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An analysis of competitiveness in the light of the Ricardian model applied to Malian cotton

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ABSTRACT

This article examines the international competitiveness of the cotton sector of Mali in the light of the ricardian model, while using, the following indicators: the Revealed Comparative Advantage (RCA), the Comparative Advantage Revealed with importation (RMA), the Revealed Commercial Advantage (RTA), the Index of Clear Exports (NEI). Our study covers a span of 47 years (1970-2016). It comes out from our results that Mali has a competitive advantage in this sector compared to its main competitors.
From these results, we can say that Mali can largely benefit in marketing from cotton.
Key words: Competitiveness; Cotton; RCA; RMA; RTA; NEI.
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1-Introduction

In Mali, the part of the population living from cotton production is 27%. Cotton cultivation was developed in this country around 1891. Since its accession to independence in 1960, Mali, through its various development plans, has focused its efforts mainly on the growth and valorization of primary sector products, particularly cotton.

Following the 5th ministerial meeting of the World Trade Organization (WTO) held in Cancun in 2003, within the framework of the Doha round negotiations, four African countries called C-4 namely, Benin, Burkina-Faso, Mali and Chad, made a declaration against the Americans, Europeans and Chinese who disrupt the rules of free competition defined by the World Trade Organization (WTO) in favor of their cotton growers. These disturbances seem to threaten the survival of their sectors, while the positive effects of cotton production in socio-economic terms are undeniable. The correction of these market distortions will allow other African countries in addition to those of the C-4 to benefit from their good competitiveness.

The same cotton sector contributes to the cereal self-sufficiency of the country because it provides a third of the national production of cereals cultivated in parallel. Most Malian cotton farms, more than 80%, practice animal traction and it can be noted that motorization is gaining more and more ground, with tractors of 30 HP and more. Cotton is, after gold, the second source of export with 187 billion CFA francs, or 22% of export earnings and 12% of state budget receipts against 1120 billion for gold in 2016, the share in the GDP is 15%, the number of people who depend directly on this culture is 4.4 million or 27% of the population; therefore, the development of such a sector is more than necessary for the development of the national economy (CMDT, 2019).

The analysis of international economic relations is often presented as the starting block of modern economic science. Although rich in ancient history, the study of the mechanisms and challenges of the international economy is of particular importance today. The rise of cross-border trade, monetary flows and investments binds nations today more closely than ever before. The result of these multiple interactions is a global economy that is regularly shaken by severe turbulence: in each country, political decision-makers and private sector leaders must deal with the inflections and upheavals that affect distant economies. (Krugman and Obstfeld, 2009).

Marzouka and Haudeville (2005), emphasize that the international environment is characterized by globalization, generating an imperative of competitiveness for all countries as an inevitable constraint. The situation is even more evident for developing countries like Mali has to face increasingly enhanced international competition. For these countries, it is a question of adapting to the production conditions as required on the international market.

What is the competitive position of Malian cotton compared to its competitors?

The purpose of this article is to evaluate the competitive position of Mali for this sector compared to its competitors on the international market.

2-Literature review

2.1- Theoretical framework

Competitiveness, unanimously considered as a requirement in the context of globalization, is a complex economic phenomenon and a controversial issue. The concept is neither subject of a universal definition nor of consensual empirical measurements. The issue of competitiveness can be considered at several levels of concern or aggregation: micro, meso, macro and mega, on the one hand; product, company, sector, branch, sector, cluster, zone, region, and country, on the other hand. At each of these levels, the concept of competitiveness must be compared to an economic objective or a social purpose, otherwise it might remain an intellectual curiosity

without a purpose. The concept of competitiveness is relatively new in the economic literature, and was researched and taught during the mid-1980s.

This concept appeared in 1907 in French vocabulary. It was used to describe everything related to a competition, rather in the sports field. It will be necessary to wait until 1954 for it to take on its economic tendency and the 1970s for it to impose itself as a valid concept. It is the work of Michael Porter that will make competitiveness a coveted notion.

The concept of competitiveness is complex and has various definitions often used to express different situations, all close to each other: "Competitiveness is the ability to provide goods and services at the time, place and form required by foreign buyers at a price equal to or better than that of other potential suppliers while earning at least the opportunity cost of the resources employed" (Sharples and Milham, 1990).

The most influential and important in the development of competitiveness theory and traditional theories of international trade are: Smith's absolute advantage (1776), Ricardo's concept of comparative advantage (1817), Schumpeter's theories (1939), on the entrepreneur and innovation, Porter's theory (1990) on competitiveness, and the concept of Krugman (1994) who denounces competitiveness in his article "the dangerous obsession with competitiveness" on the principle of absolute and comparative advantage. The first two explain an international trading system based on the principle of (absolute and comparative) advantages. Schumpeter's main objective is to target innovative activities as determining key of competitiveness.

On the whole, the apprehension of an economical competitiveness, from the angle of foreign trade, calls upon a certain number of concepts such as openness to the outside world, specialization of the economy, etc. From these observations, 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 advantage assumes that all countries must offer at least one good to international trade for it to be viable.

