DYNAMIC APPROACH TO COTTON COMPETITIVENESS IN MALI

APPROCHE DYNAMIQUE DE LA COMPETITIVITE DU COTON AU MALI

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ABSTRACT
The objective of this document was to seek, the factors which determine the competitiveness of the cotton sector of Mali on the international market via an error correction model (ECM). The regression of our model indicates that the two variables, the weighted per capita income of the partner countries and the national production are significant and have a positive impact, in the short and long term, on the competitiveness of Mali. On the other hand, the TCR and world production exert a negative influence on the competitiveness of the market in the long term. In view of these results, we can say that the competitiveness of Mali's cotton is dependent on a good level of productivity, and on the real weighted per capita income of trading partners.

Keywords: Competitiveness, sector, cotton, MCE.

1. INTRODUCTION
In any research activity in the field of economics, the main question is to determine the allocation of resources in such a way as to ensure social well-being, in particular full employment and a high standard of living. Researchers seek to know which sector is best able to contribute to national economic growth and often base their analysis on the concept of competitiveness. In the literature there is no single definition of competitiveness because this concept encompasses different aspects of economic life. The Organization for Economic Co-
operation and Development (OECD) defines competitiveness as the "capacity of companies, industries, regions, nations and supranational groups to generate, while being and remaining exposed to international competition, relatively high levels of factor income and employment" (MCE., 1996). The theoretical bases of competitiveness are found in traditional theories of international trade which consider the development of trade as resulting from differences in absolute and comparative costs. The theoretical basis of comparative advantages assumes that all countries must offer at least one good to international trade for it to be viable. Trade negotiations conducted over the past two decades within the framework of the General Agreement on Tariffs and Trade (GATT) and the World Trade Organization (WTO) have led the public authorities to pay increasing attention to assessment of their national competitiveness. In particular, the competitiveness of the agricultural sector, which is generally protected in developed countries, is of crucial importance given the potential consequences of reduced protection. On the basis of a review of studies carried out in the agricultural field of Africa south of the Sahara, and particularly in Mali, this document studies the competitiveness of the cotton sector in Mali, given that it is not indifferent to this international competition, furthermore few studies have been conducted for Mali at this point. The sector, cotton with a production of 580,000 tonnes in 2004, the year of greatest production in the last ten years, represents 08 to 10% of the gross domestic product (GDP). About three million Malians live directly or indirectly from cotton growing. Second cotton producing country after Burkina Faso, however Mali, is vulnerable to the fluctuations of the “white gold” and is threatened by the European, but especially American subsidies granted to their producers which makes African cotton uncompetitive. These subsidies encourage the overproduction of cotton, which is the cause of the fall in international prices and thereby reduce the export earnings of cotton-dependent countries such as Mali.

Given this situation, what are the strengths and constraints of this sector on the international level? Our objective is to evaluate in the short and long term, the international competitiveness of the cotton sector of Mali via the determining factors of the market share of this sector for Mali. To better understand the subject, this paper is divided into three points, the first teaches us the importance of cotton in Mali and in the world, the second gives us a brief empirical review of the literature on competitiveness based on the relationships of supply of exports and

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1 To designate cotton.
the last relates to an estimation of the determinants of the competitiveness of this sector by an error correction model (ECM).

2. IMPORTANCE OF COTTON IN MALI AND IN THE WORLD
Cotton is mainly produced for its fibre, which is used around the world as a textile raw material. Cotton is an important commodity for the global economy. Cultivated in more than 100 countries, it is a basic agricultural product that is widely traded, with more than 150 countries involved in the import or export of cotton.

1-1. COTTON IN MALI
Cotton has represented on average over the last ten years, within the primary sector, 16% of total value added and 7% of GDP. While seed cotton production is generally based on 160,000 farms, the sector as a whole supports more than three million people (Sanogo et al., 2009) with knock-on effects on all the other sectors upstream and downstream of the sector, either directly (small industries and crafts in rural areas, cereal production, textile industries, oil mills, transport, banks, etc.) or indirectly with the income effects from which the economy as a whole benefit. In addition, downstream from the sector, microfinance institutions established in rural areas receive and manage savings from cotton growers. We can always point out downstream of the sector, the oil mills of local livestock feed manufacturers who receive the seeds from the CMDT, and the transport sector whose companies largely supply the ginning factories from the villages and route fiber to export ports.

