance and the nature (e.g., positive vs. negative, and long-term vs. short-term) of the impact that gross domestic capital formation exhibits on Moroccan exports.

In the Moroccan context, and according to the authors' knowledge, the literature accounts for only three articles in the field (El Agri et al., 2020; El Aynaoui & Aormar, 2014; Lotfi & Karim, 2016). In the contributions of El Agri et al. (2020), the authors assessed the impact of price factors and structural factors on Moroccan exports in comparison to Turkey and China. Results highlight the importance of both factors to enhance export performance within the economy (El Agri et al., 2020). El Aynaoui and Aormar (2014) found that the performance of Moroccan exports is positively related to the revenues of partner trade countries but negatively associated with the appreciation of the real effective exchange rate. In the study of Lotfi and Karim (2016), the determinants of the competitiveness of Moroccan exports were analyzed. Findings indicate that Moroccan exports are sensitive to investments made by the government in many manufacturing branches (Lotfi & Karim, 2016). While the three previously mentioned contributions attempted to investigate the determinants and motivators of Moroccan exports, they have various limitations. First, El Agri et al. (2020) used a low number of explanatory variables. Additionally, the authors relied heavily on a qualitative approach (El Agri et al., 2020), which failed to confirm the statistical significance of the relationships found. Second, the study of Lotfi and Karim (2016) focuses mainly on the macroeconomic variables of foreign countries rather than national ones and fails to assess the long or short-term associations between them and Moroccan exports. Finally, the contribution of El Aynaoui and Aormar (2014) does not reflect the most recent Moroccan policies as it studies the period between 1980 and 1998. In this study, these limitations are addressed.

To investigate the long-term and short-run relationships between exports performance and macroeconomic variables, different authors used different methods which include the Vector Error Correction Model (VECM) (Abdulkadir Ali et al., 2017; Akoto, 2016; Elbeydi et al., 2010; Syekh & Zainuddin, 2021; Thangamani, 2016), Johansen cointegration (Abdulkadir Ali et al., 2017; Feddersen et al., 2017; Karimov, 2019; Rajni, 2013; Singh & Tandon, 2015; Thangamani, 2016), Granger causality (Babu, 2018; Elbeydi et al., 2010; Karimov, 2019; Rajni, 2013; Singh & Tandon, 2015), Autoregressive Distributed Lag (ARDL) model (Altaee et al., 2016; Hye, 2012; Mukhtarov et al., 2019; Sabuhi-Sabouni & Piri, 2008; Zhanje & Garidzirai, 2018), fixed and random panel regression analysis (Davaakhuu et al., 2015; Kuntluru et al., 2012; Tan et al., 2020), Error Correction Model (ECM) (Algieri, 2004), and Ordinary Least Squares (OLS) (Abolagba et al., 2010). Each of these statistical methods is used depending on the context of the study and the nature of the data (e.g., small vs. large sample sizes). For instance, in studies that only determine the significant macroeconomic factors that influence exports for a given country, the OLS method is used (Abolagba et al., 2010). Concerning studies that assess the relationship between macroeconomic motivators/barriers and the exports of a pool of economies, panel data regression is used (Tan et al., 2020). Finally, for studies that assess the long-term and short-term association between the variables with small sample sizes, the ARDL model can be used (Mukhtarov et al., 2019), respectively. In the context of this study, the ARDL technique for cointegration and the ECM are deemed suitable to investigate the long-term and short-term associations between macroeconomic variables and Moroccan exports. This is because the ARDL test provides more robust results for small sample sizes, which also benefits the ECM (Latif et al., 2015).

The following section presents the data, the models, and the statistical techniques used.

