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*Abstract*

Globalization and free trade bear the promise of welfare gains through increased competition; also in the agricultural sector. In accordance with this, liberalisation has been called by the International Financial Institutions and implemented by a "one size fits all" approach. However, where the increased-competition goal has been achieved, not always have the expected welfare gains been consequent. In this paper, I analyse the case of the cotton sector in Tanzania. The choice of Tanzania is appropriate since it is considered to date the only sub-Saharan Africa country where both a privatization and a liberalisation of the cotton sector have been fully accomplished. After liberalisation, Tanzania has seen a depletion of its cotton sector: particularly regarding the quality of its produce. In response, it has been implementing so to say "counter-reform" policies in the attempt to rescue the sector from wreck. Counter-reform policies can be envisaged as policies that are opposite in direction to those implemented in a process of liberalisation. In this paper I focus on the implementation of a number of single counter-reform policies in the cotton sector of Tanzania. I proceed by assessing the effect, if any, of such policies on the daily premium over the A Index price obtained for Tanzanian cotton. The impacts provide normative implications for policies on farmers and ginners.

Keywords: liberalization, counter-reforms, sub-Saharan Africa cotton, quality
JEL: C32, L12, O13, O55, Q13

## 1. *Introduction*

In this paper I address the problem of cotton sector liberalisation in sub-Saharan Africa by analysing the case of Tanzania. As clear from literature, there still are conflicting opinions on the results brought about by a liberalisation of this sector. If on the one hand attention is drawn on the positive result of increasing producer prices (i.e. the price to producers on the fob price) (Baffes, 2008; Vitale and Sanders, 2005) important shortfalls have shown to plague reform on the other (Fold and Larsen, 2008; Larsen, 2008; Lorenzetti, 2014).

Cotton is considered one of few sub-Saharan Africa (SSA) success stories as supported by the epithet "Africa's white gold" it is often appointed. By reason of peculiar climate characteristics, in which the crop thrives; and low labour costs, which are particularly relished cotton being a labour-intensive [1] crop; SSA benefits from a comparative advantage in the production of the cash crop. The sector is acknowledged to be critical in the economics of SSA cotton-producing countries and a catalyst of economic development. At the country level it contributes to national economic growth, to employment, and is a source of revenue and foreign exchange; at the household level it involves the rural poor. Cotton is acknowledged to play a role in fighting poverty (Minot and Daniels, 2002) enabling smallholder farmers to progress from subsistence farming and access cash which contributes to household food security and purchase of non-food goods (school and health). Furthermore, UNCTAD reports cotton is important not only for its producers but also for those in associated activities: millions of people in SSA derive their livelihood from the cotton sector.

Historically, cotton cultivation was introduced in the region by European colonisers and the region can be divided into East and West SSA because of the different colonial influences and to some extent the different paths the organisation of the sector has followed

[1] in SSA cotton is still hand picked. This is considerred to be an advantage in comparison to machine picked cotton.

in time. However, after independence (1960s) the design of the sector was homogeneous throughout: it was state-dominated and vertically integrated with a single-channel marketing system. Farmers were guaranteed inputs on credit, output markets and administered producer prices which were set in advance of each planting season on a pan-territorial and pan-seasonal basis. The sector grew almost twenty fold (since independence) thanks to increased yields and cultivated area (Tschirley et al., 2009).
However, the system was not flawless and by the 1980s a reform of the sector was insisted on by International Financial Institutions (IFI). The declared rationale for a liberalisation was on the one hand the burden on national financial budgets of sector budgetary constraints primarily considered to be consequent to guaranteed prices (often higher than world prices[2]); on the other that farmers were claimed to receive a lower price than the world price for their produce, consequently the sector was not considered successful in reducing poverty. In general, state monopolies are considered to function poorly and to restrain private sector development which is considered to enhance efficiency and deliver higher producer prices instead. Reforms addressed giving up state ownership and moving towards an involvement of the private sector and competition in input and output markets. In the 1990s reforms of the sector have been implemented in almost all of SSA cotton producing countries albeit to a different degree: East South Africa having reformed to a larger extent in comparison to Francophone SSA. The resulting design of the sector in the region is now mixed and three types of organisation can be identified: national monopoly, concentrated competition (zoning system) and atomistic competition (Tschirley et al., 2009; Pfetzer and Roettger, 2013).
In general, reforms have on the one hand resulted in a raise in the share of producer price on the f.o.b. export price and increased efficiency in the processing industry (Baffes, 2002); nonetheless they are thought to have fallen short of expectations: in some cases causing a depletion of the sector (Fold and Larsen, 2008; Tschirley et

[2] That cannot be anticipated and have shown a downward trend as for other commodities.

al., 2009). In literature the failure of reforms is generally primarily ascribed to the collapse of the input-provision system consequent to the coordination failure in competitive systems as compared to a vertically integrated organisation (Tschirley et al., 2009). However, another cardinal issue that is strictly related to input credit has shown to be sensitive to reforms: the quality of cotton. Quality is still a prominent characteristic of raw cotton and determines grand part of its price (premiums or discounts on the A Index price). Quality of cotton also determines much of the reputation of a producing country; determining the choice of spinners for one origin or the other, thus with notable consequences in the long run. Maintainance of quality is related to a number of issues: efficient delivery of inputs and extension services to smallholder farmers, supporting research into seed varieties and quality control (Larsen, 2008). Consequences of quality plummeting are evident on the premium over the A Index price fetched by raw cotton in the international market.