1.2. EVOLUTION OF COTTON PRODUCTION AND CONSUMPTION IN THE WORLD
Cotton production and marketing have undergone major changes. Developing countries are playing an increasingly important role in the production, circulation and spinning of cotton. In 2012-2013, developing countries accounted for the majority of cotton use (96%) as well as imports (97%) and production (81%), while they represent only 52% of world exports. In 2014 production fell in almost all major cotton-producing countries, primarily in Pakistan, the United States and China, where the decline represented 5%, 19% and 17%, respectively. Adverse weather conditions, weaker global market demand and policy uncertainties were all factors that contributed to this collapse. Falling synthetic fiber prices as a result of deteriorating oil prices have placed world cotton markets under strong competitive pressure. The importance of trade

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2Countries declaring themselves as "developing" at the WTO ³ 2014 _
flows (export and import) depends on the development of local cotton-based industries such as textile industries and crushers. Thus China, South and East Asia, the Middle East, Russia and Europe consume more than they produce unlike the US, Africa and Australia. (see Figure 1)

**Figure 1:** world cotton production by zone 2012/2013.

Globally, cotton production directly provides almost 350 million jobs (cultivation, transport, ginning, packaging, storage). And that's without taking into account the millions of jobs related to agricultural machinery, the agricultural supply sector, industrial equipment, seed processing and the textile industry (Estur, 2006). According to figures from the CCIC (international cotton advisory committee), Africa is not in the peloton of major producers dominated by China (1st), India (2nd), the United States (3rd), Pakistan (4th) and Brazil (5th) (see Table 1).

**Table 1:** Evolution of the production of the five (5) main cotton producing countries in the world in million tons

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>8,025</td>
<td>6,925</td>
<td>6,400</td>
<td>7,400</td>
<td>7,300</td>
</tr>
<tr>
<td>India</td>
<td>4,930</td>
<td>5,185</td>
<td>5,865</td>
<td>6,354</td>
<td>6,095</td>
</tr>
<tr>
<td>USA</td>
<td>2,790</td>
<td>2,654</td>
<td>3,942</td>
<td>3,391</td>
<td>3,770</td>
</tr>
<tr>
<td>Pakistan</td>
<td>1,926</td>
<td>2,070</td>
<td>1,967</td>
<td>2,311</td>
<td>2,204</td>
</tr>
<tr>
<td>Brazil</td>
<td>1,214</td>
<td>1,960</td>
<td>1,960</td>
<td>1,877</td>
<td>1,303</td>
</tr>
<tr>
<td>World</td>
<td>23,503</td>
<td>22,247</td>
<td>25,368</td>
<td>28,041</td>
<td>26,838</td>
</tr>
</tbody>
</table>

Source: ICAC completed by the author.
However, it is the 5th largest exporter in the world after the United States, India, Brazil, Australia, and ahead of Uzbekistan. These relative rankings can change quite rapidly: for example, since 2007, India has become the world's second largest cotton producer after China, but ahead of the United States (becoming 3rd), while Central Asia (Uzbekistan) was the 2nd largest exporter after the US, but ahead of India (3rd) and Francophone Africa (4th) (Poulton et al. 2008). But nowadays (2016) Uzbekistan has become 6th exporter behind Francophone Africa 5th. (figure 2)

**Figure 2:** main cotton lint exporting countries in the world in 2013.

![Main Cotton Lint Exporting Countries in the World in 2013](image)

Source: author, based on data from ccic (volume 69-number 3 January-February 2016)

This situation changes each year depending on both endogenous factors (policy of each producing country, etc.) and exogenous factors (for example the global financial crisis, climatic hazards, etc.) if we refer to the CCIC figures for 2016. Since the end of the Second World War, the increase in production is mainly explained by the improvement in world yields of seed cotton (multiplied by approximately 4 between 1945/46 and 2013/14, thus increasing on average from 210 kg of seed cotton per hectare to nearly 801 kg of seed cotton per hectare according to the CCIC figures), rather than by an increase in cultivated areas (22.3 million hectares in 1945/46 against 32.65 million hectares in 2013/14), an increase of around 65%). However, yields in West and Central Africa, which had increased to 450 kg/ha in the 1980s, have since stagnated and even slowly declined over the past 20 years, when spectacular explosions have been observed. yields in certain countries such as China, India, Brazil, Australia, etc.
Figure 3: Evolution of world cotton production and consumption in thousand tons.