Table 1.

Trade-based measures of competitiveness: a neoclassical approach	
Measure	Decision
	The RCA, for a country i and a goods j is defined as follows: $RCA_{ij} = RXA_{ij} = (X_{ij}/X_{ik})/(X_{nj}/X_{nk})$

RCA (revealed comparative advantage)	The RCA index can be denoted B_{ij} where the X's are exports, k all goods other than j, and n all countries other than i. For a: RCA > 1 the country has a revealed comparative advantage for the considered goods, due to the power of the export sector; RCA < 1 the country has a disadvantage for the considered goods.
RMA (The Vollrath Index)	This Import Advantage Index (RMA) is comparable to the RXA, except that it focuses on imports (M) rather than exports: $RMA_{ij} = (MA_{ij}/M_{ik})/(MA_{nj}/M_{nk})$ In this case, an RMA index less than 1 highlights a revealed comparative advantage and therefore significant competitiveness.
RTA (The revealed commercial advantage)	The difference between RXA_{ij} and RMA_{ij}, constitutes a more complete indicator of the revealed comparative advantage: $RTA_{ij} = RXA_{ij}\text{-}RMA_{ij}$ We can classify the RTA index into three categories: if RTA>0, then a comparative trade advantage is indicated, that is, a sector in which the country's trade is relatively more competitive. RTA = 0 relates to all these products in an equilibrium point. RTA < 1 refers to the absence of commercial comparative advantage or to products with comparative disadvantage.
NEI (The net export index)	It corresponds with the exports of the country or sector devoid of its imports et divided by the total value of exchange (Banterle et Carraresi, 2007). $NEI_{ij} = \frac{Xij-Mij}{Xij+Mij}$ Where X denotes exports; M imports; j a sector or product; i the country considered. The NEI index varies from -1 (when a country is the only importer) to 1 (when a country is the only exporter) and 0 when imports equal exports.

Source: authors based on theoretical reviews

2.2- Empirical framework

Our measure of competitiveness is based on the definition proposed by (Pricewater houseCoopers Development (PwC), 2012) "Competitiveness, often confused with its financial translation, profitability or productivity, corresponds to the capacity available to a company at a given moment to resist its competitors. Competitiveness is therefore a potential which is characterized by an advantage compared to competitors in its market. Profitability or productivity are only partial measures of a much larger whole called competitiveness."

Empirically, there is an abundance of methods and indicators for monitoring foreign trade in general and export performance specifically, combining descriptive and/or explanatory aspects and corresponding to different targeted objectives in the analysis. In connection with the central theme of our research work, which concerns the issue of the external competitiveness of the cotton sector in Mali, the indicators have been grouped according to the following main objective: the evolution of export performance. It should be noted that the plethora of indicators for measuring competitiveness does not allow us to establish a paradigmatic opposition between them. Nevertheless, we can classify them according to the two main approaches (neoclassical approach and approach of the school of strategic management).

The empirical foundations of competitiveness (neoclassical approach) an application to agriculture

Bavorova (2003), evaluates the international competitiveness of the Czech sugar industry during the period 1988-1999 through the indicators RXA, RMA and RTA.

The annual RXA are regularly less than 1, which reflects the competitive disadvantage of the Czech sector, while the RMA and the overall RTA show a competitive advantage for the period 1994-1998.

Ferto and Hubbard (2003) examine the comparative advantage of the Hungarian agro-food sector (for 22 product categories) vis-à-vis the EU during the period 1992-1998, based on four indices: RXA, RMA, RTA and RC. The results obtained show an advantage for 11 of the 22 product groups, for Hungary, in particular cereals, meat, sugar and live animals. During the period studied, the average RCA index (for all product categories) steadily declined, from 4, 0 in 1992 to 2, 0 in 1998, reflecting an erosion of the country's comparative advantage.

Nanno et al. (2004) determine the competitiveness of agriculture and the agri-food sector in Mercosur and EU countries during the period 1991-1999. They calculate TCR and relative real exchange rate indices and show that Mercosur countries have experienced a decline in

competitiveness (i.e. an increase in the exchange rate) since 1998 (except Paraguay for which it remained stable). In 1999, the devaluation of the Brazilian currency increased the country's competitiveness. For EU countries, despite convergence within the Eurozone countries since 1997, the figures reveal the existence of a group of weakly competitive countries: Ireland, Italy, Portugal and Spain.

Banterle and Carraresi (2007), for the evaluation of the competitiveness of the pork sector prepared in the countries of the European Union, during the period 1990-2003, proceed to the analysis of several commercial indices (the advantage of revealed comparison, Vollrath Index, Grubel-Lioyd Index) to compare trends over the last fifteen years. There is a good competitive position in the prepared sector of pork in Italy, Spain, Ireland and Austria, and a positive competitive level for Germany and France. Denmark is characterized by a negative dynamic of competitiveness, although there are high exports in the sector. A similar trend is observed for Belgium and the Netherlands. The rest of the countries show low competitiveness for this analyzed sector.