In this paper, I analyse the case of the cotton sector in Tanzania. The choice of Tanzania is considered appropriate since it is to date the only SSA country where both a privatization and a liberalisation of the cotton sector have been fully implemented. Since 1994, production, trade and processing have been atomistic with multiple small players allowed to compete for a share of the seed cotton market and producer prices determined by market conditions. Exemplarily, in Tanzania producers have benefited from prompter payments and a higher share of the export price than during the pre-liberalisation period, but crop quality and relative unit prices have deteriorated (Baffes, 2002; Larsen, 2008; Lorenzetti[3], 2014). Since liberalisation, Tanzania has seen a depletion of its cotton sector particularly regarding the quality of its produce, such that it has been implementing so to say "counter-reform" policies in the attempt to rescue the sector from wreck. Counter-reform policies are those

[3] I studied the impact of a liberalisation of the Tanzania cotton sector by analysing yearly average data on premiums/discounts, finding there was a negative change in the trend following reforms and in comparison to the West African area (where no reforms was implemented).

going towards a concentration and can be envisaged as policies that are opposite in direction to those implemented in a process of liberalisation.

The purpose of this paper is to further participate to the ongoing debate on the effects and goodness of sector design reforms in the Sub-Saharan Africa cotton sector. Hence, I analyse the impact of a number of single counter-reform policies implemented in the liberalised Tanzania cotton sector. I proceed by assessing the effect, if any, of such policies on the daily premium over the A Index price obtained for Tanzanian cotton. The impacts provide normative implications for policies on farmers and ginners.

The remainder of the paper is organized as follows. Section I sets the context for cotton in Tanzania; section II introduces quality as a key characteristic in cotton; section III introduces the counter reform policies which will be assessed in this paper; section IV presents the data and the methodology used for assessment; in section V model results are put forth; in section VI results are discussed and section VII concludes.

## 2. *Tanzania cotton sector: from the past to nowadays*

Cotton growing is not new to ESA where it has been grown for thousands of years. However, it is only with the German and, after WWI, the British colonisation that the cultivation was implemented more thoroughly, the object of colonisers being that of securing the necessary raw material for the domestic textile industry. At that time, in Tanzania, Asian buying agents were middlemen to the ginneries to whom they were linked and to which they sold the raw cotton. Later these were replaced by cooperative societies[4] which were recognised

[4] Tanzania has a long history of producers' organizations: at the village-level there were primary societies and above was a second tier of organizations called cooperative unions all grouped at the national level in a national federation of cooperative unions. (Uliwa and Fischer, 2004).

by the government in the 1950s and were subsequently grouped in cooperative unions which comprised gins and oil mills. A single channel marketing system (the Lint and Seed Marketing Board, founded in 1952) and a price announcement system were put in place with pan-seasonal and pan-territorial prices announced before each season. Inputs were provided on credit by the cooperatives and a research station (Ukiriguru) was devoted (from 1932) to the breeding of tailored and improved varieties of cotton also guaranteeing the quality of the seeds distributed to farmers. Farmers were paid on time and quality standards were enforced thanks to the produce controlled at the primary market and the fact that most ginneries were roller gins, which are acknowledged to maintain quality of the lint. This resulted in the crop being sold at a premium over the A Index price. By independence (1961) two thirds of the crop were ginned by the unions and in 1966 cotton was Tanzania's biggest earner of foreign exchange. Revenues were invested in providing the necessary infrastructure to the sector (roads, dams, stores, bridges etc.) (Coulson, 2016). In the 70s Tanzania was the largest producer of cotton in Africa (USAID), producing seven times as much as Burkina Faso (Burkina Faso being now SSA's major cotton producer) and with almost double yields per hectare.

In 1976 the government decided to close the cooperatives in search of higher efficiency and in response to corruption. These were replaced with a single parastatal, responsible for the whole value chain. Buying posts, input credit and ginning were now managed by the Cotton Authority. The single channel system managed the quality control system from primary marketing to ginning but there were difficulties in maintaining quality standards without the primary societies at the village level. In the attempt to solve this, in 1984 cooperative unions were reestablished and a new Tanzania Cotton Marketing Board was founded in place of the Lint and Cotton Marketing Board, to regulate the sector. All in all the sector is considered to have had excellent production performance to that time, fetching a premium price of 4 cents per pound (Tanzania Cotton Board, TCB). Nonetheless during the 1980s the sector started

being under pressure by International Financial Institutions (IFI) to reform and liberalise.

In 1994, with the Cotton Act the Government formally liberalised the market. The buying, ginning and selling of cotton were thereafter open to private agents and soon a large number of private companies had engaged in these activities leading to considerable competition. During the first years of reforms 17 new private ginneries were built (Larsen, 2008), most of which were saw gins which are cheaper to run than roller gins but do not maintain the quality of cotton. Ginning capacity was expanded and after a few years many ginneries ceased to run due to over-capacity. The administered fixed prices were replaced by indicative prices which are not binding: the TCB sets the price for each season before the marketing opening in June, using 60% of world market price as a base along with stakeholder consultations. The share of prices going to farmers increased although this was not a homogeneous result since traders are considered to have paid very little for cotton in more remote areas, as the Eastern growing area, taking advantage of farmers' unawareness of market prices and partly due to high transport costs (Larsen, 2008). In addition, the share of prices going to farmers was relatively higher in other liberalised cotton markets such as in Uganda and Zimbabwe which reformed their sector but kept a concentrated sector design. In general, production has been very volatile and highly dependent on previous season prices: it declined after a peak consequent to particularly high world prices, in 1995; the input supply system and primary market quality control system collapsed (Larsen, 2008; Gibbon, 1999; Baffes 2004; Bargawi, 2008).