Source: author, based on ICAC data.

World cotton consumption increased and reached a record level of 26,677 thousand tons in 2007 against 23,813 for the year 2016. Demand is mainly driven by the Asian textile industry, with China in first place absorbing more than 30% of world consumption, compared to only 10% in the 1960s. This corresponds exactly to the opposite ratio for the United States and the European Union, whose share of world demand has fallen to less than 10% today. This is consistent with the phenomenon of the relocation of textile activities to southern countries, which, according to the CCIC, accounted for 87.70% of the world's use of cotton fibers in 2012. India and Pakistan follow China and together account for 23% of global demand. Finally, Turkey, the leading textile producer in the Mediterranean, today weighs as much as the United States, with a consumption of 1.4 million tonnes compared to only 100,000 tonnes in the 1960s.

Figure 4: World cotton consumption by area 2015/2016.

Source: author, based on data from ccic (volume 69-number 3 January-February 2016)
In Africa, between 2 and 3 million households in West and Central Africa grow cotton and about 16 million people depend directly and indirectly on cotton (Organization for Economic Cooperation and Development, 2006). In 2016, the main producing countries in Africa are mainly made up of Burkina Faso, Egypt (irrigated cotton), Mali, Zimbabwe, Tanzania, and Benin, which alone represent 54% of African cotton production.

Figure 5 Main cotton producing countries in Africa in 2016.

Source: author, based on data from ccic.

3. EMPIRICAL REVIEW OF COMPETITIVENESS BASED ON THE SUPPLY RELATION OF EXPORTS

Several export supply relationships have been estimated. In Cameroon, Amin (1996) estimated a function of the exports of several agricultural products. His results show that trading partner income and several relative price variables do not affect export supply significantly. The ratio of the price of cocoa to the price of non-tradables is the only variable that proved to be significant. The export supply function estimated by Gbetnkom and Khan (1999) shows that export price, export credit, road infrastructure, international market structure and agroclimatic factors are important in determining the export offer. The structural adjustment program does not seem to be big enough.

Khan and Baye (2005) for their shares estimated a function of market shares for Cameroon and Ghana. They show in their study that structural adjustment programs (SAPs) do not affect market shares significantly for Cameroon. The dummy variable that captures the strategic stock effect of the International Trade Organization (ICO) also has an insignificant effect on market share. The volatility of the real exchange rate (RER) and its misalignment were the significant variables.

Yusuf and Edom (2007) in their study examine the effect of changes in export prices of forest products, domestic prices, local quantity consumed, national production and the external
exchange rate on the volume of products exported from Nigeria. Their analysis is made on the exports of exported logs, the quantity of logs lagged by one period, the domestic production and consumption ratio of logs, the domestic production and consumption ratio lagged by one period, and the national and international price ratio on the one hand. On the other hand, they show that there is also a strong relationship between the volume of sawn timber exported and its main determinants which are: The lagged value of the official exchange rate, the ratio of domestic production and consumption of sawn timber, the value of the ratio of domestic production consumption of sawn wood, and the ratio of world exports and production of sawn wood.

4. ECONOMETRIC FRAMEWORK FOR COMPETITIVENESS OF THE COTTON SECTOR IN MALI

To achieve our objective, it will be a question here of making an econometric regression of the determinants of the competitiveness of Malian cotton and interpreting the various results obtained. Applied economics uses theoretical developments to analyze concrete cases in order to obtain political, economic and even social recommendations, to test economic theory or to suggest new ways of improving it. In view of the rapid development, it is essential for anyone interested in economic studies to be able to understand its strengths and weaknesses, because econometric methods applied incorrectly often lead to unfounded results.