Wijnands and al., (2008) evaluate the competitiveness of the food industry of the European Union (EU 15) compared to that of Australia, Brazil, Canada and the United States over the period 1996-2004 . Based on each country's trade data, the authors calculate the progression of RCA and EMS in the global market for the EU15 and the other four countries. In their results, the EU15 shows very low competitiveness compared to Brazil for both measures, but higher competitiveness than the United States in terms of global market share growth (despite lower growth in the RCA indicator).

Akhtar and al., (2009) measure the competitiveness of Pakistan's fruit exports, namely dates, oranges and mangoes, through Revealed Comparative Advantage (RCA) over the period 1995-2005 using a series three-year average (1995-1997, 1998-2000 and 2003-2005). The results of the study show that Pakistan enjoys a comparative advantage in these products with a higher level of competitiveness in dates and mangoes compared to its competitors.

Some empirical studies of cost-based measures of competitiveness (strategic management school approach).

Koné (2016), analyzes the incentive factors on the competitiveness of the cotton sector in Mali using the Domestic Resource Cost (DRC) method. This competitiveness is calculated using a spreadsheet calculation model which takes into account the types of farms and all farms taken as a whole. His analysis is based on Mali's cost advantages. The CRD takes into account the entire sector, among other things, production (production per hectare, production cost, producer

price of seed cotton), processing (energy consumption, transport of seed cotton, cost of ginning, packaging, personnel, etc.), marketing (the price of cotton on the international market and marketing costs). Examination of the results reveals a CRD less than 1, for all types of exploitation and at the overall level, over the three campaigns (2009/2010, 2010/2011 and 2011/2012). Mali therefore maintains a comparative advantage with all types of exploitation. The current level of competitiveness of the sector is not sustainable, because it is mainly favored by the increase of the price of seed cotton on the world market and by fertilizer subsidies, the amount of which is becoming increasingly high for the government of Mali.

Mbaye and Golub (2007), calculate two indices of competitiveness, namely the relative unit labor costs and the relative price of production, to measure the effects of international competitiveness on the performance of industrial exports in Senegal for the period 1974- 1998. For these indices, they compare the Senegalese experience with that of developing or transition countries in the four other regions: Africa, Asia, South America, and Central/Eastern Europe. They indicate in their results that the two indicators have a significant effect on sectoral exports. However, the effect of the relative unit cost of labor is more important than that of the relative price of production. Indicators show that Senegalese international competitiveness has deteriorated significantly over time compared to that of all other regions. The devaluation of the franc CFA in 1994 significantly improved this competitiveness. But this deteriorated rapidly in the years that followed. There are several reasons for the deterioration before 1994.

Nanno and al., (2004) who, through indicators of the real effective exchange rate (REER) and unit labor costs, analyze the competitiveness of agriculture and food-processing industries in MERCOSUR and the European Union in a perspective of trade liberalization on behalf of the CPII. From their results, they show that TCER increased in general between 1991 and 1998, signifying a loss of competitiveness for these countries. They also observe that the European Union is at a disadvantage in all agricultural and agri-food categories except for dairy products, cereals and meat. Similarly, Mercosur achieved better performance in terms of positioning on all the world markets for agricultural and agri-food products during the 1980s and 1990s, except for cereals and dairy products. The real effective exchange rate (TCER) indicator summarizes all of these movements. Brazil is therefore very competitive in terms of unit labor costs compared to the European Union. Thus, a liberalization will probably have a significant impact on Mercosur's exports to the European Union than the reverse case.

Stephan and al. (2008) follow the same trend, to analyze the competitiveness of Belarusian agriculture using two approaches. The first based on the calculation of revealed comparative

advantage (RCA). For these authors, the use of this index is justified by the fact that most of the distortions induced by the powers are at the level of imports, and that export performance therefore truly shows competitiveness. The second approach measuring competitiveness is causal and seeks to measure factors influencing competitiveness, such as the institutional environment, infrastructure, macroeconomic stability and cost structures. For these reasons, they use social cost-benefit ratio analysis (SCB) to shed light on the competitiveness of Belarusian agriculture. The results of Stephan and his colleagues reveal (50.3%) for cereals, and (60.4%) for milk, a relatively large proportion of farms in Belarus produce competitively. Competitive farms produce 63% of grain and 73% of milk in Belarus. It is important to emphasize that in their results, competitive farms tend to produce more on average than non-competitive farms.

3-Methodology

Our work borrows tools and techniques from Latruffe's methodological approaches (2010); a neoclassical approach based on the calculation of certain Indices (RCA, RXA, RMA, NEI) (see table 1) for Mali and for certain countries gathered into two groups, the first (zone 1) , made up of a few countries from the franc area, namely Burkina Faso, Benin, Chad, Senegal, Ivory Coast and a second (zone 2), made up of the United States, China, Uzbekistan, India, Brazil, and Australia, the main cotton exporting countries in the world.