### 3. Data and Methodology

#### 3.1 Data

The choice of macroeconomic variables selected in this study is based on the prevailing literature. For the dependent variable, export performance is measured using total exports of goods and services

(EXPO) expressed in current US dollars. This variable includes all goods and services provided to the rest of the world and excludes the compensation of employees, investment income, and transfer payments. Concerning the independent variables, they account for 5 main variables that are the real effective exchange rate as an index of 2010 (REER), GDP annual percentage growth (GDPGR), consumer price index (2010 = 100) (CPI), net foreign direct investment in current US dollars (FDI), and gross capital formation annual percentage growth (GCF).

For REER, it measures the value of the currency of the exporting country relative to the weighted average of foreign currencies of trade partners (Goswami & Sarker, 2011), and its impact on exports performance was assessed in many contributions (e.g., Abolagba et al., 2010; Adam et al., 2017; Nguyen et al., 2019). GDPGR measures the annual growth of GDP at market prices. This variable is usually used as a proxy of economic performance, and its association with export performance has been investigated in many countries (e.g., Abdulkadir Ali et al., 2017; Albiman & Suleiman, 2016; Bakari & Mabrouki, 2017). With regards to the CPI, it is a macroeconomic variable that reflects the changes in the cost of the average consumer acquiring a specific basket of services or goods. But for the FDI, it is a measure of the net inflows of the total investments generated from holding 10% or more voting stock in companies/enterprises operating in a country different than the exporting one. The link between FDI and exports has been previously investigated in the case of many economies (e.g., Davaakhuu et al., 2015; Karimov, 2019). Finally, the last used independent variable is GCF, which represents the total fixed assets (e.g., railways, industrial buildings, machinery, and construction of roads amongst many others) of an economy plus net changes in the level of inventories, and its association with exports performance was investigated in the case of many economies (e.g., Meyer & Sanusi, 2019; Syekh & Zainuddin, 2021).

The data used in this study is extracted from the World Bank database and consists of yearly time series data ranging from 1990 to 2020, covering 31 years. To note, the REER and CPI variables were transformed using the natural logarithm function to enhance the model fit.

**Table 1.** Descriptive Statistics Of The Dependent And Independent Variables

	EXPO	REER	GDPGR	CPI	FDI	GCF
Unit	Billion US\$	Base year 2010 (REER2010 = 100)	Annual % growth	Base year 2010 (CPI2010 = 100)	Billion US\$	Annual % growth
Mean	22.44	103.58	3.50	90.14	-1.38	4.48
Median	19.28	103.35	3.53	89.71	-1.07	4.14
Standard Deviation	13.59	5.50	3.98	15.53	0.95	7.46
Minimum	6.98	95.38	-6.29	56.90	-3.09	-14.25
Maximum	47.13	114.85	12.37	111.85	-0.17	22.88
Count	31	31	31	31	31	31

EXPO is exports, REER is real effective exchange rate, GDPGR is GDP growth, CPI is consumer price index, FDI is net foreign direct investment, GCG is gross capital formation.

According to Table 1, the EXPO ranges from a value of almost 7 to a value of 47.13 billion US dollars, with a mean of 22.44 billion US dollars. But for FDI, descriptive statistics indicate that all the values are negative, implying that the outflows generated by partner countries from holding 10% or more voting rights in Moroccan companies outperform the inflows generated by the Moroccan government by holding a similar percentage of voting right in other economies. Concerning the GDPGR, it has a mean of 3.50% average annual growth and a standard deviation of 3.98%. This shows the high variability of this variable. This is also the case of the GCF as it has a mean of 4.14% and a standard deviation of 7.46%, and it is confirmed by the high range of the values that are between -14.25% and 22.88%. For the REER and CPI, they are measured as an index, with the base year in 2010. The two values have average values of 103.58 and 90.14, which correspond to

the standard deviations of 5.50 and 15.53, respectively. Finally, it is important to note that since the mean and median variables are almost equal for all the variables (Table 1), the data is assumed to be normally distributed.