4.1. BUILDING THE MODEL

In the context of econometrics, we can consider that a model consists of a representation of a phenomenon in the form of an equation whose variables are economic quantities. Based on the model developed by Khan and Baye (2005) to specify the market share function of cocoa in Cameroon and Ghana, we will examine the determinants of Mali's cotton market share in the world market. We will represent this competitiveness by the ratio of cotton exported by Mali to total cotton exports in the world. The cotton export market share is specified as follows:

\[ PMS = f (REV; PMA; TCR; PMO). \]

The model developed defines a relationship between Mali's market share and the other variables. (World cotton production, weighted per capita income of partner countries, Malian cotton production, real exchange rate for cotton).

With:

-PMS: Mali's market share on the international cotton market;
-REV: weighted real per capita income of partner countries;
-PMOC: world cotton production;
-PMAC: Malian cotton production;
-TCR: real exchange rate for cotton.

The arsenal of data is made up of annual observations between 1980 and 2006; i.e., 27 observations; due to data availability.

4.2. ESTIMATION METHODOLOGY:

After the specification of our theoretical model. We intend to estimate the short- and long-term relationships between market share and the other explanatory variables using an Error Correction Model (ECM). This requires doing the analysis of stationarity and cointegration of the variables of the model beforehand.

Stationarity tests:

The decision rule is as follows:

if the probability P-value > at the threshold, we accept H₀ the process is not stationary.
If the probability P-value < the threshold we reject H₀ the process is stationary.cf. Doucouré (2008).

Table 2: Study of stationarity at variable level with the ADF test

<table>
<thead>
<tr>
<th>Variables</th>
<th>P-value</th>
<th>Threshold</th>
<th>Decisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMS</td>
<td>0.3855</td>
<td>5%</td>
<td>Non-stationarity</td>
</tr>
<tr>
<td>REV</td>
<td>0.9159</td>
<td>5%</td>
<td>Non-stationarity</td>
</tr>
<tr>
<td>LDCs</td>
<td>0.3130</td>
<td>5%</td>
<td>Non-stationarity</td>
</tr>
<tr>
<td>TCR</td>
<td>0.4231</td>
<td>5%</td>
<td>Non-stationarity</td>
</tr>
<tr>
<td>PMO</td>
<td>0.6897</td>
<td>5%</td>
<td>Non-stationarity</td>
</tr>
</tbody>
</table>

The P value is above the threshold (5%) for all variables. We do not conclude that any of the variables in the model are level stationary.

Table 3: stationarity in first difference of the variables with the ADF test

<table>
<thead>
<tr>
<th>Variables</th>
<th>P-value</th>
<th>Threshold</th>
<th>Decisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMS</td>
<td>0.0001</td>
<td>5%</td>
<td>Stationarity</td>
</tr>
<tr>
<td>REV</td>
<td>0.0000</td>
<td>5%</td>
<td>Stationarity</td>
</tr>
<tr>
<td>LDCs</td>
<td>0.0000</td>
<td>5%</td>
<td>Stationarity</td>
</tr>
<tr>
<td>TCR</td>
<td>0.0000</td>
<td>5%</td>
<td>Stationarity</td>
</tr>
<tr>
<td>PMO</td>
<td>0.0000</td>
<td>5%</td>
<td>Stationarity</td>
</tr>
</tbody>
</table>

3The calculation was made on the four countries (China, Thailand, Pakistan, Indonesia) taking into account the availability of data on GDP/head on the beach of our study.
The P value is below the threshold (5%) for all variables. The variables are therefore all stationary in first difference. The study of the stationarity of the variables reveals that all our variables are stationary in first difference. We will now move on to the cointegration test which is essential for the specification of an ECM.

*Cointegration test:*

The hypothesis test is as follows 4:

\[ H_0: \text{No cointegration} \quad H_1: \text{Cointegration} \]

The Stata software offers two test statistics: Max-lambda statistics and Trace statistics. These statistics should be compared to the Osterwald critical values. We do not reject the hypothesis \(H_0\) if the calculated statistic is lower than the critical value.

