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## Exchange rate policy and sectoral competitiveness in Morocco: Vector autoregressive model

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**Abstract.** The objective of this work is to study the exchange rate policy and its impact on sectoral competitiveness in Morocco. For this issue we used a VAR econometric model with annual data covering a period from 1990 to 2020. As a result of this study, we found that the exchange rate policy adopted and applied by the Moroccan monetary authorities showed that the real effective exchange rate experienced an appreciation that is, a loss of competitiveness. Thus, the monetary authorities have chosen the second course of action which is the gradual flexibility of the exchange rate regime and the improvement of the weak performance of exports. This is done through the diversification of production structures on the one hand and the diversification of exports on the other. Indeed, the overvaluation of the national currency results in a loss of competitiveness towards foreign countries, which means that domestic goods cost more than they should. Conversely, when the domestic currency is undervalued, this allows a gain in competitiveness.

**Keywords.** Competitiveness, Exchange rate policy, VAR, Production structures, Diversification of exports..

**JEL.** C01, C50, E10, E60, F02, F30, F41.

### 1. Introduction

Morocco has been engaged in a liberalization process since 1983, with the implementation of a structural adjustment program (SAP). This process of openness brings many advantages, but also many challenges. In particular, it requires a strengthening of competitiveness and an upgrading of the national productive fabric, to enable companies to withstand the shocks of openness and consolidate their presence on both domestic and foreign markets.

To achieve these competitiveness objectives, an appropriate exchange rate policy is crucial to accompany other economic policies. Indeed, this highly sensitive and strategic issue has been the subject of much debate and comes up frequently in discussions of competitiveness and growth issues. In addition, to better understand the issue, the estimation of export elasticities in relation to the real effective exchange rate and in relation to

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European demand for Morocco should make it possible to identify the most sensitive economic sectors. In addition, the results obtained should make it possible to ask questions about the outlook for Morocco's exchange rate policy and export performance.

However, while relying on these theoretical and empirical studies as economic arguments, our empirical investigation aims to study the impact of the exchange rate policy on sectoral competitiveness for the period from 1990 to 2020.

Indeed, it is within this framework, that this theoretical and empirical work, which attempts to answer the following main problem:

- What is the impact of the exchange rate policy on sectoral competitiveness for the Moroccan economy?

To answer to this problematic question, we propose the following plan. First, we will present the literature review by presenting the history of the exchange rate regimes applied in Morocco, then in a second section, we will present the data and general methodology that have been used, and finally the presentation of econometric results and its discussion.

### 2. Literature review

In the following section we will present the evolution of historical process of the exchange rate regimes applied in Morocco.

#### 2.1. From the French Franc to a basket currencies

After independence, Morocco had to resort to exchange controls to deal with the flight of capital associated with the departure of foreigners. In 1959, Morocco created the dirham to replace the Moroccan franc, while pegging it to the French franc at a fixed parity. During this period, the international monetary system was known as the "gold standard". It was based on the gold convertibility of each currency and corresponded to a set of fixed parities. Moreover, after the collapse of the Bretton Woods fixed exchange rate system in the early 1970s, and with the adoption of the second amendment to the IMF's Articles of Agreement, member countries are free to adopt the exchange rate regime of their choice. In this context, countries can choose on the basis of sound criteria and according to their needs between a fixed, intermediate or floating exchange rate regime. In this context, and in order to stabilize the variations of the dirham, due to the disturbances related to the French Franc to which it is anchored, Morocco decided in 1973 to put an end to this pegging and henceforth, to determine the value of the dirham from a basket of currencies of the main traders. In 1980, the Moroccan monetary authorities proceeded to readjust the weighting rates of the currencies entering the quotation basket to take into account the variations having affected the structure of settlements and exchanges with foreign countries.

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### **2.2. Devaluation process and structural reforms**

In reaction to the above, attempts were made to stabilize the exchange rate, and to this end the national monetary authorities had to readjust downwards the rate of the dirham in relation to the main listed currencies in order to give a new impetus to exports, a devaluation of 16.5% in 1983. In the same context, the Structural Adjustment Program (SAP) was implemented in the same year, with the aim of seeking macroeconomic balances, namely the balance of payments, budget deficit, inflation and external debt. In order to accompany the efforts to restructure the economy and improve the competitiveness of exports, a devaluation of the dirham of 9.25% was carried out on 2 May 1990. The limitation of the economic exchange rate policy, the structural difficulties of the Moroccan economy and the rise in import prices of raw materials used for intermediate consumption of exported products penalized Moroccan exports.