### 3.2 Method

This study investigates the determinants of Moroccan exports using the autoregressive distributed lag (ARDL) method developed by Pesaran et al. (2001). First, both the Augmented Dickey-Fuller (ADF) and the Phillips-Perron unit root tests are employed to ensure the non-existence of variables' stationarity at I(2) before proceeding to the ARDL Bound testing. Essentially, the ARDL approach to cointegration consists of the estimation of conditional error correction of the ARDL model for the performance of exports as well as its determinants. The model can initially be expressed as follows (Equation 1):

$$\Delta EXPO_t = \alpha_0 + \sum_{i=0}^l \beta_1 \Delta \ln REER_{t-1} + \sum_{i=0}^l \beta_2 \Delta GDPGR_{t-1} + \sum_{i=0}^l \beta_3 \Delta \ln CPI_{t-1} + \sum_{i=0}^l \beta_4 \Delta FDI_{t-1} + \sum_{i=0}^l \beta_5 \Delta GCF_{t-1} + \delta_1 \ln REER_{t-1} + \delta_2 GDPGR_{t-1} + \delta_3 \ln CPI_{t-1} + \delta_4 FDI_{t-1} + \delta_5 GCF_{t-1} + \varepsilon_t \quad (1)$$

Where:

- $\Delta$  : is the difference operator;
- $\alpha_0$  : is the drift constant;
- $l$  : is the optimal lag length;
- $i$  : is the number of lags;
- $\beta_i$  : represents the short-term coefficients that correspond to each variable,  $i = 1, 2, \dots, 6$ ;
- $\delta_j$  : represents the long-run coefficients that correspond to each variable,  $j = 1, 2, \dots, 6$ ;
- $\varepsilon_t$  : is the Gaussian white noise.

The first step to investigate the long-run relationship using the ARDL model is to calculate the F-Bound statistics, which needs to be compared with a critical value in the lower bound and the upper bound (Pesaran et al., 2001). The upper bound assumes that all regressors are integrated at their first levels while the lower bound assumes that all regressors are at their levels (Guan et al., 2015). The null hypothesis of the non-existence of cointegration is supported when the resulting F-statistic is below the lower bound and is rejected when the F-statistic is above the upper bound. But when the resulting F-statistic lies between the lower and upper bounds, results remain inconclusive (Nkoro & Uko, 2016). It is important to note that this study uses the small sample size ( $n = 30$ ) critical bounds values provided by Narayan (Narayan, 2005) to assess the significance.

If the F-Bound statistics support the existence of cointegration, the long-run model can be estimated using the following formula (Equation 2):

$$EXPO_t = \alpha_0 + \sum_{i=0}^l \delta_1 \ln REER_{t-1} + \sum_{i=0}^l \delta_2 GDPGR_{t-1} + \sum_{i=0}^l \delta_3 \ln CPI_{t-1} + \sum_{i=0}^l \delta_4 FDI_{t-1} + \sum_{i=0}^l \delta_5 GCF_{t-1} \quad (2)$$

Finally, if there is enough evidence of the existence of a long-run relationship, the Error Correction Model (ECM) is employed to estimate the short-run dynamic coefficient. This is using the error correction term  $ECM(t-1)$ , which shows the correction mechanism in stabilizing the disequilibrium in the model. This coefficient is also referred to as the feedback effect or the speed of adjustment (Nkoro & Uko, 2016). Therefore, the short-run dynamics can be derived using the following formula (Equation 3):

$$\Delta EXPO_t = \alpha_0 + \sum_{i=0}^l \beta_1 \Delta \ln REER_{t-1} + \sum_{i=0}^l \beta_2 \Delta GDPGR_{t-1} + \sum_{i=0}^l \beta_3 \Delta \ln CPI_{t-1} + \sum_{i=0}^l \beta_4 \Delta FDI_{t-1} + \sum_{i=0}^l \beta_5 \Delta GCF_{t-1} + \gamma ECM_{t-1} + \varepsilon_t$$

To assess the ARDL model's goodness of fit and stability, various diagnostic tests were used. This includes the serial correlation test to check the existence of any serial correlation (Godfrey, 1978), the Ramsey RESET test to check functional form issues (Thursby, 1979), Jarque–Bera to check the normality assumption (Jarque & Bera, 1980), Breusch–Pagan–Godfrey test to investigate for homoscedasticity (Breusch & Pagan, 1979), and the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) to check the model's stability (Turner, 2010).