**Note:** if the rank of cointegration is 0, then the hypothesis \(H_0\) of non-cointegration is not rejected. \(H_0\) of non-cointegration is rejected.

Results of the cointegration test:

**Table 4: cointegration test using Max-lambda statistics**

<table>
<thead>
<tr>
<th>Max lambda statistics</th>
<th>Critical-value</th>
<th>Cointegration rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>65.63</td>
<td>33.46</td>
<td>65.63 &gt; 33.46 → r = 1</td>
</tr>
<tr>
<td>7.47</td>
<td>27.07</td>
<td>7.47 &lt; 27.07 → r = 0</td>
</tr>
<tr>
<td>5.81</td>
<td>20.97</td>
<td>5.81 &lt; 20.97 → r = 0</td>
</tr>
<tr>
<td>2.06</td>
<td>14.07</td>
<td>2.06 &lt; 14.07 → r = 0</td>
</tr>
<tr>
<td>0.001</td>
<td>3.76</td>
<td>0.001 &lt; 3.76 → r = 0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>Rank = 1+0+0+0+0 = 1</strong></td>
</tr>
</tbody>
</table>

The rank of cointegration is 1, the variables PMS, REV, PMA, TCR, PMO are cointegrated.

**Table 5: cointegration test under Trace statistics**

<table>
<thead>
<tr>
<th>Trace statistics</th>
<th>Critical-value</th>
<th>Cointegration rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>80.98</td>
<td>76.07</td>
<td>80.98 &gt; 76.07 → r = 1</td>
</tr>
<tr>
<td>15.35</td>
<td>53.12</td>
<td>15.35 &lt; 53.12 → r = 0</td>
</tr>
<tr>
<td>7.88</td>
<td>34.91</td>
<td>7.88 &lt; 34.91 → r = 0</td>
</tr>
<tr>
<td>2.06</td>
<td>19.96</td>
<td>2.06 &lt; 19.96 → r = 0</td>
</tr>
<tr>
<td>0.001</td>
<td>9.24</td>
<td>0.001 &lt; 9.24 → r = 0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>Rank = 1+0+0+0+0 = 1</strong></td>
</tr>
</tbody>
</table>

---

The rank of cointegration is (un) 1, the variables PMS, REV, PMA, TCR, PMO are cointegrated.

It is noted that the results obtained for the two (2) cointegration tests are convergent. The stationarity study shows that our variables are integrated of order (one) 1. The cointegration analysis shows that our variables have a stable long-term relationship. We can now estimate our model. Stationarity and cointegration tests validate the possibility of using an Error Correction Model (ECM) to study the short- and long-term relationships between market share and the main explanatory variables used.

4.3. THE MODEL SPECIFICATION

The MCE consists of estimating, through the OLS method, the short- and long-term relationships of cointegrated macroeconomic variables. There are two types of ECMs. Hendry's ECM (1986) consists in simultaneously studying the short- and long-term dynamics between them. We will use this model to specify the econometric regression of our theoretical model. Engel-Granger's ECM (1987) consists of studying the short-term and long-term dynamics separately;

For our model, the error correction equation à la Hendry (1986) is written as follows:

$$\Delta (Pst) = \beta_0 + \beta_1 \Delta (REV_t) + \beta_2 \Delta (PMA_t) + \beta_3 \Delta (TCR_t) + \beta_4 \Delta (PMO_t) + \beta_5 PMS_{t-1} + \beta_6 REV_{t-1} + \beta_7 PMAt-1 + \beta_8 TCR_{t-1} + \beta_9 PMOt-1 + t$$

Where:

- $\Delta$ is the first difference operator: $\Delta (PMS_{t}) = PMS_{t} - PMS_{t-1}$
- $\beta_0$ is the model constant;
- The coefficients $\beta_1 \beta_2 \beta_3 \beta_4$ represent the short-term dynamics of the ECM. They are also called short-term elasticities;
- The coefficient $\beta_5$ represents the error correction coefficient. It must be less than unity and negative for the MCE specification to be validated Doucouré (2008, p. 124);
- The coefficients $\beta_6 \beta_7 \beta_8 \beta_9$ characterize the long-term equilibrium of the ECM;
- The long-term elasticities of the Hendry ERM are given by the coefficients. These coefficients reveal the nature of the long-term relationship between market share and exogenous variables. $t$: represents the error term. We estimated on the stata 11 software our error correction equation by the OLS method.

