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**Revisiting the “cotton problem”:  
A comparative analysis of cotton reforms in Sub-Saharan Africa**

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**Abstract of the paper** *The cotton sector has been amongst the most regulated in Africa, and still is to a large extent in West and Central Africa (WCA), despite repeated reform recommendations by international donors. On the other hand, orthodox reforms in East and Southern Africa (ESA) have not always yielded the expected results. This paper uses a stylized contracting model to investigate the link between market structure and equity and efficiency in sub-Saharan cotton sectors and analyze the potential consequences of orthodox reforms in WCA. We argue that the level of the world price and of government intervention, the degree of post-reform competition, as well as the degree of parastatal inefficiency, all contribute to making reforms less attractive (but not less pressing) to farmers and governments in WCA today, as compared to ESA in the 1990s. We illustrate our arguments with empirical observations on the performance of cotton sectors across sub-Saharan Africa.*

**JEL codes:** Q12, L33, O12

**Keywords** Sub-Saharan Africa, cotton reforms, self-enforcing contracts

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## 1. INTRODUCTION

Cotton is sometimes referred to as African ‘white gold’ (Moseley, 2008): it represents a crucial source of income in large parts of Africa, both for rural populations and for national economies. Its production has been further described as a unique ‘success-story’ (e.g. Lele et al., 1989): between 1980 and 2000, Africa’s share of world cotton trade rose by 30%, while its average share of world agricultural trade was divided by two during the same period (Boughton et al., 2003). Performance has been particularly impressive in West and Central Africa (WCA): yields grew over 6% between the early 1970s and late 1980s (Figure 1), compared to about 2% worldwide; and, combined to considerable expansion of the area under cultivation, this resulted in impressive production growth with total output being multiplied by ten between the early 1970s and the mid-2000s (Baffes, 2007). Due to its widespread and substantial smallholder involvement, cotton was considered to play a key role for development and poverty reduction (e.g. Badiane et al., 2002; USAID, 2004; Moseley, 2008).<sup>4</sup>

Cotton requires the use of various external inputs that most smallholders cannot afford without resorting to credit. Because the credit market is almost non-existent in rural areas, production occurs almost exclusively through interlinked transactions, also referred to as ‘contract farming’ or ‘outgrower schemes’. With inputs provided on credit by the ginning companies; contracting has taken place in a regulated environment ever since the promotion of cotton growing by European colonizers in the 1950s in most countries of SSA.<sup>5</sup> The

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<sup>4</sup> According to the OECD (2006), “between 2 and 3 million households in West and Central Africa cultivate cotton on part of their small farms” and “up to 16 million people are directly and indirectly involved in or benefit from cotton production and trade.” Besides, “for a number of countries in the region, cotton is a vital or, indeed the largest, source of foreign exchange, with few or no possibilities of diversification in the short to medium term.” In WCA, the cotton sector accounts for 5 to 9% of the GDP and is also the largest employer in countries such as Burkina Faso, Chad or Mali (Townsend, 2006).

<sup>5</sup> In Zambia, Zimbabwe, and all countries of WCA, cotton supply chains were organized in a similar way, based on a parastatal single-channel supply chain. In Tanzania and Uganda, cotton ginning was operated somewhat differently, through village level cooperative societies which had exclusive procurement rights. While in WCA,

majority of the output was ginned by parastatal companies, and competition between ginners was inexistent or very limited. Regulation also included government intervention in price setting, and cotton prices were fixed pan-territorially and pan-seasonally (i.e. the producer price was fixed throughout the country and throughout the year).<sup>6</sup>