With regard to the reference (the objective of this approach), the analysis of the competitiveness of a product for a country can be done either directly with competing countries (China, United States, etc.) and or by bringing the country's performance to that of a reference area of which economic structure is similar and producing the same product. And our study focuses on Burkina Faso, Benin, Chad, Senegal, and Ivory Coast. Either by comparing indirectly the country's performance with that of a reference zone such as the Economic Community of West African States (ECOWAS), the West African Economic and Monetary Union (WAEMU), Union European (EU)…

Inspired by the method adopted by Latruffe (2010), Carraresi and Banterle (2008), the competitiveness of Mali's cotton sector over the period 1970-2015 will be evaluated. These different indices for Mali will be compared to those of these different countries such as: China, United States, India, Brazil, Australia, Uzbekistan, Burkina Faso, Benin, Senegal, Chad, and Ivory Coast.

The data used are annual from 1970 to 2015 (46 observations) and come from the CCIC (International Cotton Consultative Committee) database and the World Bank, and improved by our own care using calculation techniques.

4-Results

In the literature, countries examine the competitiveness of their sectors in the international market using different measures available in the economic literature such as revealed comparative advantage (RCA), relative import advantage (RMA), Relative Trade (RTA), Domestic Resource Cost Ratio (DRC), Export Market Share (SME), Net Export Index (NEI), etc. Most economists have used these measures to study the competitiveness (of a country, of a sector, etc.) in relation to its competitors.

The results of this research for Mali cannot be compared with the literature in the past for the reason that there are no studies available on cotton for Mali and even for other African countries. Relating to this competitiveness analysis.

The different decisions relating to each index have been developed in Table 1. On this basis, the values of the index of revealed comparative advantage (RCA) of the six countries (Benin, Burkina-Faso, Côte-d'Ivoire, Mali, Senegal, and Chad), have evolved as follows: the value of the index is largely above the unit, thus indicating a strong specialization in cotton for all of these countries, over the entire year range. In general, these figures show that cotton exports are adapted to world import demand.

The results of the RCA index values show that Mali experiences an evolving trend throughout the period, having values largely higher than the one of other competitors which have an erratic trend between 0 and 20, except Burkina Faso and Uzbekistan which show figures that are slightly higher than those of Mali during certain periods.

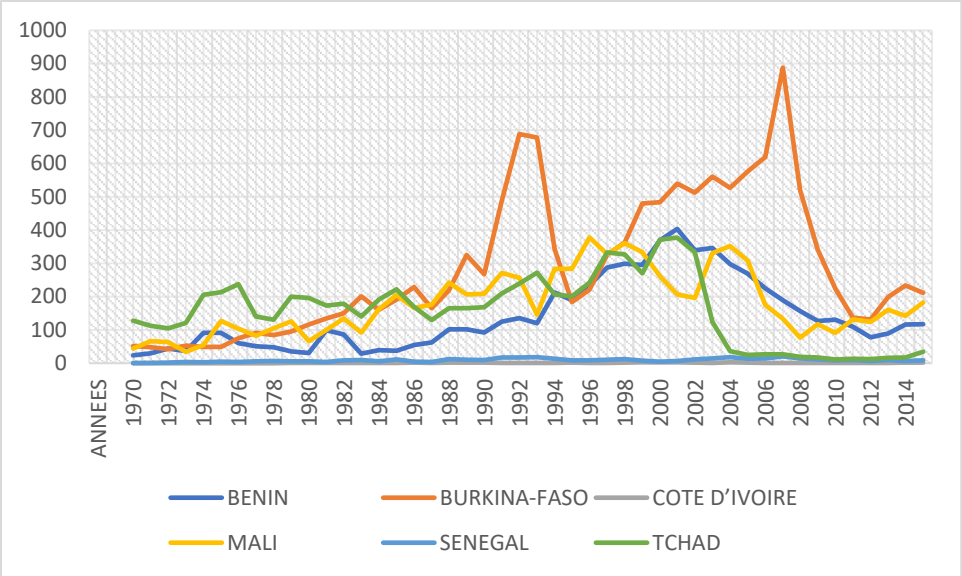

Figure 1: RCA area 1
Source: Authors using data from CCIC, (2017); WDI, (2017).