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5 It is not mandatory that these two tests (Max-lambda and Trace) are convergent to conclude the cointegration.
MCE Estimation Table

<table>
<thead>
<tr>
<th></th>
<th>Number of observations = 26</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>F (9.16) = 3.50</td>
</tr>
<tr>
<td></td>
<td>Prob F = 0.0255</td>
</tr>
<tr>
<td></td>
<td>R- Squared = 0.6304</td>
</tr>
<tr>
<td></td>
<td>Adj R- squared = 0.4225</td>
</tr>
<tr>
<td>dpPMS.md</td>
<td>coefficient</td>
</tr>
<tr>
<td>dpREV</td>
<td>0.0291956</td>
</tr>
<tr>
<td>dpPMA</td>
<td>1.696395</td>
</tr>
<tr>
<td>dpTCR</td>
<td>-0.0074827</td>
</tr>
<tr>
<td>dpMO</td>
<td>-0.0236213</td>
</tr>
<tr>
<td>lPMS_L1</td>
<td>-0.8673846</td>
</tr>
<tr>
<td>lREV_L1</td>
<td>0.0151088</td>
</tr>
<tr>
<td>lPMA_L1</td>
<td>3.287575</td>
</tr>
<tr>
<td>lTCR_L1</td>
<td>-0.0113276</td>
</tr>
<tr>
<td>lMO_L1</td>
<td>-0.0259538</td>
</tr>
<tr>
<td>Cons</td>
<td>1.667108</td>
</tr>
</tbody>
</table>

Source: constructed by the author, extracted from the regression under Stata 2016 from the data

***= significant at 1%
**= significant at 5%
*= significant at 10%

4.4. INTERPRETATION OF RESULTS:

The interpretation of the results of the estimation remains essential if one wants to know the true meaning of the estimated coefficients, to ensure their significance and to formulate relevant macroeconomic policy recommendations.
The error correction coefficient

We have seen previously that the essential condition for an MCE-type specification is that the error correction coefficient be less than unity and negative. This condition is essential so that the error correction mechanism, that is to say the catch-up which makes it possible to move towards the long-term relationship, can work. Conversely, the error correction mechanism would move away from the long-term target if the error correction coefficient is positive and greater than unity.

The estimation of our model gives a negative error correction coefficient and less than unity: $\beta_5 = -0.86733846$ it is significantly different from zero (0) at the threshold of 1%: the absolute value of the student's $t$-statistic of this coefficient is (2.82) greater than 1.96 and the probability (0.012) is less than 1% and 5%. These results indicate that there is indeed an error correction mechanism. In other words, the imbalances between market share and the other variables in our model compensate each other in the long run so that these series have a similar evolution over time.

According to Doucouré (2008, P.137), the error correction coefficient also represents the speed at which any imbalance between the desired level and the effective level of market share is corrected $\beta_5 = -0.86733846$ indicates that 86.73% of the imbalance between the desired level and the effective level of the market share is adjusted via the error correction mechanism. In other words, the effects of a shock occurring on the market share during a given year are absorbed up to 86.73% during the year following the shock.

The shocks on Mali's market share will therefore be corrected via a "feedback" effect the annual duration of this "feedback" effect corresponds to the inverse of the absolute value of the error correction coefficient, i.e., $1/\beta_5 = 1.15$ years. This means that a shock occurring during a given year on the market share is absorbed after one (1) year 1 month 24 days.

**short-term elasticities.**

They are given respectively by $\beta_1$, $\beta_2$, $\beta_3$, $\beta_4$ for the real weighted per capita income of the trading partners, the production of Mali, the RER, the world production. - $\beta_1 = 0.0291$ and Student's probability (F) = 0.063 show us that the weighted per capita income of the main trading partners has a positive and significant impact at the 10% threshold on Mali's market share. In the short term, the value of the coefficient indicates that a 10% increase in per capita income of partners would increase Mali's market share by 0.29%. Thus, making Mali more competitive.
\( \beta_2 = 1.696, \) and its student probability (F) = 0.023 means that Mali's production has a positive and significant impact at 5% and 10% on Mali's competitiveness. So, in the short term this value shows that a 10% increase in Mali's production improves Mali's market share by 16.96%.