Many stakeholders believed that intensive cropping practices would not be feasible in the absence of state-supported integrated supply-chain with interlinked contracts (see for example AFD (2004) for a recent pledge). The major advantage of maintaining a single-channel system has traditionally been the prevention of ‘side-selling’, where farmers sell their cotton to other, higher-bidding, buyers at harvest, instead of to the company which has pre-financed their inputs. This has resulted in relatively successful input provision schemes for cotton production, with positive residual effects on food crops through crop rotation (e. g. chapter 3 in Hussein et al., 2006). For several decades, cotton parastatals have been perceived as relatively efficient, even by proponents of orthodox market institutions.<sup>7</sup>

Still, state control of cotton markets has been criticized by international donors such as the World Bank (WB) and the International Monetary Fund (IMF). The main reason behind calls for reforms is the fact that the applied price setting mechanisms do not allow producer prices to reflect world prices and thus distorted production incentives. More specifically, as can be seen from Figures 5 and 6, producer prices in several countries have remained largely constant since the 1970s, while the world price has fluctuated considerably in the same period. This implies that at times when the world price for cotton was high, such as in the

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regulation was put in place under colonial rule it was introduced mostly after independence in ESA, especially in the latter two countries.

<sup>6</sup> In Burkina Faso, for example, where the system is still in place as in the rest of WCA, the 2009/2010 campaign producer price was set to 160 and 135 CFAF/kg, for 1<sup>st</sup> and 2<sup>nd</sup> grade cotton, respectively. Producers will however receive a bonus (*‘ristourne’*) in April 2010 if the realized world price is higher than the forecast at the time of price setting (in April 2009).

<sup>7</sup> The Berg report, considered to be the reference paper for World Bank (WB) adjustment programs in developing countries’ agricultural markets, notes: “some of the smallholder cotton growing schemes in francophone African countries are organized by agencies with mixed private-public ownership and are among the more successful ventures on the continent” (WB, 1981).

1980s, producers were taxed,<sup>8</sup> while at times of low world prices, as in recent years, producers have been subsidized to an extent that is generally agreed to be unsustainable from a budgetary point of view.

In addition, inefficiencies in parastatal ginning (Tschirley et al. 2009) have become a concern. Pan-territorial pricing schemes are also considered to be ineffective in promoting rural development (Baghdadli et al., 2007). As a result, reforms have been advocated with the objective of strengthening the competitiveness of these sectors, ensuring their long-term financial sustainability and allowing a fair sharing of the profits between producers and ginners.

However, reform choices have differed strongly between regions in Africa. The cotton sectors in East and Southern Africa (ESA) were privatized and liberalized under pressure from international donors in the early to mid 1990s. When farmer payments remained low and inconsistent in the early 1990s, while cotton prices were at an all-time high, the international community started pushing strongly for reform. In 1994/1995, Tanzania, Uganda, Zambia and Zimbabwe all liberalized their cotton supply chains, by privatizing cotton ginneries, liberalizing prices, and allowing competition.

Resistance to reforms was stronger in WCA. While private entry has been allowed to some extent in Benin, in the Ivory Coast and in Burkina Faso, liberalization is only very partial. In Burkina Faso and in the Ivory Coast, private investment has been allowed in cotton ginning since 2004, but each cotton company has been allotted local monopsony rights on the purchase of cotton in a particular region. In Benin, private investment in cotton ginning has been allowed since 1994, but the seed cotton is allocated administratively to cotton ginners.

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<sup>8</sup> According to proponents of the traditional system, ‘taxation’ was necessary to finance investments in research, extension and infrastructure improvement. This remains difficult to evaluate. Besides, at some points in time, stabilization funds were created to fuel future support at times of low world price. They however often ultimately dried up before being used because of mismanagement, fraud and unexpectedly long periods of low world prices.

Everywhere, prices are still administratively fixed. Several pricing mechanisms have been considered to establish a link between producer prices and the world price but they still have not been applied, despite the increasingly tense financial situation of most ginning companies.

Differences in resistance to reform may reflect the unwillingness of certain stakeholders involved in processing or in the administration to give up on rents, or a belief that reform would not be beneficial to farmers.