**Table 2.** Augmented Dickey-Fuller And Phillips-Perron Unit Root Tests Results

Test	Integration order	Includes	EXPO	lnREER	GDPGR	lnCPI	FDI	GCF
Augmented Dickey Fuller (ADF)	I(0)	Intercept	-0.36 (0.905)	-1.17 (0.672)	-9.09*** (0.000)	-7.14*** (0.000)	-1.94 (0.308)	-4.48*** (0.001)
		Trend and intercept	-2.63 (0.269)	-2.29 (0.427)	-8.99*** (0.000)	-5.99*** (0.000)	-4.83*** (0.003)	-4.42*** (0.008)
		None	1.45 (0.960)	0.20 (0.737)	-1.75 (0.076)	6.14 (1.000)	-0.64 (0.430)	-3.39*** (0.001)
	I(1)	Intercept	-4.73*** (0.001)	-4.20*** (0.003)	-15.09*** (0.000)	-3.55** (0.014)	-10.75*** (0.000)	-5.79*** (0.000)
		Trend and intercept	-4.67*** (0.005)	-4.28** (0.011)	-14.93*** (0.000)	-4.05** (0.018)	-10.79*** (0.000)	-6.30*** (0.000)
		None	-4.35*** (0.000)	-4.27*** (0.000)	-15.24*** (0.000)	-2.75*** (0.008)	-10.92*** (0.000)	-5.93*** (0.000)
Phillips-Perron (PP)	I(0)	Intercept	-0.21 (0.928)	-1.44 (0.549)	-8.78*** (0.000)	-5.50*** (0.000)	-3.40** (0.019)	-4.48*** (0.001)
		Trend and intercept	-2.51 (0.323)	-2.28 (0.430)	-8.66*** (0.000)	-5.80*** (0.000)	-4.83*** (0.003)	-4.35*** (0.009)
		None	1.81 (0.981)	0.15 (0.722)	-4.80*** (0.000)	3.60 (0.999)	-1.23 (0.195)	-3.41*** (0.001)
	I(1)	Intercept	-4.80*** (0.001)	-4.23*** (0.003)	-19.95*** (0.000)	-3.79*** (0.008)	-14.13*** (0.000)	-13.89*** (0.000)
		Trend and intercept	-4.55*** (0.006)	-4.32*** (0.009)	-20.97*** (0.000)	-4.05** (0.018)	-26.55*** (0.000)	-19.83*** (0.000)
		None	-4.30*** (0.000)	-4.31*** (0.000)	-20.13*** (0.000)	-2.99*** (0.004)	-13.57*** (0.000)	-13.28*** (0.000)

EXPO is exports, lnREER is the log form of real effective exchange rate, GDPGR is GDP growth, lnCPI is the log form of consumer price index, FDI is net foreign direct investment, GCF is gross capital formation.

\*, \*\*, \*\*\* Significance at the 10%, 5%, and 1% levels. Source: Authors' estimates

## 4. Results

### 4.1 Unit root testing

This study investigates the main macroeconomic determinants of exports in Morocco using the ARDL technique. Before applying the model, it is necessary to estimate the order of integration



of the variables. According to table 2, both the ADF and PP unit root tests indicate that different variables have different orders of integration. However, all variables are either stationary at their levels (e.g., GCF) or 1st differences (e.g., EXPO), which confirms the main assumption of stationarity of the ARDL model.

## 4.2 Bound testing

The ARDL bound testing is used to investigate the existence of a cointegration relationship among EXPO, lnREER, GDPGR, lnCPI, FDI, and GCF in Morocco. Results indicate that when the regression is normalized on EXPO, the F-statistics resulted in a value of 5.013, which is significant at 5% (Table 3). This confirms that at least one long-run relationship exists when EXPO is the dependent variable.