To date cotton is grown by between 350,000 and 500,000 small-holder[5] farmers under rain-fed conditions and is still a major source of employment and income (USAID). Total land under cotton cultivation is estimated between 400,0000 and 500,000 ha; the areas in which cotton is cultivated are West and East Tanzania, although the WCGA (West Central Growing Area) produces 95% with the remaining 5% coming from the ECGA (East Central Growing Area).

[5] No large scale commercial cotton farming is carried out in Tanzania.

Cotton is still the second largest export-earning agriculture commodity after coffee and it is estimated to contribute to the livelihood of 40% of the population (FAO). Grand part of the cotton is exported directly instead of being processed through further stages in the value chain, by reason of a depleted (after liberalisation) and not fully developed textile industry. The sector has seen its yields depleted, having now the lowest yields world wide: with average 215 kg per ha against 440 kg per ha average in West Africa. To date more than 60 ginneries are registered with the TCB, of which 14 are saw gins and 46 are roller gins, but only around 40 are active of which the top five account for 40% of total cotton seed purchase (TCB). The consequent expansion of ginning capacity[6] has caused a scramble for cotton, as ginners are motivated to do anything to purchase cotton and avoid ginning overcapacity. Among consequences are: impossibility of maintaining quality control with consequent plummeting of quality, proliferation of side selling opportunities and seed mixing.

## 3. *Quality: a design-sensitive key issue*

Cotton is differentiated by quality parameters for the purpose of trade. Quality, along with a number of other factors determines the premiums and discounts over or under the Cotlook A Index: differences in quality are directly reflected in the fetching of premiums or discounts.
Cotton from Tanzania is acknowledged to be naturally high in quality (it is long staple[7]). In addition to the comparative advantage in cotton growing that is general in the SSA region, Tanzania cotton also has a structural quality advantage deriving from its processing half of its cotton production by roller gins (the other half being saw ginned). Roller ginned cotton fetches a premium of one cent per pound over saw ginned cotton with the same grade and type.

[6] The new private ginneries added some 16,967 tons of monthly capacity to the existing 19,148 tons of union capacity in the western cotton growing area. (TCB).
[7] Among fiber properties, staple length has the greatest influence on spinning performance.

However, after liberalisation the quality of Tanzanian cotton has been plummeting. The increased number of private ginners that have entered the market after liberalisation have brought ginning capacity to increase. The primary worry for ginners being that to avoid overcapacity, they started scrambling for cotton regardless of its quality to guarantee a sufficient volume. Consequently, side-selling was facilitated and primary market grading systems disappeared, so that different grades of cotton were sold and ginned together. A control of the supply chain by the ginner with some form of contract farming has proven difficult to maintain in a competitive system; as a result producers do not have the incentive to implement quality-enhancing practices. The overcoming of distinct ginning areas consequent to the surge of ginners to increase their market share has also caused the mixing of cotton seed varieties which were previously developed to suit different agronomic sub-zones (Larsen, 2008). All the more, subsequently, the International Textiles Manufacturers Federation also started classifying cotton from Tanzania as highly contaminated. Fibre contamination is a serious and expensive problem for the end user since it damages the quality of cotton, thus it heavily affects the reputation of this origin of cotton.

The poor performance of Tanzania cotton mainly stems from three shortcomings: input-resource limitations, poor agronomic management and lateness of farming operations. After reforms the input-credit scheme failed and farmers' capacity to secure inputs in a private and competitive system has shown to be very weak. On the one hand formal lending is nearly non-existent and where it is available the collateral asked for is too high for the smallholder farmers to be able to access it. On the other, maintaining an input-credit scheme by the ginners has also shown to be problematic: the presence of multiple ginners which compete makes coordination impossible consequently side-selling from farmers cannot be avoided. Side-selling results in the reduction of quota delivery to the ginner, decreased processing efficiency and increased production costs. (Poulton and Maro, 2009).

Poor agronomic management is mainly consequent to missing

extension services. These were mainly taken care of by ginners in the vertically integrated system. In a competitive system where ginners scramble for cotton and farmers can side-sell, ginners do not have incentives to invest in extension services.
Lateness of operations is consequent to the previous two points: fertilizers and pesticides need to be used with a definite timing or production is negatively affected.
The sum of complications results in the poorest cotton yields in the region, low production (although production is quite volatile showing high elasticity to world prices (World Bank), it is below potentiality) and plummeting quality.
Low quality in cotton has two main consequences: it erodes the premium over the A Index price in the short run and affects the reputation of the country of origin of cotton in the long run, consequently affecting prices and purchase decisions by end users (i.e. spinners). Larsen (2003) states that as soon as the reputation of contamination-free lint origin is questioned, the premium declines. This is consequent to the non substitutability of origin on the spinners side. Actually, spinners have been demanding growing lint quality, in contrast with for example Gilbert and Tollens (2005), who claim that any change in quality is a result of what market end-users are willing to pay for the product, hence that changes are market-driven.

## 4. *Counter reforms*

In the Tanzanian cotton sector, counter-reform policies have been implemented in response to the detrimental effect of reforms, particularly regarding quality. In the context of a liberalised cotton sector, counter-reforms can be envisaged as those policies which are implemented centrally and head in the opposite direction of a liberalisation policy. Three major attempts have been implemented to improve the quality of Tanzanian cotton, primarily by assisting farmers in accessing inputs: the organization of input provision to smallholders; it being, along with quality control procedures, one of the key issues involved in maintaining high lint quality. Contract

farming can be considered as a form of business governance that emerges in response to the failure of input credit, insurance, output markets and enables to obtain assured supply of produce for processing.