Comparative research by Tschirley et al. (2009 and 2010) reveals several interesting patterns. First, there seems to be a strong link between market structure and different elements of performance: while competitive, market-based systems usually involve relatively high producer prices, without any type of budgetary support, they mostly fail in the provision of inputs and extension. Monopolistic and concentrated sectors, on the other hand, are better in providing inputs and services to farmers, although the latter tend to cover fewer farmers than the former. Prices can be high in monopolistic markets – even higher than in competitive markets – but this can be at the cost of huge public transfers. In concentrated markets, relatively high prices can be, but are not always paid to producers, due to various reasons (e.g. collusion in the output and input sub-sectors).<sup>9</sup> In fact, different market structures and different local institutions resulted in very different reform experiences in the ESA countries. As a result, while Baffes (2005) advocated further privatization of the State monopsonist ginning companies as well as further liberalization of African cotton sectors and associated sub-sectors (mainly transport and inputs) in his paper “The Cotton Problem”, Tschirley et al. (2009 and 2010) today conclude that no market sector type seems to have performed so well that it can be used as a reference for other countries.

This paper therefore aims to understand why the “Cotton Problem” still has not been solved. While the comparative overview of different reform experiences in ESA and WCA

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<sup>9</sup> Another important issue, which we will not discuss in this paper, is cotton quality, which has often been strongly affected by the respective reforms.

provided in Tschirley et al. (2009) offers very useful empirical insights into the expected reform impacts for WCA; our paper tries to go one step further, by assessing these effects in a formal theoretical framework provided by Swinnen et al. (2009). This simple theoretical model allows characterizing the effects of liberalization given different conditions of market structure and the nature of ownership, in a context of imperfect markets, absent formal contract enforcement institutions, and prevalence of linkages between input and output markets. The important variation in reform options chosen among countries of SSA offers a particularly interesting set-up for examining variations in the supply responses to liberalization and identifying the reasons for the observed divergence in performance.

The paper is organized as follows. Section 2 presents our stylized contracting model and motivates our strategy in accounting for public intervention in price setting. Section 3 looks at the impact of orthodox reforms and identifies reasons for diverging reform outcomes across SSA. Section 4 concludes.

## **2. A MODEL OF LIBERALIZATION**

### **2.1 Characteristics of the pre-liberalization economy**

To use a model for explaining reform effects, it is important to take into account the specific characteristics of the pre-liberalization economies. First, government institutions were monopoly buyers. Second, as efficient credit markets did not exist in rural areas (among other reasons because of the absence of transferrable land-property rights, which precludes the use of land as credit guarantee), interlinking was widespread. The dominant form (and often the only source of inputs and credit) was that of seasonal input and credit provisions by state-controlled organizations to small farmers in return for supplies of primary produce. Processing and marketing were also directed by the parastatal, under the control of the

government.<sup>10</sup> Although there were some variations in countries in the extent and scope of control, this was the basic system all across Africa. As a result, an important achievement (in historical perspective) of these systems was that they did manage to provide inputs and credits to farms, albeit in a costly way.<sup>11</sup> The monopoly control contributed to enforcement of the interlinked contracts, but there were problems of high costs, enforcement problems with buyers (sometimes) paying with delays and farmers (sometimes) not repaying credit or inputs. Third, government control of the supply chains was also used to set prices, which contributed to massive distortions in agricultural markets. While distortions were present everywhere, the nature of the distortions differed strongly across countries. As we will document further, farmers were generally taxed more in ESA, and even sometimes subsidized in WCA.