### **2.3. Towards further liberalization of the foreign exchange market**

To better reflect market forces and to accompany the process of trade liberalization, more flexible exchange rate management was adopted in the mid-1990s. Morocco introduced convertibility of the dirham for current transactions in 1993. In addition, in 1999, a basket reorganization was introduced, replacing the old European currencies with the euro. Since the introduction of the euro, Morocco has enjoyed a substantial advantage due to the improvement in the value of the euro against the dollar, as the external debt burden has improved significantly. Oil imports expressed in dollars give a slight advantage to Morocco, given that the value of the euro has appreciated significantly against the dollar and given that most of Morocco's export earnings, remittances from Moroccan nationals, and tourism earnings come from the euro zone. Moreover, in order to strengthen the dirham's anchorage to the euro and thus limit its volatility against the currency of our main trading zone, the domestic monetary authorities proceeded on April 25, 2001 to a reorganization of the quotation basket which resulted, on that date, in a depreciation of the dirham of about 5%. The new weights were respectively for the euro and the dollar of 80% and 20%. The basket weights were thus revised in 2015 to 60% EUR and 40% USD.

### **2.3. Transition to floating**

Morocco has initiated a first step towards the adoption of a flexible exchange rate regime, by widening the fluctuation bands to +/- 2.5% in relation to a central rate determined by the Moroccan monetary authorities on the basis of a basket of currencies composed of 60% Euro and 40% Dollar. This decision, which took effect on January 15, 2018, is a first step towards breaking with the fixed exchange rate regime adopted since independence. This transition would allow the Moroccan economy to eventually acquire a macroeconomic instrument that acts as a shock absorber and promotes rapid adjustment at lower cost. In the absence of

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this mechanism, adjustment to macroeconomic shocks has sometimes required a contraction in demand and, thus, a cyclical slowdown in growth, in order to restore external balances. The widening of fluctuation bands is a first step towards a managed long-term floating regime. Thus, the Moroccan monetary authorities have also decided to proceed, as from March 9, 2020, to a widening of the fluctuation band of the dirham from +/- 2.5% to +/-5% (second stage) in relation to a central rate fixed by Bank Al-Maghrib on the basis of a basket of currencies composed of the euro (EUR) and the American dollar (USD) up to 60% and 40% respectively.

### 3. Daha and methodology

#### 3.1. Data and variables

To carry out this empirical work, statistical data from the World Bank was used as a primary source. These data are annual and cover a period from 1990 to 2020.

Dependent variables:

Based on this work, there are 4 linear regressions that includes a dependent variable, namely:

- XAP: Exports of automotive products and parts
- XAAP: Exports of agricultural and agri-food products
- XPPD: Exports of Phosphate products and derivatives
- XTLP: Exports of textile and leather products

The explanatory variables are as follows:

- REER: The real effective exchange rate. This financial variable is measured by the logarithmic function, that is to say the log, and which represents the price elasticities, that is to say the prices of the exports marketed abroad and their costs, and finally it represents the exchange risk;
- Y: The European demand addressed to Morocco. This real economic variable represents the purchasing power of foreign economic agents, that is to say the foreign income of the European Union allowing to increase or to decrease the purchasing power of these countries vis-à-vis Morocco;
- TARIF: Is a qualitative institutional variable that allows to measure the effect of the commercial policy on the studied exports, since it measures by the tariffs and the customs of the customs.

#### 3.2. Econometric methodology

The analysis of stationarity is the first step before estimating our econometric model. The method applied allows us to analyze the level of stationarity and the existence of cointegration between all the variables.