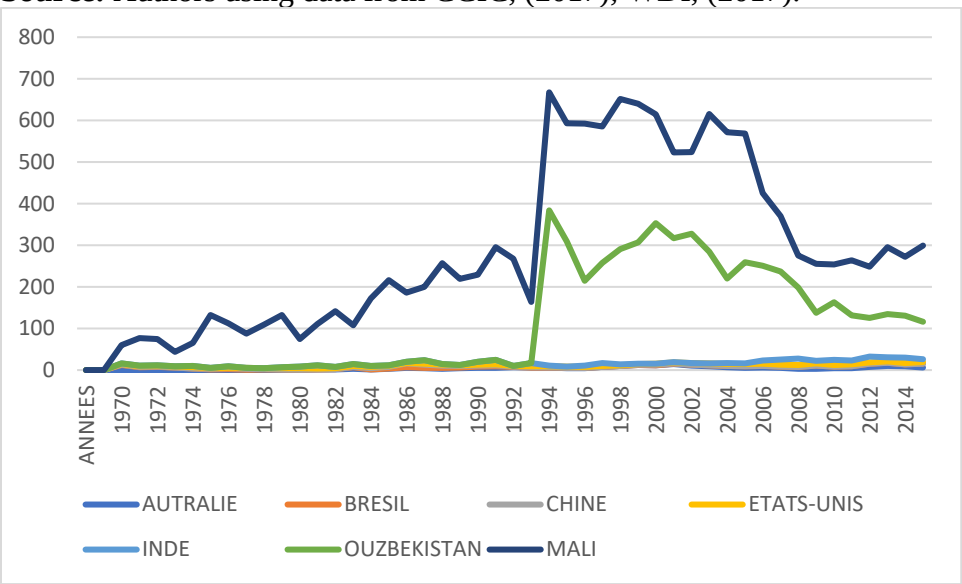

Figure 2 : RCA zone 2
Source: Authors using data from CCIC, (2017); WDI, (2017).

All Zone 1 countries have a competitive advantage regarding the Revealed Comparative Import Advantage (RMA) index, although Senegal and Ivory Coast observed a slight disadvantage during the periods of late 70s and early 90s respectively. Without doubt, Mali has a fairly comfortable competitive position for this index based on imports, knowing that it has absolutely not imported cotton during this entire period.

The RMA index shows a strong comparative advantage for Mali, Australia, the United States, and Uzbekistan. However, Mali has a fairly strong competitive advantage over all years with

values uniformly equal to zero. On the other hand, countries like Brazil, China, and India have a disadvantage, except for a few years.

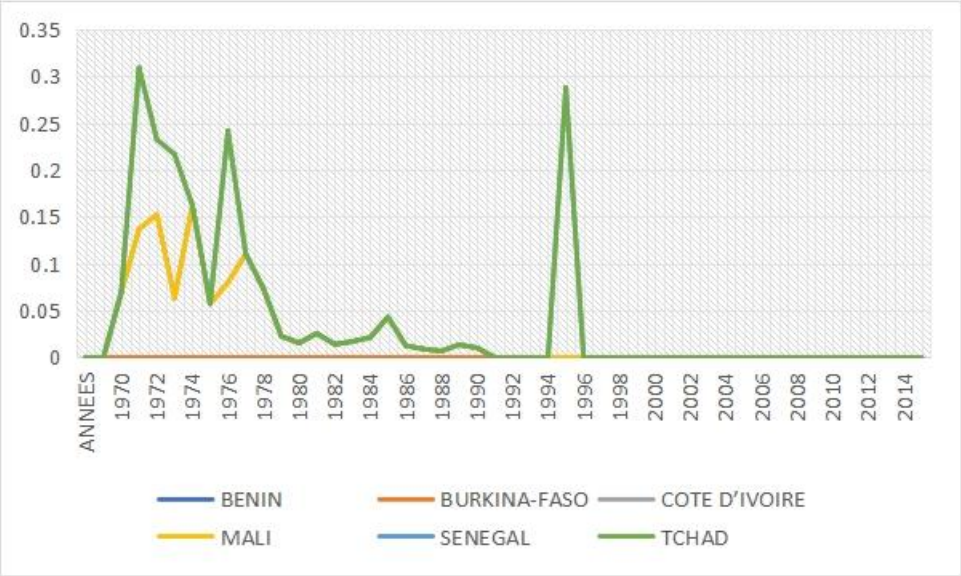

Figure 3 : RMA zone 1
Source: Authors using data from CCIC, (2017); WDI, (2017).

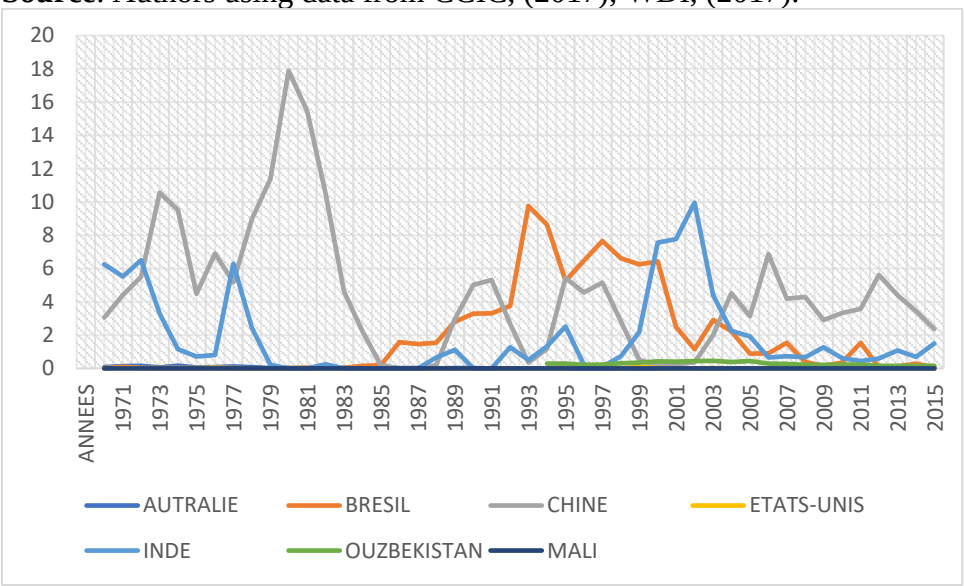

Figure 4 : RMA zone 2
Source: Authors using data from CCIC, (2017); WDI, (2017).