\( \beta_3 = -0.0074 \) and its student probability (F) = 0.046 this result implies that the TCR is significant at 5%, 10% and negatively impacts the market share for Mali. So, a 10% increase in the real exchange rate leads to a 0.074% reduction in Mali's market share.

\( \beta_4 = -0.0236 \) Student’s probability (F) = 0.072% which therefore means that world production has a negative and significant impact at 10%; a 10% increase in world cotton production deteriorates the market share for Mali by 0.23%. This result is consistent with the various studies conducted on the impact of American and European subsidies on the competitiveness of cotton in African countries.

In summary, the econometric regression of our model shows that all the variables exert in the short term a significant influence at a threshold of 10% on the market share for Mali.

**Long-term elasticities:**

The long-term dynamic is represented by \( \beta_6 \beta_7 \beta_8 \beta_9 \) respectively for the weighted per capita income of the main trading partners, cotton production in Mali, the real exchange rate for cotton, world cotton production.

The calculation of these elasticities gives the following results:

\( \beta_6/\beta_5 = 0.0174188; \) if the weighted real per capita income of the partner countries increases by 10%, then the market share for Mali increases by 0.17% in the long term.

\( \beta_7/\beta_5 = 3.79021; \) a 10% increase in national production leads to an increase in market share for Mali of 37.9% in the long term.

\( \beta_8/\beta_5 = -0.013059; \) an increase in the RER of 10% induces a deterioration of the market share for Mali of 0.13% in the long term.

\( \beta_9/; \beta_5 = -0.029921; \) if world production increases by 10%, then the market share for Mali decreases by 0.29% in the long term.

In summary, the regression of our model indicates that the two variables, the weighted per capita income of partner countries and national production are significant and have a positive impact, in the short and long term, on the competitiveness of Mali. On the other hand, the TCR and world production exert a negative influence on the competitiveness of the market in the long term.
Overall significance and explanatory power of the model:

Fisher's test indicates that the probability of the statistic is (0.0255) and is less than 5%; this shows that our model is globally significant. And moreover, the coefficient of determination amounts to (0.6304). This means that the explanatory variables used in our model explain 63.04% of Mali's market share over the period 1980-2006. In view of these results, we can say that the competitiveness of Mali's cotton is dependent on a good level of productivity, and on the real weighted per capita income of trading partners.

4.5. OTHER CLASSIC TESTS OF THE MODEL:

We correctly interpreted the coefficients of our error correction model. It would now be interesting to challenge the robustness of our econometric regression model, from the point of view of its level of specification and also of its behavior over time.

Breusch -Pagan heteroscedasticity test.

Breusch -Pagan heteroscedasticity test is used to verify the statistical properties of the residuals of an econometric regression. It consists in doing the regression on the residuals of the model by explaining them by the exogenous variables. Under the null hypothesis, the residuals are homoscedastic, i.e., have a constant variance over time. The decision rule is to compare the probability to the threshold value of 5% (usually). If the value of the probability is greater than 5%, the null hypothesis of homoscedasticity of the errors is accepted; otherwise, one rejects the null hypothesis which implies that the errors are heteroscedastic.

Note that the probability is 0.1512 greater than 5%. We accept the null hypothesis of homoscedasticity of errors. The errors in our model have a constant variance over time.

- Breusch -Godfrey test:

This test comes from the synthesis of the work of Godfrey (1978) and Breusch (1979). This is an error autocorrelation test whose general idea is based on the search for a significant relationship between the residual of a regression and this same shifted residual cf Doucouré (2008, p.80). Under the null hypothesis, there is no autocorrelation of errors while a rejection of the null hypothesis presumes the existence of a risk of autocorrelation of errors. The decision rule is to compare the probability of the Fisher statistic to the 5% threshold.
When it is greater than the threshold, the null hypothesis of no autocorrelation of errors is accepted. The value of the probability of the Fisher statistic is 0.0431 less than 5%. The null hypothesis of no autocorrelation of errors is rejected. So, the errors of our model are dependent.