The first attempt was in 2001/02 and 2002/03 when farmers were issued with "passbooks". In this system every farmer owns a passbook where a stamp is put in correspondence of the cotton sold by the farmer. This entitles the farmer to receive a certain value of inputs the following year, conditional on the quantity of cotton the farmer has sold. Seeds are available at the buying posts and purchased against credits reflected in the passbook. The introduction of the passbook scheme in 2003 meant that for the first time, a good proportion of producers could plant cotton confident that, when the time came to obtain chemicals, they had a basic entitlement through their passbooks, irrespective of their cash situation at the time. The system was funded by a levy paid by ginners to the Cotton Development Fund. This worked until 2005, subsequently the scheme failed. The system has been "one contributory factor toward the major resurgence in cotton production in 2004 and 2005 (..)" (Tschirley and Kabwe, 2007 citing Poulton and Maro).

After this, came a brief period when farmers were issued with "vouchers". These are a form of support from the government which entitle farmers to buy inputs from input dealers at a subsidized price. The voucher has a face value of inputs. However, the system failed within two years.

The third innovation was "contract farming". Contract farming is widespread in cotton in comparison to other cash crops by reason of high input intensity, the difficult access to inputs and extension services for smallholder farmers as well as the bulk nature of the seed cotton prior to processing which makes transportation expensive. According to this system, farmers sign a contract that requires them to sell a specific quantity of cotton to a specific local ginnery which in turn guarantees to purchase the crop and prefinances and provides upfront inputs such as seeds, fertilizers, pesticides and extension services; and sometimes even equipment and investment goods such as oxen, tractors and ploughs and

organise transport. The farmer is later charged against the purchase price. This was implemented as part of the Cotton Sector Development Programme launched in 2007.

## 5. *Data description and methodology*

### 5.1. Data

My source of data is the Cotlook Ltd. bulletin of daily quotations for Tanzanian cotton.

The Colook A Index is compiled by Cotlook Ltd in Liverpool, a private company, by collecting quotations from cotton traders. It is an index of the level of offering prices[8] on the international market. Cotton is in general priced in line with the Cotlook A Index pricing system which is used as a reference price in physical trade although there exist a variety of pricing systems[9].

The bulletin I have for Tanzanian cotton goes from 1970 to 2003. Subsequently I compared it to the Cotlook A Index bulletin to obtain a time series of the premiums and/or discounts above or below the A Index. However, the time series is not complete, so I have chosen time frames from it in correspondence of the implementation of the considered counter-reform policies. This enables avoiding discretionary decisions which would have been necessary for the interpolation of the data. The chosen time frames are more or less one year long, i.e. more than 300 data per time frame. Previous to

[8] The daily quotation is an average of the cheapest five quotations from a selection of sixteen upland cottons traded internationally. Prices are expressed in US dollars (or cents) per lb, c.i.f. (cleared, insured and forwarded) for delivery at a Northern Europe port.

[9] ICE Futures represent actual transaction prices. However, Cotlook A Index and ICE futures prices are highly correlated as traders take into account ICE (Intercontinental Exchange) closing prices for their quotations and correlation between monthly returns of the cotlook A Index and the ICE futures is calculated to be around 90%.

analysis, the data was transformed in order to clear it from inflation. The first time frame I consider is not related to the implementation of the counter-reform policies but to the Cotton Act in 1994 to confirm my findings in Lorenzetti (2014) on the daily quotation data.

The analysis of the impact of the counter-reform policies is possible because *all the* phases of cotton growth are contained in each time frame I consider. Currently, 95% of Tanzanian cotton production comes from one region, i.e. the West Central Growing Area[10] (WCGA); and proceedings take place at one time as detailed in figure 1.

[10] 60% of total cotton production in Tanzania comes from the Shinyanga region alone, followed by the Mwanza region. Both are in the WCGA.

Figure 1 - *Cotton production calendar for the West Cotton Growing Area WCGA*

| Proceed-ings | MONTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
| **Farm Preparation** | | | | | | | | | | X | X | |
| **Compost Spread** | | | | | | | | | | X | X | |
| **Planting** | | | | | | | | | | | X | X |
| **Weeding** | X | X | X | X | | | | | | | | X |
| **Pruning** | X | | | | | | | | | | | X |
| **Spray-ing Pesticide** | | X | X | X | | | | | | | | |
| **Harvesting and Grading** | | | | | X | X | X | | | | | |
| **Marketing** | | | | | | X | X | X | X | | | |
| **Farm Clearing (uprooting and burning)** | | | | | | | | X | X | | | |

## 5.2. Software

The computations for the regression models have been done with SPSS software using the expert modeler criterion. The expert modeler attempts to automatically identify and estimate the best-fitting model (ARIMA in my case) autonomously choosing the parameters and making due transformations for stationarity, homoskedasticity and normality conditions to be in place. Thus, eliminating the need to identify an appropriate model through trial and error.

## 5.3. Methodology

The objective of this econometric analysis is to spot/highlight if there is a change of trend in the time series related to the implementation of the considered policies. In literature, for the purpose of the analysis of a change in the trend or a structural break, a GARCH or Markov switching GARCH are privileged. In this case this was not possible, due to the incompleteness of the time series. Fixing the time series would have meant deciding for a criterion to interpolate the data which could have influenced the results. Thus, I have chosen to consider time frames in correspondence of the implementation of the mentioned policies and the Expert modeler criterion has chosen an ARIMA (Auto Regressive Integrated Moving Average) model for analysis.