**Table 3.** Results of Bound Testing

F-Statistics					
$F_{EXPO}(EXPO/\ln REER, GDPGR, \ln CPI, FDI, GCF)$	5.013				
Critical bounds values	5%		10%		
	Lower bound	Upper bound	Lower bound	Upper bound	
	3.125	4.608	2.578	3.858	

Source: Authors' estimates

## 4.3 Estimation of long-run and short-run coefficients

In this section, the long-term and the short-run elasticities of lnREER, GDPGR, lnCPI, FDI, and GCF with respect to EXPO are estimated in Morocco using the ARDL technique and the ECM. Using the AIC selection criteria to select the optimal lag length of the variables (Figure 2), the selected model is ARDL (1, 2, 0, 0, 2, 0). This accounts for only two maximum lag lengths to the model as the sample size is limited. Thus, p1, p2, p3, p4, p5, and p6, the lag orders for EXPO, lnREER, GDPGR, lnCPI, FDI, and GCF in equation 2 are 1, 2, 0, 0, 2, and 0, respectively. The corresponding estimated long-run coefficients of this same equation are summarized in table 4.

As indicated in table 4, the lnREER and lnCPI have a long-run relationship with EXPO. This is because these two variables have a negative and a positive coefficient significant under 5%, respectively. Concerning FDI and GCF, and under a 10% significance level, results indicate that they have a long-run relationship with exports. But for the GDPGR variable, no long-run relationship is found.

**Table 4.** Estimated Long-Run Coefficients Using The ARDL Approach

ARDL(1, 2, 0, 0, 2, 0) selected based on Schwarz Bayesian Criterion;  
Dependent variable is EXPO

Variable	Coefficient	Std. Error	t-Statistic	Prob.
lnREER	-1.27E+11***	2.50E+10	-5.08	0.000
GDPGR	-2.03E+07	1.97E+08	-0.10	0.919
lnCPI	7.87E+10***	9.72E+09	8.10	0.000
FDI	4.23*	2.16	1.96	0.066
GCF	3.61E+08*	1.99E+08	1.81	0.087

EXPO is exports, lnREER is the log form of real effective exchange rate, GDPGR is GDP growth, lnCPI is the log form of consumer price index, FDI is net foreign direct investment, GCF is gross capital formation  
\*, \*\*, \*\*\* Significance at the 10%, 5%, and 1% levels.