Revealed Trade Advantage (RTA) index trends show that for all ranges, the numbers are positive and largely above zero (0). This result explains that the cotton exported by these countries (zone 1) is greater than what they import. Furthermore, the analysis of the RTA, of the overall competitiveness of cotton in these different countries (zone 2) shows that three countries, Mali, the United States, and Uzbekistan, have maintained an advantage throughout

the period. On the other hand, the other countries China, India, Brazil, and Australia record periods of disadvantage with figures less than 1.

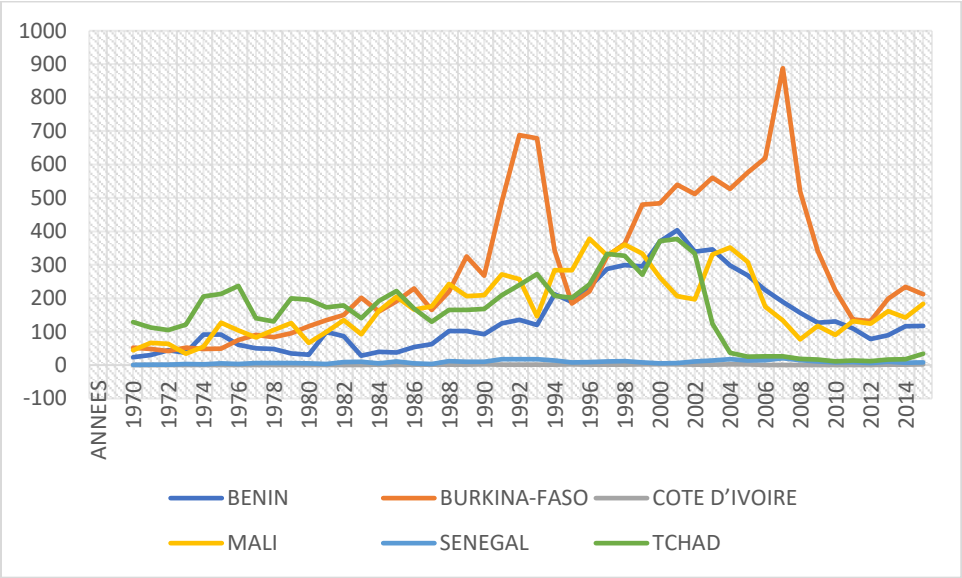

Figure 5: RTA zone 1
Source: Authors using data from CCIC, (2017); WDI, (2017).

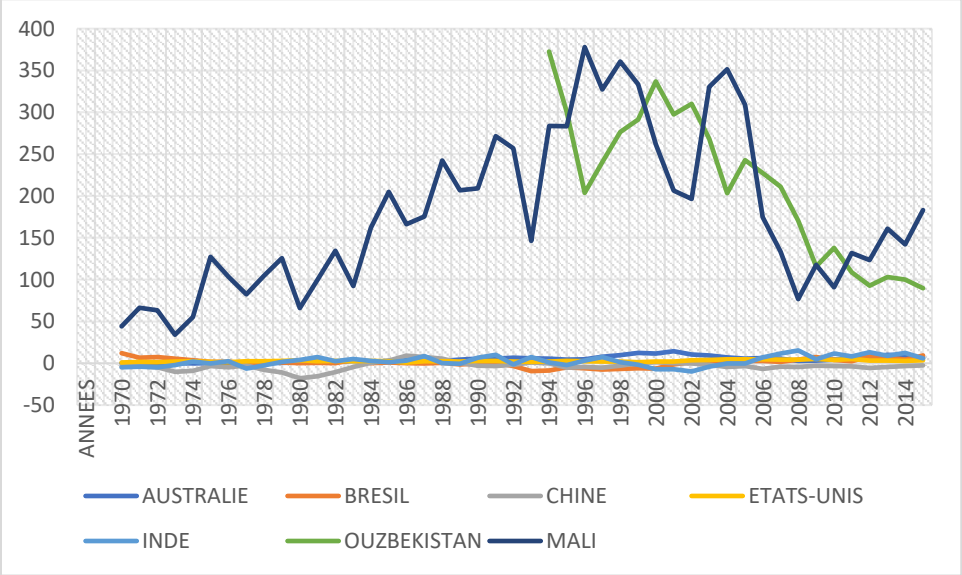

Figure 6 : RTA zone 2
Source: Authors using data from CCIC, (2017); WDI, (2017).