The first step in the modelling process is to check for the stationarity of the time series as the estimation procedures are available only for stationary series. If the stationary condition is not in place, the time series needs to be transformed into a suitable stationary form (i.e. integrated). The ARIMA forecasting equation for a stationary time series is then a linear equation in which the predictors consist of lags of the dependant variable and/or lags of the forecast errors i.e.: predicted value of y = constant or weighted sum of one or more recent values of y and/or a weighted sum of one or more recent values of the errors.

The next step is to find the values for the orders p and q of the AR and MA process. This is done by looking at the significant autocorrelation and partial autocorrelation coefficients ACF and PACF. If the model succeeds in extracting all the "signal" from the data, there should be no pattern at all in the errors: the error in the next period should not be correlated with any previous errors.

ARIMA (p,q,d)

p stands for the number of lags in the time series

d stands for the necessary differencing order to achieve stationary data. First differencing

q stands for the number of lags in the errors

*Tests: Ljungbox*
Among statistical tests the Expert Modeler criterion chooses the Ljung–Box test to check for the model's match to the data set, which is commonly used in ARIMA modeling. The Ljung-Box test is a portmanteau test (i.e. where the null hypothesis is well specified, but the alternative hypothesis is looser). It tests for autocorrelation in the residuals: whether any of the groups of autocorrelations of the residual time series are different from zero. Instead of testing randomness at each distinct lag, it tests the overall randomness based on a number of lags. It is an improved version of the Box-Pierce test and avoids having to be very specific about the particular type of departure being tested.
A similar assessment can be also carried out with the Breusch–Godfrey test (for serial autocorrelation of order m) and the Durbin–Watson test (for autocorrelation of the first order) but the Ljung Box test verifies the autocorrelation hypothesis till order m. The Ljung–Box test is applied to the residuals of the model, and the null hypothesis being tested is that the residuals from the ARIMA model have no autocorrelation.

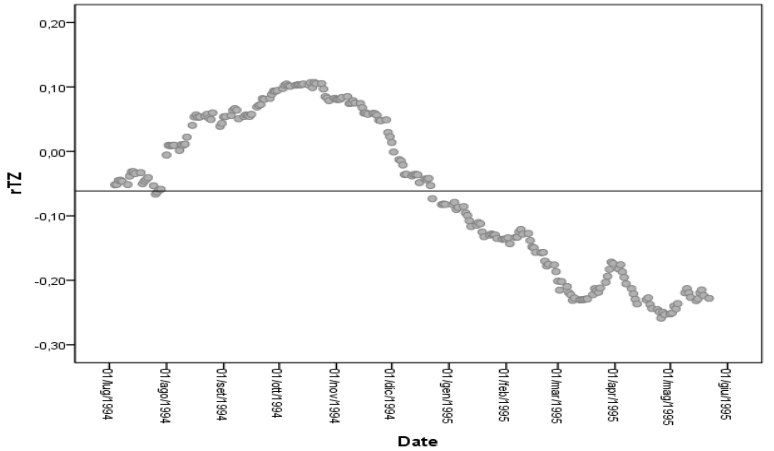
The Ljung–Box test may be defined as:

H0: The data are independently distributed (i.e. the correlations in the population from which the sample is taken are 0, so that any observed correlations in the data result from randomness of the sampling process).

Ha: The data are not independently distributed; they exhibit serial correlation.

## 5.4. Results

Figure 2 - *1994-95 – Premiums for Tanzania cotton before and after the Cotton Act 1994*




| Model Description | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | Model Type |
| Model ID | | rTZ | | Modello_1 | | ARIMA(1,1,0) |
| | | | | | | |
| Number of Predictors | Model Fit statistics | | | Ljung-Box Q(18) | | |
| | Stationary R-squared | | MaxAE | Statistics | DF | Sig. |
| 0 | ,051 | | ,053 | 14,360 | 17 | ,641 |
| | | | | | | |
| ARIMA Model Parameters | | | | | | |
| | | | | | Estimate | Sig. |
| rTZ-Modello_1 | rTZ | No Transformation | AR | Lag 1 | ,246 | ,000 |
| | | | Difference | | 1 | |

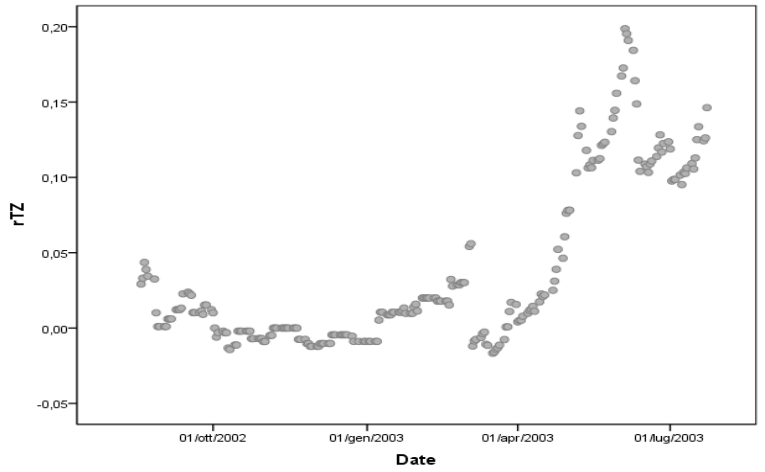
$p_t \coloneqq premium\ at\ the\ data\ t$