## 2.2 The model<sup>12</sup>

To produce one unit of cotton, a farmer needs to invest an amount of labour  $l$  and in inputs of value  $k$  (e.g. seeds, fertilizers and pesticides but also tools to adopt new cropping techniques). We assume an indivisible production function and a fixed proportions production technology.<sup>13</sup> The farmer's opportunity cost of labour is  $\bar{l}$ . If the farmer's only alternative is to produce food crops for the local market, then  $\bar{l}$  equals their price. We assume the required inputs are not directly available to the farmer because of market imperfections but processors have better access to credit and/or inputs, such that they can provide inputs on credit to the

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<sup>10</sup> In some countries, the parastatal would also be responsible for developing new seeds (to varying degrees, with public budget support), distributing seeds, fertilizers and pesticides on credit, providing technical advice to farmers, taking care of relevant infrastructures, and sometimes, even building schools and dispensaries. For a historical review examining the reasons for the emergence of these integrated 'supply-chain institutions' as well as their evolution over the past half century, see Delpuech (forthcoming).

<sup>11</sup> In Benin, for example, according to a 1998 farm survey, 97 percent of cotton growers used fertilizer, which they all purchased on credit through the cotton parastatal, while only 24 percent of other farmers did (IFPRI and LARES, 2001).

<sup>12</sup> The model presented here builds on the Swinnen et al. (2009) extension of a model by Kranton and Swamy (2008).

<sup>13</sup> Note that perfect information is assumed, hence we do not consider production, price nor market risks.



farmers.<sup>14</sup> We normalize the interest rate to zero and set the processor's processing and marketing costs to be equal to the consumer's valuation of processing and marketing such that the processor's opportunity cost of exporting cotton is  $\bar{k}$ .<sup>15</sup>

Inefficient processors face extra processing and marketing costs, denoted by  $c$ . These costs may encompass different inefficiencies, such as excessive transport and storage costs (Kherallah et al. 2003), or poor sales strategies, management tools, and technology (Baffes, 2007). They could also reflect, for example, the fact that parastatals have a record of serving as job providers to politicians needing to reward political support.

Finally, to account for government intervention in price setting, we introduce a parameter  $t$ , representing a government tax ( $t \geq 0$ ) or subsidy ( $t \leq 0$ ).<sup>16</sup>

The farmer can sell his cotton to a processor. The processor exports the cotton and receives  $p$ , the exogenous world price for cotton.<sup>17</sup> The net value that is created if a contract is agreed and enforced, the “surplus”, is denoted by  $\theta$ , with

$$\theta = p - \bar{k} - \bar{i} - c - t \quad (1)$$

If a surplus is realised (i.e.  $\theta > 0$ ), it is shared according to a simple Nash bargaining process, in which total payoffs are obtained by adding each agent's outside option to his share of  $\theta$  (Nash, 1953).

To account for the fact that, in most of rural SSA, credible contract enforcement is very often unaffordable (among other reasons because of the oral nature of many

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<sup>14</sup> We assume that the processors do not have the skill (or land) to produce directly.

<sup>15</sup>  $\bar{k}$  depends both on the capital intensity of the crop, and on the buyer's potential return to alternative investments.

<sup>16</sup> Note that, as  $t$  only enters into the equations as a net tax contribution or a net subsidy received, we do not explicitly account for possible benefits that producers (or processors) could obtain from possibly beneficial effects of public expenditures on infrastructure, agricultural research and development, and research extension (or, conversely, for foregone benefits of public investment that has been crowded out by the subsidies to cotton farmers). This can however be considered to be implicitly comprised in the value of  $t$ .

<sup>17</sup> Local consumption is extremely small. In WCA, it is estimated to be inferior to 5 percent. However, African countries remain “small” exporters on the World market, unable to influence the world price. In 2007, the C-4 countries, which together are the first African exporter, accounted for just below 3% of world exports, while, for example, the US accounted for above 19% and Uzbekistan for above 5% (UN Comtrade, 2007).