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**Table 1.** Results of the ADF and PP stationarity test

Variable	ADF (% 5)		Phillips-Perron (% 5)		
	Level (Intercept)	1st. Difference (Intercept)	Level (Intercept)	1st. Difference (Intercept)	Level
REER	-0.865489 (-1.941145)	-4.195439 (-1.943427)	-0.885439 (-1.941145)	-4.194869 (-1.943427)	I (1)
Y	-1.872668 (-3.052145)	-4.036969 (-2.994742)	-0.826379 (-2.846145)	-4.726435 (-2.829467)	I (1)
TARIF	-2.983668 (-5.987263)	-5.873467 (-3.293874)	-2.873645 (-4.992837)	-4.873526 (-2.982637)	I (1)
XAP	-1.873475 (-3.983745)	-3.873456 (-2.873645)	-1.763543 (-3.874563)	-3.874536 (-2.982635)	I (1)
XAAP	-0.201994 (-1.628383)	-5.872536 (-2.98231)	-0.629834 (-2.987083)	-5.938744 (-2.536601)	I (1)
XPPD	-0.872567 (-1.192875)	-5.837652 (-1.762836)	-0.265399 (-2.909823)	-5.682831 (-2.837227)	I (1)
XTLP	-1.827512 (-2.825671)	-3.787392 (-3.523912)	-1.281726 (-3.092837)	-6.21700 (-2.983501)	I (1)

**Notes:** The numbers in the table are statistical t values, and critical values are indicated in parentheses. The significance level is 5% (i.e. 0.05).

From this table, we notice that the variables are integrated of order one [I (1)], so this shows that these variables are stationary in first difference.

Based on the BIC selection criterion, we find that the optimal number of lags is equal to unity, since this result was found based on the VAR(P) modeling.

**Table 2.** Results of the selection criterion

Lag	AIC	SC	HQ
0	-6.611408	-6.373515	-6.538682
1	-16.99533*	-14.16796*	-15.15897
2	-15.13685	-12.52002	-14.33686
3	-15.95122	-13.14492	-15.78760*

**Source:** authors from EViews 10 software

Johansen's approach consists of a cointegration test based on trace analysis and maximum eigenvalue analysis (maximum Envale). In addition, this model is estimated in order to determine the existence of a long-term relationship between all the variables integrated in the econometric model. This third step, after the study of the stationarity of the variables and the selection criterion, this cointegration test should lead us to the final choice of the model.

According to the results of this test, all the explanatory and dependent variables are not cointegrated in the long run. Therefore, the type of model to be applied is the vector autoregressive model (VAR).

## 4. Results and discussion

### 4.1. Empirical results

In this section, we will first present the estimation of the VAR model. Secondly, we will analyze the results obtained from the estimation of the parameters of our model.

$$X_{it} = \alpha_0 + \alpha_1 REER_t + \alpha_2 Y_t + \alpha_3 TARIF_t + \varepsilon_t$$

$\alpha_0$  : Constant of the model;

$X_{it}$  : represents the exports (i) either global or by products at the date t, namely:

- Exports of automotive products and parts
- Exports of agricultural and agri-food products
- Exports of Phosphate products and derivatives
- Exports of textile and leather products

$\alpha_1, \alpha_2, \alpha_3$  : Elasticities are parameters of the model to be estimated;

Y: European demand addressed to Morocco in period t;

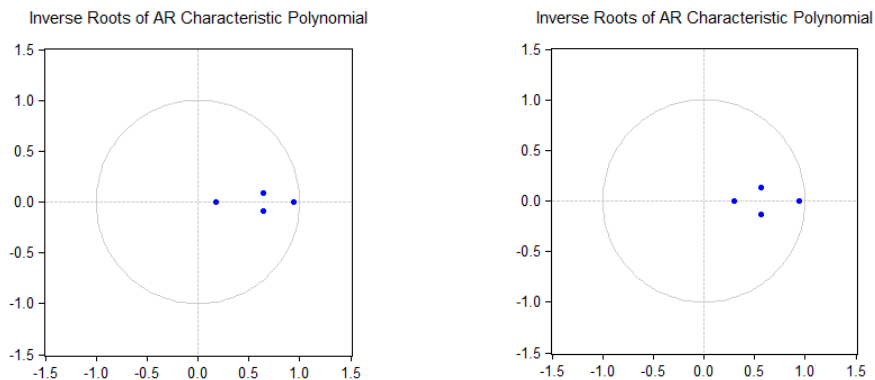
REER: real effective exchange rate;