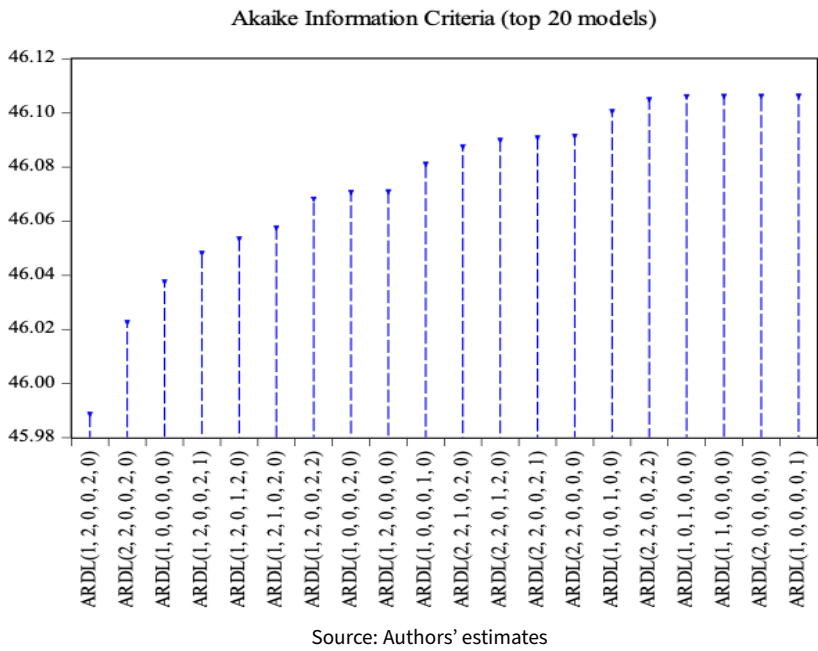


Figure 2. Standardized Smoothed Errors Of The State Variables

Concerning the short-run dynamic coefficients calculated using the ECM model in equation 3, they are summarized in table 5. Results indicate that the ECM coefficient is significant under a 5% significance level with the correct sign. This implies that the system can converge back to long-term equilibrium after a short-term shock. With a value of  $-0.655$ , about 65.5% of disequilibria from the current year's shock can be adjusted in the coming year. This means that the disequilibrium of EXPO will converge back in less than 2 years. In addition to that, GCF has a significant positive coefficient under the 5% significance level while  $\ln REER$  has a significant negative coefficient under a 10% significance level. Therefore, there is a relationship between these two variables and EXPO in the short run.

4.4 Diagnostic tests

To confirm the efficiency as well as the consistency of the model, several diagnostic tests were conducted. To assess the existence of serial correlation, the serial correlation test is used. The resulting F-statistics has a value of 1.244 which corresponds to a p-value of 0.31, which is higher than the significance level of 5% (Table 6). This supports the rejection of the null hypothesis. Therefore, no serial correlation exists in the model. According to the Ramsay RESET, Jarque Bera, and Breusch-Pagan-Godfrey tests, the results indicate that the model is free from functional form, normality, and heteroscedasticity problems (Table 6).

Concerning the model's stability, both the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests were used to assess the stability of the ECM model parameters. Both figures 3 and 4 indicate the CUSUM and CUSUMSQ plots are well within the 5% critical bounds except for a short period where the CUSUMSQ breaks the critical bound and then returns to the recommended space. Despite the mentioned short stint in figure 4, it can be concluded that both the long-run and short-run coefficients are stable.

**Table 5.** Error Correction Representation For the Selected ARDL Model

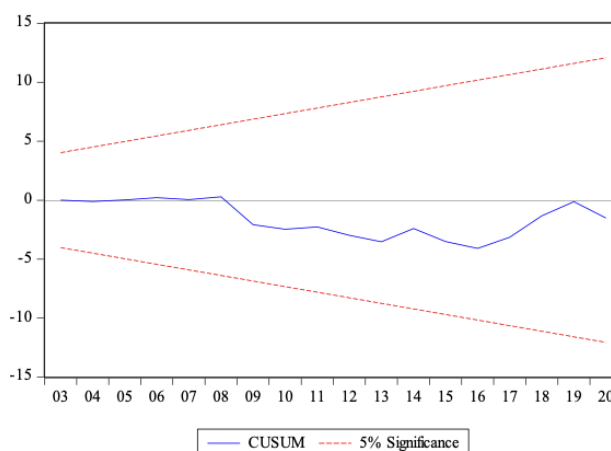
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.71E+08	9.35E+08	0.50	0.620
D(lnREER)	-5.59E+10*	2.93E+10	-1.91	0.070
D(GDPGR)	3.25E+07	7.10E+07	0.46	0.652
D(lnCPI)	3.88E+10	4.16E+10	0.93	0.363
D(FDI)	0.05	0.50	0.09	0.927
D(GCF)	1.19E+08**	5.59E+07	2.13	0.045
ECM(-1)	-0.66**	0.30	-2.22	0.038
R-squared	0.468	Mean dependent var	1.11E+09	
Adjusted R-squared	0.316	S.D. dependent var	2.95E+09	
S.E. of regression	2.44E+09	Akaike info criterion	46.278	
Sum squared resid	1.25E+20	Schwarz criterion	46.611	
Log likelihood	-640.896	Hannan-Quinn criter.	46.380	
F-statistic	3.081	Durbin-Watson stat	1.705	
Prob(F-statistic)	0.025			

EXPO is exports, lnREER is the log form of real effective exchange rate, GDPGR is GDP growth, lnCPI is the log form of consumer price index, FDI is net foreign direct investment, GCF is gross capital formation  
\*, \*\*, \*\*\* Significance at the 10%, 5%, and 1% levels.