$dp_t^{(1)} \coloneqq\ p_t - p_{t-1}$

ARIMA(1;1;0) $: dp_t^{(1)} = 0.246 dp_{t-1}^{(1)} + e_t$

The results show that the Expert Modeler criterion has chosen a (1,1,0) ARIMA model. As of the ARIMA parameters box above, the time series needed to be stationarized by one differencing (I=1), and AR one lag (AR=1) is needed to correct for autocorrelation in the differenced time series. The ARIMA coefficient (0,246) shows there is a negative trend around 1994/95 which is significant. This can also be seen in the plot in figure 2. The Ljung Box test is applied to determine whether residuals are random. The p-value for the Ljung Box test being well above .05, indicates non-significance. This is a desirable result, showing that residuals are random and the model provides adequate fit to the data.

Figure 3 - *2002 – Premiums for Tanzania cotton at passbook scheme implementation*

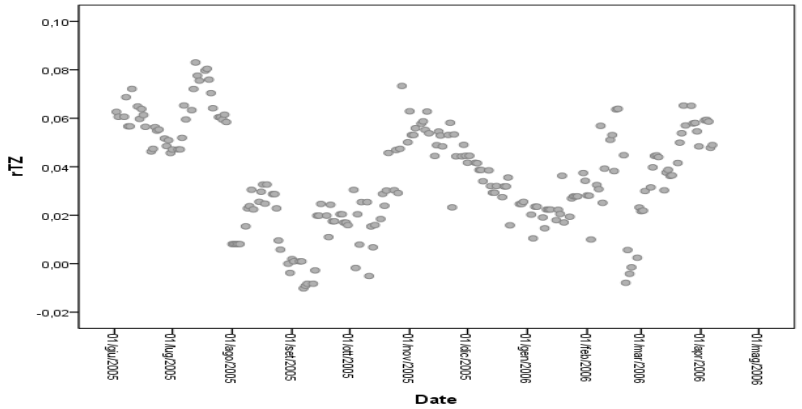


| Number of Predictors | Model Fit statistics | | Ljung-Box Q(18) | | | | |
|---|---|---|---|---|---|---|---|
| | Stationary R-squared | MaxAE | Statistics | DF | Sig. | | |
| 0 | ,044 | ,067 | 12,303 | 17 | ,781 | | |
| | | | | | | | |
| | | | | Estimate | SE | t | Sig. |
| rTZ-Modello_1 | rTZ | No Transformation | Difference | 1 | | | |
| | | | MA Lag1 | -,233 | ,064 | -3,618 | ,000 |

ARIMA(0;1;1) : $dp_t^{(1)} = -0.233e_{t-1} + e_t$

The Expert Modeler criterion has chosen a (0,1,1) ARIMA model. As of the ARIMA parameters box above, the time series has been stationarized by one differencing (I=1); no significant lag is needed in the AR, but a lag in the residuals is MA=1. The ARIMA coefficient (-0,233) shows there is a positive trend around 2002 which is significant; as also highlighted by the plot in Figure 3. The Ljung Box tests whether residuals are random: the p-value for the Ljung-Box test is well above .05 (0,781), indicating insignificancy of the residuals' autocorrelations. This is a desirable result, showing that residuals are random and the model provides adequate fit to the data.

Figure 4 - *2005 – Premiums for Tanzania cotton relative to failure of "passbook" scheme and implementation of "voucher" scheme*



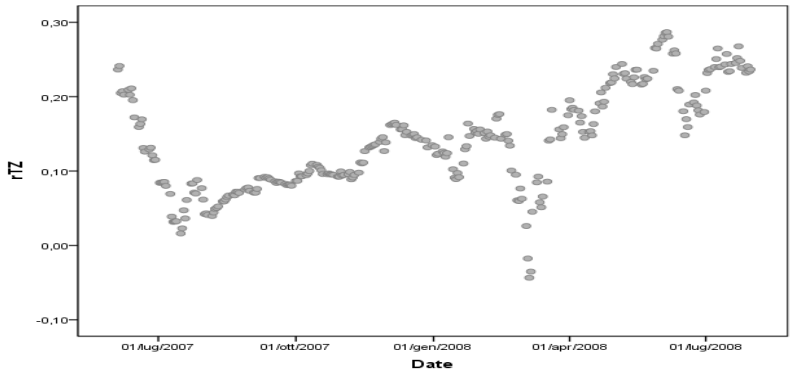

| Model Description | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | Model Type | | | | |
| Model ID | rTZ | Modello_1 | Simple | | | | |
| | | | | | | | |
| Model | Number of Predictors | Model Fit statistics | | Ljung-Box Q(18) | | | Number of Outliers |
| | | Stationary R-squared | MaxAE | Statistics | DF | Sig. | |
| rTZ-Modello_1 | 0 | ,106 | ,058 | 21,255 | 17 | ,215 | 0 |
| | | | | | | | |
| Model | | | Estimate | SE | t | Sig. | |
| rTZ-Modello_1 | No Transformation | Alpha (Level) | ,673 | ,064 | 10,484 | ,000 | |

ARIMA(0;0;0): $p_t = 0.673 + e_t$

The Expert Modeler criterion has chosen a simple model, i.e. the estimated model is constant. The coefficient shows there is no

positive trend around 2005; as also highlighted by the plot in Figure 3. The Ljung Box test determines whether residuals are random: the p-value for the Ljung Box test is well above .05 (0,215), indicating non-significance (see above). This is a desirable result, showing that residuals are random and the model provides adequate fit to the data.