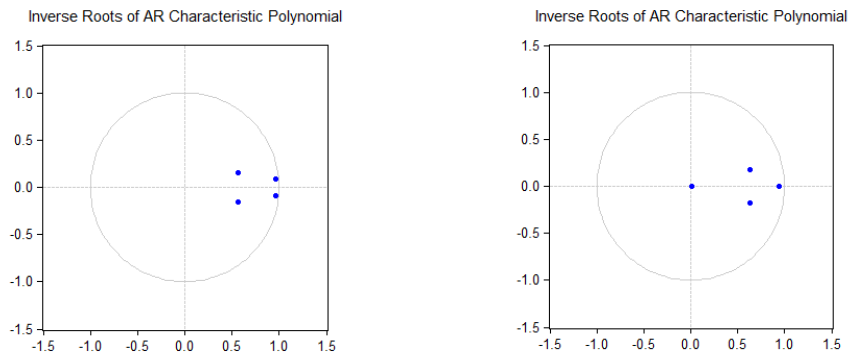
TARIF: is an institutional variable that measures the impact of trade policy on the exports studied, measured by tariffs and customs duties;

$\varepsilon_t$  : Error term.

To continue the rest of the work on the model to be estimated and to interpret the results obtained, it is essential to carry out some tests to validate the model. These are three tests, the stationarity test, the normality test and the autocorrelation test.

The stationarity of the VAR (1) model is tested by the inverse of the roots of the characteristic polynomial. If the inverse of all the roots lies inside the unit circle, the conditions of stationarity of the model are therefore verified.





**Figure 1.** Stationarity tests of the VAR (1) model for the five regressions

Source: authors from EViews 10 software

The inverse of all the roots is in the unit circle according to the stationarity test. The conditions of stationarity are verified, the VAR (1) model is stationary and is therefore retained.

Normality test:

This validation test of the VAR model allows to see if the residuals (error terms) of the model follow a normal distribution. In our study, we refer to the Jarque-Bera normality test. The results of the normality test of the model are represented by the following table.

**Table 3.** Normality tests of variables

Component	Jarque-Bera	df	Prob.	Component	Jarque-Bera	df	Prob.
1	3.387626	2	0.1838	1	0.463023	2	0.7933
2	0.375105	2	0.8290	2	0.510535	2	0.7747
3	0.888689	2	0.6412	3	0.776335	2	0.6783
Joint	5.179731	8	0.7382	Joint	3.371523	8	0.9089

Component	Jarque-Bera	df	Prob.	Component	Jarque-Bera	df	Prob.
1	2.887425	2	0.2360	1	2.094412	2	0.3509
2	0.497263	2	0.7799	2	0.456405	2	0.7960
3	0.291536	2	0.8644	3	0.956518	2	0.6199
Joint	4.187793	8	0.8398	Joint	3.859724	8	0.8696

Source: authors from EViews 10 software

The results of the normality test on the model indicate that the variables follow the normal distribution, given that the Jarque-Bera probabilities are greater than 5%.

The absence of autocorrelation between the errors is one of the conditions necessary to validate an econometric model. In order to do so, an autocorrelation test of the errors is necessary.

In the present study we refer to the Lagrange Multiplier LM test.

**Table 4.** Autocorrelation (LM) tests of the regressions

Lags	LM-Stat	Prob	Lags	LM-Stat	Prob
1	12.72350	0.6929	1	10.91208	0.8149
2	23.31378	0.1056	2	18.62569	0.2886

Lags	LM-Stat	Prob	Lags	LM-Stat	Prob
1	12.34154	0.7202	1	13.11732	0.6642
2	19.67211	0.2354	2	18.40037	0.3010

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We notice that there is no autocorrelation between the errors of the model since the probabilities are higher than 5%. The different tests carried out show that the model is stationary, the errors are not self-correlated and follow the normal distribution. Thus, the model is validated and retained; it can be the object of analysis and economic interpretation.

### 4.2. Discussion

The objective is to show the sensitivity of exports in relation to European demand addressed to Morocco and in relation to the exchange rate and also in relation to the variable tariffs and customs duties. Using the Vector Autoregressive (VAR) econometric model, the estimates allow us to see which product groups are susceptible to exchange rate fluctuations. A depreciation, in real terms, is favorable to competitiveness since it indicates a relative decline in domestic prices compared to those of competing countries.