**CONCLUSION**

The simplest measure of competitiveness is to see if a company or a country manages to maintain or increase its market share, national or global. Recent data show a significant increase in the market share of African cotton, while the major traditional exporters (United States, Uzbekistan, Australia) have seen their exports stagnate or even decline. However, this study of the concept of competitiveness in the agricultural sector (cotton), which does not claim to be exhaustive, highlights several points, given the various theoretical and empirical studies highlighted above. The definition of competitiveness is broad and varies according to schools of thought and level of analysis. However, it is generally accepted that it is a complex concept incorporating a multitude of aspects. The evaluation of competitiveness must therefore be carried out on the basis of several elements. However, it is not uncommon to find studies that calculate only one measure (e.g., export indices only, production costs only, productivity growth only), despite evidence that the ranking of competitiveness can vary according to the elements measured (for example, Masters and Winter-Nelson, 1995; Wijnands et al, 2008). It would be preferable to measure several elements and then aggregate them into a single measure of competitiveness, or aggregate the observations based on all the elements, to obtain a more complete view of competitiveness. In addition, the issue of measurement distortion due to government intervention needs to be carefully considered. Several authors emphasize that the elements of competitiveness are measured in the theoretical context of an ideal world, without any public intervention. For example, the concept of comparative advantage postulates a situation of free trade. According to some authors, this is what distinguishes it from competitive advantage, in other words, from competitiveness. Infrastructure and public spending can, for example, be greater in developing countries like ours (Mali), in particular to increase competitiveness. In addition, the influence of other types of public intervention, such as tax or labor policies, could also be assessed. The existing literature focuses mainly on price or cost competitiveness. The non-price element of the competitiveness of companies or farms is generally forgotten, even though several authors emphasize that it constitutes an important aspect of the conquest of market shares and the maintenance of profits. Product differentiation, quality and variety of products and services, design, novelty, reputation and reliability are all
dimensions of competitiveness to which researchers need to pay more attention. In the specific case of the agricultural sector, particular attention should be paid to the issue of unpaid inputs, such as family labour. Our study was to seek the factors that determine the competitiveness of Malian cotton on the international market. Analysis by the error correction model (ECM) shows that national production is significant and positively impacts the market share of cotton for the country, this relationship could be explained by the level of effort at the export (95%). Similarly, a significant and positive effect is observed for the per capita income of the partner countries in accordance with certain empirical studies such as that of Calvain.F (2006). Moreover, the result relating to the effect of the RER and world production is not surprising, it confirms previous work on the question of the volatility of the terms of trade, and the distortion of overproduction caused by American and European subsidies to their producers (L. Goreux, Traoré. F). In this context, the analysis and interpretation of the results obtained allow us to propose mechanisms for improving the sector. It is the intensification of cultivation that will allow producers to increase their income per hectare despite the stagnation or fall in world prices and will ensure the sustainability of the sector by making it more competitive given that in the long term, an increase of production by 10% leads to an increase in market share of 37.9%. This is the point on which Mali and the other African countries must emphasize. In addition, the establishment of a policy of indexation of trading partners would be an asset for the expansion of exports for Mali. Another proposed solution was to transform our cotton locally into textile products. By exporting finished products instead of fiber, the country would no longer be penalized by the subsidies granted to American and European producers, and it would industrialize. The recent expansion of textile industries in Asian cotton-producing countries proves that cotton is a strong vector of industrialization. This example inspires Mali and Africa, because beyond the jobs it could generate, it is a good opportunity to promote a broad industrialization policy. The country would also capitalize on more added value and reduce its textile imports. The measures planned within UEMOA, to allow the transformation in its zone of at least 25% of its production within 10 years, with an innovative vision: that of a textile market on a sub-regional scale are salutary. Even if it is therefore clear that, for years to come, the export market will be the main outlet for African cotton.
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