arrangements, the geographical dispersion of agents and the weakness of judiciary systems), we consider the extreme case that there is no external enforcement mechanism.<sup>18</sup> This implies that after the farmer accepts a processor's offer for inputs, which comes with an announced buying price, he can still decide ex-post (i) whether to use the inputs for cotton production and (ii) whether to supply the cotton produced to the contracting party. We focus on the farmer's defaulting opportunities.<sup>19</sup> If the farmer sells the inputs or uses them on crops other than cotton to obtain food crops of better quality or in a larger quantity for example, he earns  $\bar{k} + \bar{i}$ .<sup>20</sup> Alternatively, he might have an incentive to produce cotton but sell it to an alternative buyer at the spot market price (i.e. "sidesell"). Indeed, if any, an alternative processor may be able to offer a higher price than the contracting party, as he does not need to deduct the cost of the provided inputs from the price. We define  $\gamma$  as the share of  $p$  offered by potential competing processors, such that  $\gamma p$  can be considered the spot market price for cotton. One can think of  $\gamma$  as reflecting the degree of competition, but also the processor-specificity of the production characteristics or the fact that alternative processors have a different reputation on the world market, resulting in a different sales price. By defaulting on contract obligations, in both cases, however, the farmer incurs a reputation cost ( $\phi$ ).<sup>21</sup> The different payoffs under each situation are summarized in Figure 8. With no formal enforcement mechanisms, contract compliance can be ensured only by making the contract self-enforcing. This implies that the respective payoffs of the contract are given by:

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<sup>18</sup> In this respect, this model can be viewed as a particular case of "bargaining with imperfect enforcement", as described in White and Williams (2009), which implies that the weakest party in the negotiation can actually gain a larger share of an agreement if it must be implemented non-cooperatively as "the lot of the weaker player must be improved in order that he finds continuing the agreement worthwhile."

<sup>19</sup> Processors' incentives to default (for example by postponing payment) are discussed by both Kranton and Swamy (2008) and Swinnen and Vandeplas (2009). Adding the option of opportunistic behaviour by the processor would not significantly affect our conclusions.

<sup>20</sup> Note that, for simplicity, we adopt Kranton and Swamy (2008)'s assumption that the farmer's opportunity cost of the borrowed capital is equal to the buyer's opportunity cost of capital.

<sup>21</sup> In fact, the reputation cost is a short-hand way of introducing some dynamics in the model and keeping it simple (Kranton and Swamy, 2008). Such a cost would result, for example, from the loss of an opportunity to conclude a contract and to access credit and input, since, in WCA, alternatives to pre-finance a cotton season are very scarce.

$$Y = \max (\bar{i} + \beta\theta; \bar{k} + \bar{i} - \varphi; \gamma p - \varphi) \quad (2)$$

$$\Pi = p - c - t - Y \quad (3)$$

In turn, such a contract is feasible only if the world price satisfies the following condition:

$$p \geq p_{\min} = \max \{ \bar{i}; \bar{k} + \bar{i} - \varphi; \gamma p - \varphi \} + \bar{k} + t + c \quad (4)$$

Condition (4) shows that single-market channel systems (with low  $\bar{i}$ , low  $\gamma$ , and high  $\varphi$ ) are expected to perform well on efficiency, in the sense that they reduce  $p_{\min}$  and allow contracting at lower levels of the world cotton price  $p$ . On the other hand, it can be seen from condition (2) that the same factors would cause producers prices to be lower. Furthermore, processing inefficiencies  $c$  are expected to reduce contract feasibility, as well as suppress producer and processor payoffs. Finally, taxation by the government ( $t > 0$ ) will have a similar impact as processing inefficiencies, while subsidies by the government ( $t < 0$ ) reduce  $p_{\min}$  and hence improve contract feasibility as well as producer and processor payoffs.

### 3. THE EFFECTS OF ORTHODOX REFORMS

#### 3.1 Model predictions

We now look at the potential impact of orthodox reforms understood as the combination of liberalization of the ginning sector, and privatization of parastatals. The variable  $R$  will be used to denote the extent to which orthodox reforms have been implemented, with  $R$  continuous, going from ‘no reform’ ( $R = 0$ ) to ‘complete reform’ ( $R = 1$ ).