Like the NEI, all the C-4 countries are only cotton exporters, with a constant index equal to one (1) for all the periods. Similarly, Ivory Coast, Senegal, the United States, and Uzbekistan experience figures slightly below 1, respectively during the periods 1995-2002; 1971-1973; 1970-2010 and 1992-2010. On the other hand, the other countries show more periods of disadvantage.

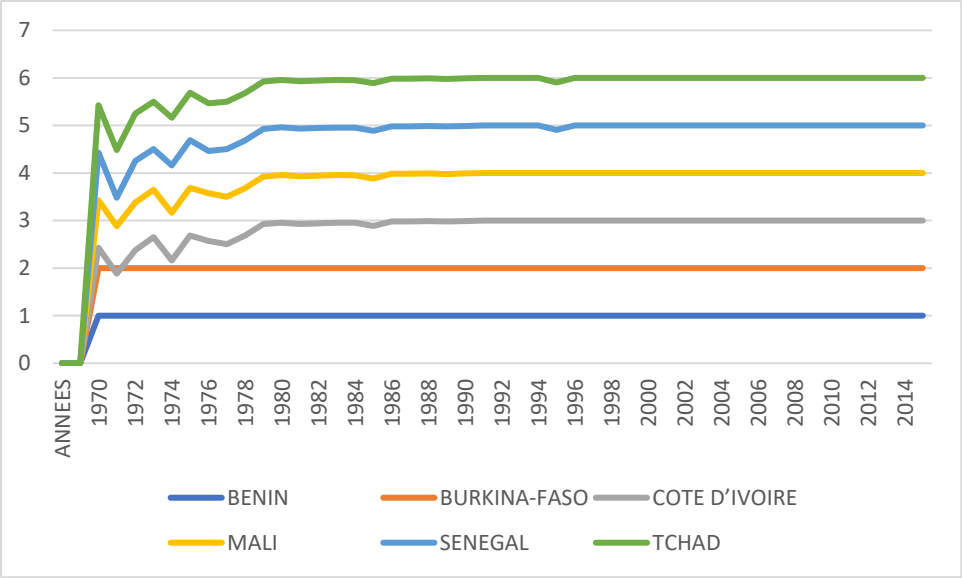

Figure 7 : NEI zone 1
Source: Authors using data from CCIC, (2017); WDI, (2017).

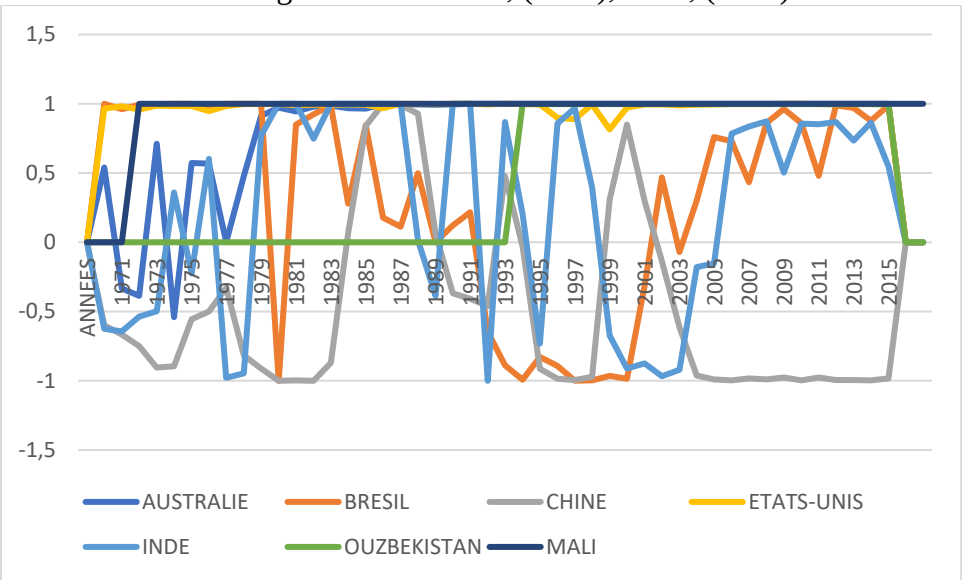

Figure 8 : NEI zone 2
Source: Authors using data from CCIC (2017); WDI, (2017).

Overall, the results of this approach show that Mali occupies a comfortable position compared to its main competitors.

5-Conclusion

In a modern economic environment, technological progress and innovations as well as concerns about environmental and resource scarcity have created new opportunities and constraints of gaining, maintaining and improving competitiveness facing the competition in an increasingly complex and globalized economy. The calculation of competitiveness indices indicates that Mali has a competitive advantage in the cotton sector. In some of the countries under our study,

we find that competitiveness has remained quite unstable, showing a lack of persistence over the years. Thus, the results indicate that Mali has a persistent competitive advantage in cotton, allowing it to earn significant foreign exchange in the international market.