Based on the Vector Autoregressive (VAR) model, the statistical results obtained are presented in the following table:

**Table 5.** *Elasticity estimates*

	Constant	X(-1)	Y	REER	TARIF	R <sup>2</sup>
Exports of automotive products and parts (XAP)	18.42	0.93	0.07	-4.43	-0.018	0.89
Exports of agricultural and agri-food products (XAAP)	9.66	0.34	0.32	-0.45	-0.07	0.74
Exports of Phosphate products and derivatives (XPPD)	25.91	0.25	0.11	-6.02	-0.23	0.71
Exports of textile and leather products (XTLP)	16.31	0.55	0.43	-0.68	-0.13	0.88

Source: authors from EViews 10 software

With:

X (-1): lagged variable, represents the exports of the previous year.

R<sup>2</sup>: adjusted correlation coefficient.

The estimation results show that the parameters of the estimated models are globally significant. The coefficients of determination R<sup>2</sup> calculated exceed 70%. This means that estimated VAR models can explain almost 90% of exports of automotive products and parts for example. And also, the explanatory variables used in the case of the estimation of the model of exports of textile and leather products allow to explain 88% of the dependent variable. While the rest could be explained by other variables that have not been taken in the model.

- For exports of automotive products and parts, estimates show that a 1% increase in European demand leads to a 0.07% increase in exports of these products. This shows that these products are highly dependent on quality rather than price. Indeed, the competitiveness of these products requires investment in high technology, research and development and human capital. Moreover, the rapid growth in exports of this product group is due mainly to the rise of foreign investment in the automotive and aerospace sectors in Morocco.

- Concerning exports of textiles and leather products, the real effective exchange rate elasticity, which represents the price elasticity, is equal to (-0.68), this result obtained is negative, i.e. an increase of 1% in this



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explanatory financial variable leads to a drop of 0.68% in exports of the textile sector, so it is a negative impact, in other words this sector is sensitive to the variation of the real effective exchange rate. Moreover, the elasticity of European demand addressed to Morocco, which represents the elasticity of foreign demand addressed to Morocco, is equal to 0.43. This result is positive, i.e. an increase of 1% in this real variable leads to an increase of 0.43% in textile exports, because an increase in foreign income from the EU leads to an increase in the purchasing power of these economic agents and consequently their demand for exported products. Finally, concerning the qualitative institutional variable, i.e. tariffs and customs duties, its coefficient is equal (-0.13), which is a negative result and means that the increase in tariffs and customs duties as part of a trade policy could subsequently lead to a decrease in the volume of exports of this economic sector studied.

- For exports of agricultural and agri-food products, the results show that price elasticity is relatively low (-0.45), while elasticity with respect to European demand is almost zero (0.32). Indeed, even if Morocco has a comparative advantage for this group of products, the price and demand response is not significant. This is because export quotas, foreign competition in destination markets, and quality problems in local production, among others, are the resident factors behind these results. Finally, the impact of the variable tariffs is also negative with an elasticity equal to (-0.07) this result is statistically zero.

- With respect to exports of phosphate products and derivatives, the estimates show that they are very elastic with respect to the exchange rate. In fact, with a negative elasticity equal to (-6.02), a drop in the exchange rate, in real terms, of 1% leads to an increase in exports of 6.02%. This shows the high sensitivity to price. Also, a 1% increase in European demand for Morocco will lead to a 0.11% increase in exports of phosphate products and derivatives, and the same is true for the last explanatory variable, tariffs, where a decrease in this variable could lead to a 0.23% increase in exports of the products studied.

## 5. Conclusions

The objective of this paper was to study the impact of exchange rate policy on sectoral competitiveness. Although this subject has been around for several years, it is still under debate for research economists, particularly because of the importance of the macroeconomic policy of the exchange rate in international economic relations, and the advances made by research work in advanced macroeconomics.

Price competitiveness is today, as in the past, a sensitive and strategic issue for all economies. It is closely linked to the exchange rate. In the case of Morocco, the estimation of exports in relation to the real effective exchange rate and in relation to European demand makes it possible to detect the sensitivity of each sector of economic activity. The results obtained lead us to question the prospects for an exchange rate policy

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adapted to the requirements of the internal and external balances of the economy, on the one hand, and the objectives of sustainable economic growth, on the other. Based on the results obtained from this work, the prospects for economic growth in Morocco are closely linked to external dynamics, i.e. exports. The latter are unquestionably linked to foreign demand for Morocco and the exchange rate. Indeed, calculations of the elasticities of the exports studied, in relation to foreign demand and in relation to the exchange rate, have confirmed this prediction.

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