**Table 6.** Diagnostic Tests Of the ARDLModel

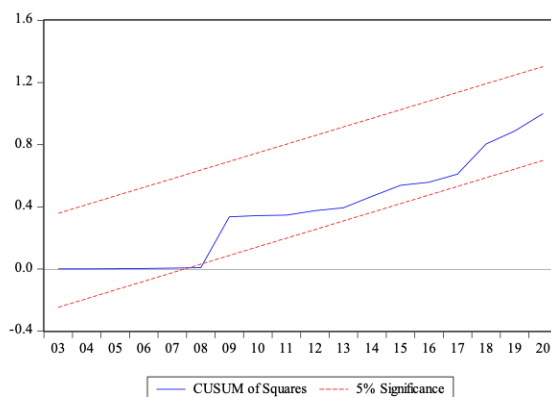
Test statistics	LM version [p-value]	F-version [p-value]
1: Serial correlation	CHSQ(2) = 3.90 [0.142]	F(2,16) = 1.24 [0.315]
2: Functional form	T-statistics = 1.66 [0.116]	F(1,17) = 2.75 [0.116]
3: Normality	Jarque-Bera = 1.90 [0.388]	NA
4: Heteroscedasticity	CHSQ(10) =14.92 [0.135]	F(10,18) = 1.91 [0.112]

\*, \*\*, \*\*\* Significance at the 10%, 5%, and 1% levels.



Source: Authors' estimates

**Figure 3.** Plots Of The Cumulative Sum Of Recursive Residuals



Source: Authors' estimates

**Figure 4.** Plots Of The Cumulative Sum Of Squares Of Recursive Residuals

## 5. Discussion

The following section discusses the findings of this study. First, the real effective exchange rate has significant and negative long-run as well as short-run impacts on Moroccan export performance. This means that any appreciation of REER leads exports to become more expensive and/or imports to become cheaper. Hence, any appreciation of REER leads the Moroccan government to incur immediate and long-run losses in exports. A similar association between REER and exports is found in many economies such as Eastern Africa (Hunegnaw, 2017), Tanzania, Ethiopia (Wondemu & Potts, 2016), and Nigeria (Abolagba et al., 2010) amongst many other countries (e.g., Adam et al., 2017; Afshan & Batul, 2014; Algeri, 2004; Cheung & Sengupta, 2013). Second, the findings do not support any long-run or short-term association between GDP growth and exports. Third, and while no evidence for the association between CPI and export performance exists in the short term, a long-term positive relationship exists. This means that the increase in the current consumers' goods and services enhances price competitiveness at an international level, which itself leads the Moroccan government to benefit from higher export volumes in the future. Fourth, a positive relationship between FDI and export performance is supported in the long run, but not in the short term. This indicates that holding more investments with 10% or more voting rights in foreign countries generates high levels of inflows, which results in higher export performance in Morocco. The complementarity theory between FDI and exports is also supported in many economies that include, but are not limited to, Albania (Koroci & Deshati, 2016), Mongolia (Davaakhuu et al., 2015), Zimbabwe (Zhanje & Garidzirai, 2018), and many Central Eastern European countries (Kutan & Vukšić, 2007). Finally, results reveal that a significant positive relationship is found both in the short-term and long-term between gross capital formation and export performance. As such, any increase in the Moroccan government's fixed assets (e.g., infrastructure, railways, and machinery) will translate into immediate and long-term increases in exports. This relationship aligns with the contributions of Mukhtarov et al. (2019), Rajni (2013), and Feddersen et al. (2017) as well as many other authors (e.g., Albiman & Suleiman, 2016).