Figure 5 - *2007 – Premiums for Tanzania cotton at Contract farming implementation*




| Model Description | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Model Type | | | |
| Model ID | | rTZ | | Modello_1 | ARIMA(0,1,7) | | | |
| Model | Number of Predictors | Model Fit statistics | | Ljung-Box Q(18) | | | Number of Outliers | |
| | | Stationary R-squared | MaxAE | Statistics | DF | Sig. | | |
| rTZ-Model_1 | 0 | ,080 | ,077 | 17,845 | 16 | ,333 | 0 | |

| | | | | | Estimate | SE | t | Sig. |
|---|---|---|---|---|---|---|---|---|
| rTZ-Modello_1 | rTZ | No Transformation | Difference | | 1 | | | |
| | | | MA | Lag 1 | -,166 | ,056 | -2,973 | ,003 |
| | | | | Lag 7 | -,255 | ,057 | -4,483 | ,000 |

ARIMA(0;1;7) : $dp_t^{(1)} = -0.166e_{t-1} - 0.255e_{t-7} + e_t$

The results show that the Expert Modeler criterion has chosen a (0,1,7) ARIMA model. As for the ARIMA parameters' box above, the time series has been stationarized by one differenciating (I=1), and AR one lag (AR=1) and MA=7 lags are needed to correct autocorrelation in the differenciated time series. The ARIMA coefficient, -0,166 and -0,255, show that there is a positive trend around 2007 which is significant; as also highlighted by the plot in Figure 4. The Ljung Box test determines whether the residuals are random. The p-value for the Ljung Box test is well above .05 (0,333), indicating "non-significance". This is a desirable result, showing that residuals are random and the model provides adequate fit to the data.

## 6. *Comments*

In the first model results show a change in the trend of the premiums time series after the implementation of the Cotton Act (1994) which defines the liberalisation of the Tanzanian cotton sector. The Cotton Act concretised in an opening of the sector to competition and to private marketing and ginning agents. It has also meant the end of primary market grading and of seasonal input credit. The objective of this first analysis is to check the findings in Lorenzetti (2014), where impact of a liberalisation had been assessed on a time series of yearly average premiums (Cotlook Ltd.) instead. Results confirm findings in Lorenzetti (2014): the effect of liberalisation on the daily bulletin is a depletion of the premium. This can be interpreted as a consequence to the transfer of input supply and quality control from public institutions to numerous private players resulting in depletion of both and eventually in the plummeting of the quality of cotton; all the more if we consider that production in terms of quantity has shown a surge instead (in response to high cotton world prices in 1995). After liberalisation grading has disappeared at first point of purchase and different grades have since been indiscriminately purchased and ginned together. The absence of grading causes

information asymmetry in the market as buyers and sellers possess different levels of information during transactions and producers lose the incentive to implement those labour intensive activities which are necessary to keep quality high.
The following three models assess the impact of policies that move in an opposite direction to that of liberalisation i.e. counter-reforms. Results show that the implementation of counter-reform policies have a positive impact on the premiums, except from model number 3.

The positive impact of the counter-reform policies in model 2 and 4, emphasizes the non negligibility of coordination in input supply and the direct consequences that these policies have on the quality of cotton and the premiums it can obtain on the world market. Both systems encouraged producers to increase their chemical application, so protecting the harvest that was available and at the same time contributing to an increase in quality. In addition, crop yields seem to follow the trends detected in the premiums and were particularly high in 2008 (highest yield value in the period from 1990 to 2010) (USDA). In general, production values also seem to follow the trends found in the premiums time series. The implementation of the passbook scheme shows simultaneous performance in production with an increase from season 2003 to season 2004 from 215,000 to 525,000 of 480 lb bales; and 575,000 in 2005 showing a growth rate of 144.19% from 2003 to 2004 and an additional 9.25% in 2005. The failure of the passbook scheme in 2005 is matched by a fall in production quantity from 575,000 to 200,000 480 lb bales; a 65.22% decrease (USDA).

The blur of results in model 3 could be due to the policy having been plagued with a number of shortcomings in the implementation. For example vouchers have often been reported as not delivered on due time, interfering with farmers timely planting decisions. Late planting negatively affects yields and delayed inputs have consequences on quality. Ukiriguru Agricultural Research Institute (ARI) stress that late planting may reduce cotton yields by 68%, late thinning and weeding may reduce yields by 59% and soil fertility

exhaustion through continuous cropping without addition of fertilisers or manure may lower cotton yields by 75%. In addition, late delivery of fertilizer results in most cases with farmers ending up not using it (Larsen, 2015). According to a pilot study by Pan and Christiaensen (2012) bureaucracy in the framework also causes distribution of ineffective pesticides and poor quality seeds. Distribution also seems to be affected by corruption: agro-dealers tend to deal with stockists to provide substandard inputs. If on the one hand the system is successful in reducing the cost of inputs for farmers, on the other these may not be distributed on time, affecting production in terms of yields and quality. Inadequate extension service and in general poor targeting performance seem to be an additional problem, with elite farmers capturing grand part of vouchers.

In general, the private sector has struggled to take over many of the roles performed by the parastatals. Cotton is a crop that requires significant investments: on an annual basis for inputs, in the medium term to provide credit for animal traction/equipment, and in the long-term for R&D to maintain productivity and quality. If any of the financial and input channel mechanisms are interrupted, the system has shown to wreck (one example is the cotton sector in Uganda) not only in terms of quality but also quantity. In particular, quantity has shown to be increasingly volatile consequent to the absence of production incentives in the form of support services; hence production decisions have been increasingly influenced by world prices.