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ANNEX

Annex 1

Evolution of contemporary theory of Competitiveness	
AUTHORS	MAIN CONCEPT
Michael Porter (1982,1990.1998)	Determinants of competitiveness (Diamond model). Competitiveness depends on long-term productivity, which, in turn, requires a business environment conducive to continue innovation in products, processes and management. The four conditions underlying the global competitiveness of a country's firms include: factor endowments, demand conditions, related and supporting industries (clusters), strategy, and market structure and rivalry of Company.
Cruz (1993)	Double Diamond Model
Cho (1994)	The Nine Factor Model

Moon, Rugman & Verbeke (1995)	Generalization of the Double Diamond Model
Paul R. Krugman (1995)	Productivity growth is the main driver of competitiveness. The international competitiveness of countries is linked to their high standard of living.

Source: Cho and Moon, (2002), Asim Anwar Avril (2013), Tomasz Siudek, Aldona Zawojska (2014) improved by us.

Annex 2

Evolution of Competitiveness Theory: Neoclassical Models	
AUTEURS	MAIN CONCEPTS
Hecksher-Ohlin (1919,1933)	Endowment in Factors: A country will specialize in the production and export of products that require relatively intensive use of locally abundant production factors. A relatively capital-rich country will export capital-intensive products while the relatively labor-abundant country will export labor-intensive products.
Joseph A. Schumpeter (1939)	Theory of entrepreneurship and innovations: The company's ability to innovate is essential to gain a competitive advantage over its competitors. The ability to create new solutions and the predisposition to take risks associated with testing them in the market points out the process of competition and entrepreneurship. Differences in the level of innovative capacity and entrepreneurship translate into differences in the competitive position of any economic agent.
John M. Clark (1940)	Theory of effective (feasible) competition: Competitive advantage depends on the innovations introduced by the company. Innovations cause companies to compete for advantages, which leads to technological progress and economic growth at the macro level.
Stolper, Samuelson (1941)	Return between prices and price factors in a single country.
P. Samuelson (1948)	The factor price equalization theorem shows the relationship between the relative prices of factors between two countries.

Leontief (1953)	Leontief paradox (criticism of the Heckscher Ohlin theory, Leontief shows that if American foreign trade obeys the law of proportion of factors, it is not in the sense that is commonly envisaged.
T.M. Rybczynski (théorème) (1955) Salter (1959)	This theorem explains the relationship between the supply of factors and the yield of the product which uses the factor intensively. "This theorem indicates that at constant relative prices of goods, an increase in the endowment of a factor will result in a more than proportional expansion of production in the sector which uses that factor intensively, and an absolute decline in the production of the other good."
Sawan (1960)	Exchange rate
Challenges to Comparative Advantage	
S. Linder (1961)	The recovery request
R. Vernon (1966)	The Product Cycle
Krugman (1979) Lancaster (1979)	Economy of scale
Paul R. Krugman (1995)	Productivity growth is the main driver of competitiveness. The international competitiveness of countries is linked to their high standard of living.

Source: Cho and Moon, (2002), Asim Anwar Avril (2013), Tomasz Siudek, Aldona Zawojska (2014) improved by us.

Annex 3

Evolution of traditional competitiveness theory	
AUTHORS	MAIN CONCEPTS
Mercantilism approximately 1500-1800	The theory of mercantilism states that for a country to be rich its exports should be greater than other countries.
Classical theories of trade:	
Adam Smith	Absolute Advantage:

(1776)	Each party involved in international trade in a free trade context can profit by specializing in the production of goods in which it has an absolute advantage. So, let each country export the goods it produces at the lowest costs and import the goods it produces at the highest costs.
David Ricardo (1817)	Comparative advantage: A country can benefit from foreign trade even if it lacks any absolute advantage over its trading partners in the production of goods. It is just to have a relative advantage on a product to be able to sell it abroad.
Friedrich List (1831)	Institutional economics sector: In addition to economic factors, competitiveness depends on social institutions such as public authorities, trade unions, financial institutions, socio-political organizations, ownership and organizational structures, habits of mind, rules and codes of conduct.
J.S. Mill (1848)	International Values ("in any place, the value of something depends on what it costs to acquire in that place; and consequently that of an imported article depends on the cost of the export article whose price was used to pay for the imported item").
J.S. Mill (1873)	Protection Policies (Stuart Mill attributes to the State a major role in the redistribution of income. If it must not hinder the functioning of markets or threaten private property, the State must nevertheless strive to reduce inequalities and to protect the weak against the strong).
Joseph A. Schumpeter (1911)	Economics of Evolution: The constant survival of companies in the market is based on their constant adaptation to a changing environment, mainly due to the search for a new innovative recombination of collected resources.
Paul R. Krugman (1995)	Productivity growth is the main driver of competitiveness. The international competitiveness of countries is linked to their high standard of living.

Source: Cho and Moon, (2002), Asim Anwar Avril (2013), Tomasz Siudek, Aldona Zawojska (2014) impro