The results have some insightful policy implications to enhance export performance in Morocco. Concerning REER, its appreciation implies that the Moroccan government is facing higher inflation compared to its trading partner countries. For this, to ensure the stability of the exchange rate and control inflation, the Moroccan central bank should encourage capital inflows by increasing interest rates and reducing financial instruments' availability for less developed financial markets. This latter

strategy will allow the exchange rate stability in the short run (Hassan et al., 2016). However, the long-term policy measures that can ensure higher export competitiveness in Morocco consists of sterilizing capital inflows and maintaining the stability of the exchange rate throughout (Hassan et al., 2016; Lee, 1997): (a) reducing the current monetary base and thereby control for inflation, sterilization must be complemented by an increase in reserve requirements or a decrease of central bank lending; (b) making the economy more financially liberalized and improving the efficiency of financial systems.

Other policy implications that will enable the Moroccan government to achieve higher levels of exports through controlling REER, and enhancing FDI as well as GCF consists of (c) promoting private investments abroad rather than only focusing on attracting foreign investors; (d) enabling foreigners to borrow from local markets; (d) promoting technological innovation to enhance a large share of Moroccan fixed assets; (e) reducing infrastructures inefficiencies; (f) and supporting investments related to infrastructures, industrial buildings, and introducing clean and cheap energy sources among other strategies through direct investments or promoting public-private partnerships.

## 6. Conclusion

Many economists support the export-led growth theory, which highlights the significant role of exports in driving economic growth (Tan et al., 2020). To note, the associations between macroeconomic variables and export performance has been massively studied in many countries, and the factors that impact exports differ from one country to another. For this, this study aims to investigate the long-term and short-term associations between macroeconomic variables and export performance in the case of Morocco. In other words, the current study adds to the existing literature by proposing a new theoretical framework that explains the long-run and short-term influences of some macroeconomic variables on export performance with an application in the Moroccan context. The used macroeconomic variables are derived from prior literature and account for the real effective exchange rate (REER) (e.g., Guechari, 2012; Nguyen et al., 2019), GDP annual growth (GDPGR) (e.g., Abdulkadir Ali et al., 2017; Bakari & Mabrouki, 2017), consumer price index (CPI) (e.g., Esteves & Rua, 2013), net foreign direct investment (FDI) (e.g., Karimov, 2019; Zhanje & Garidzirai, 2018), and gross capital formation (GCF) (e.g., Syekh & Zainuddin, 2021).

Using data that covers the period between 1990 and 2020, the autoregressive distributed lag technique for cointegration, and the error correction model, various relationships have been identified. Findings reveal that the real effective exchange rate and gross capital formation influence the performance of Moroccan exports in the long and short terms negatively and positively, respectively. Additionally, results also found that CPI and FDI only impact export performance in the long term. Finally, no relationship between GDP growth and export performance is identified.

Current results suggest some practical and insightful implications to policy makers that will foster the performance of Moroccan exports in the future. This includes the use of various strategies that will ensure the stability of the effective exchange rate, sterilizing capital inflows, promoting private foreign investments by Moroccan investors, reducing infrastructure inefficiencies, and supporting investments that will participate in the development of infrastructures (e.g., airports, industrial buildings, etc.) that have a direct or indirect impact on exports.

It is important to note that the following contribution has a few limitations. First, the statistical methods used allow only deriving the short-term and long-term impacts of independent variables on the dependent ones. For this, avenues for future research should investigate the causal relationships between macroeconomic variables and Moroccan exports using techniques such as Granger Causality. Second, the proposed theoretical framework only includes five variables to explain Moroccan exports. Hence, future contributions might include more variables. Third, this research investigates the impact of macroeconomic determinants on aggregate export performance. Therefore, future studies might consider being industry-specific or product specific to provide more detailed insights to

policy makers and business organizations.

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### **Conflicts of interest**

The authors declare no conflict of interest.

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