The implementation of the considered policies has in general not been flawless, which possibly explains why the policies have failed to persist. One shortcoming to the implementation of contract farming is that neither ginners nor farmers fulfilled their obligations completely. On the one hand, ginners often did not seem to respect the timeliness of input supply for high quality and quantity of production. On the other, farmers would sell their produce to non contract buyers, failing to have due regard of contractual obligations. The scope for non fulfillment of contractual obligations on one side

and the other is a structural absence of legislation in contract farming policy. Larsen et al. (2015) report that contracts behind the contract farming policy implemented for the 2012/13 season have resulted to be incomplete and this must have plagued contracts even in the previous seasons that are here considered. All in all, the empirical evidence points out the critical need to maintain an input credit system; the shortcomings of the policies instead highlight the need for a better formalization of the contracts and call for completion of the legislation in contract farming possibly involving stakeholders from early stages.

## 7. *Conclusions*

The purpose of this paper is to add another tessera in the mosaic of the debate on the liberalisation of the cotton sector in SSA in order to contribute to the design of effective policies.

Globalization and free trade bear the promise of welfare gains through increased competition, and this applies also to the agricultural sector. Consistently, liberalisation has been treated as a sort of "one size fits all" receipt by the International Financial Institutions (IFI): developing countries have been more or less coercively persuaded by the IFI and developed countries that liberalising their economies was the golden rule for achieving development and succeeding over poverty. This paradigm has also concerned the cotton sector, which is of considerable importance for many SSA countries where it is a catalyst to economic development. SSA is acknowledged to benefit of a comparative advantage in cotton cultivation: in perfect conditions the resultant is a high quality cotton which fetches a premium on the A Index world cotton price. In addition, cotton cultivation involves the rural poor, consequently it is recognised as a means of fighting poverty.

The problem is that where the goal of increased competition in the cotton sector has been achieved, optimistic expectations of welfare gains have not been met. The acknowledged important role in poverty reduction of cotton makes decisions on the design of this sector a prominent matter; even more so in the SSA region. In

particular, this is true in Tanzania, which heavily depends on exports of lint for a significant part of its GDP (ICAC) and where around 500,000 smallholders are involved in the cultivation of cotton. Tanzania pursued far-reaching reforms and is to date the most liberalised cotton sector in SSA, but it is also an example of the undesirable effects of such reforms. In particular, the characteristic that is required for the long'run survival of the sector, i.e. the quality of cotton (Fold and Larsen, 2008; Lorenzetti, 2014), has been negatively affected, thus lowering the reputation of Tanzanian cotton, with a subsequent impact on end users' purchase decisions.

This paper focuses on the so-called counter-reform policies (policies that to a certain extent reverse the reforms made for changing the previous vertically integrated parastatal system) in the liberalised and privatised cotton sector of Tanzania. Such policies have been implemented as a reaction to the shortcomings of the liberalisation of the sector: before liberalisation, cotton from Tanzania had gained a reputation for high quality on the international market and consequently was sold at a premium over the A Index price on international markets; after liberalisation, Tanzania cotton is sold at a discount compared to similar varieties of cotton produced in other countries (TCB, ICAC).

The results of this investigation give a rationale to the call for some public authority with the task of coordinating the cotton sector. I interpret these results as an expression of the inadequacy of a break neck implementation of liberalisation as opposed to a sequenced reform approach with still strong state involvement. There seems to be a hiatus between the rhetoric of liberalisation and its reality as far as least developed countries are concerned. Consistently with this interpretation, a number of authors (Rodrik 2001, Chang 2002, 2005; Reinert, 2007 and Stiglitz) agree that the timing, sequencing and context of liberalisation are prominent in determining its impact. Even authors who advocate a far reaching liberalisation of the cotton sector in SSA as Vitale and Sanders (2005) acknowledge that adequate planning emerges as a key factor, since "it's apparent that privatization can create as many problems as it fixed."

The cotton sector in Tanzania and in the SSA region in general is

acknowledged to be vulnerable, being part of a very competitive world market. It needs to face competitors like China and the US and a number of challenges coming from the world market. Among these are the subsidies to the cotton sector in developed and developing countries (particularly in the US and China) that have a detrimental impact on world prices (ICAC) and eat away the SSA domestic comparative advantage in cotton production; along with the access to technological innovations which impose new standards and that are not affordable in SSA (High Volume Instrument classification is one example).

However, developed countries have no natural advantage in cotton quality or characteristics: SSA cotton farmers produce some of the highest quality fibers traded in world markets.

If the objective is that of a flourishing cotton sector, by reason of its acknowledged huge potential to increase income and employment in rural areas, and to fulfill its duty to fight poverty, then it might be due to follow the afore mentioned sequenced implementation of reforms. As F. List first wrote in 1856, paving the way in this direction: “no country has ever developed by simply opening itself up to foreign trade and investment: liberalisation can be effective to make an industry competitive when it is near the stage of maturity while it harms infant industries or inefficient industries subject to prolonged protection.”

*Acronyms*

ESA - East South Africa
FAO - Food and Agriculture Organisation
ICAC – International Cotton Advisory Committee
IFI - International Financial Institutions
SSA – Sub-Saharan Africa
TCB – Tanzania Cotton Board
UNCTAD – United Nations Conference on Trade and Development
USDA - United States Department of Agriculture
WCA – West and Central Africa

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