First, the introduction of competition is hypothesized to affect  $\gamma$ ,  $\bar{i}$  and  $\varphi$  (Swinnen et al., 2009). Competition creates new options to side-sell:  $\gamma$  is expected to increase, as we move from a monopsony (where  $\gamma \approx 0$ ) to a competitive environment (as long as processors do not collude). Hence,  $\partial\gamma/\partial R \geq 0$ . As competition might also bring along improved contract options

ex-ante,  $\bar{r}$  is expected to increase, hence:  $\partial \bar{r} / \partial R \geq 0$ .<sup>22</sup> The farmer's reputation cost  $\varphi$  is also likely to decrease: the more numerous processors are, the more expensive it gets for them to coordinate and share information (Zanardi, 2004) and the more alternative buyers remain after defaulting with one of them (Hoff and Stiglitz, 1998). Hence, as  $\partial \varphi / \partial R \leq 0$ : competition might also increase the farmer's returns from the two ex-post defaulting options.

Furthermore, privatization might lead to increased efficiency, for example through the removal of excessive employment or of soft budget constraints. Similarly, the introduction of competition is likely to remove certain inefficiencies in processing congruent with Hick's "quiet life" hypothesis (1935) which argues that competition brings incentives for cost minimization and the removal of processing inefficiencies, as was the case in, for example, Eastern Europe and China (Rozelle and Swinnen, 2004).

However, some have argued that competition might increase inefficiencies by suppressing economies of scale (e.g. Demsetz, 1973; Guy et al., 2004), increasing transaction costs (Shervani et al., 2007) or lowering incentives for investing in research (e.g. Pray et al., 2005). So far, most reform experiences in the sub-Saharan African (SSA) cotton sector suggest that competitive sectors are more efficient than concentrated sectors, and both substantially outperform monopolistic sectors (Tschirley et al., 2009). The same report mentions that even after reform, most research programs remain in public hands, weakening the link between market structure and research performance. Hence, most evidence seems to suggest that  $\partial c / \partial R$  will be negative. Still, some anecdotal evidence suggests that the partial liberalization of the ginning sector in Benin led to a significant increase of the cost of transporting seed cotton from fields to ginneries (Delpeuch, forth.), underscoring the importance of examining this effect on a case-by-case basis.

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<sup>22</sup> Note that ex-ante competition refers to competition between buyers at the time of negotiating the agreement, while ex-post competition relates to competition between buyers at the time of contract execution, i.e. trading. In the case of contract farming, ex-post competition is only possible in case of weak contract enforcement.

Finally, price liberalization removes government intervention in price-setting. In case the sector was taxed before reform,  $\partial t/\partial R < 0$ . In case the sector was subsidized before reform,  $\partial t/\partial R > 0$ .

If we combine these effects with equation (2), we can derive the impact of the orthodox reforms on the farmer's returns, at the condition that contracts can be sustained:

$$\frac{\partial Y}{\partial R} = \frac{\partial Y}{\partial \gamma} \frac{\partial \gamma}{\partial R} + \frac{\partial Y}{\partial \bar{l}} \frac{\partial \bar{l}}{\partial R} + \frac{\partial Y}{\partial \phi} \frac{\partial \phi}{\partial R} + \frac{\partial Y}{\partial c} \frac{\partial c}{\partial R} + \frac{\partial Y}{\partial t} \frac{\partial t}{\partial R} \quad (5)$$

The first three terms of equation (4) are non-negative. The sign of the fourth term is most likely to be positive (or zero). Finally, the fifth term will be positive (or zero) if the government taxed farmers before the reform, and negative (or zero) if farmers were subsidized. If contracts remain sustainable after the reform, farmers will benefit unless a decline in efficiency and/or the abolition of state support mitigate entirely the positive effects of increased ex-ante and ex-post competition and lower reputation costs. In case farmers were taxed before reform and efficiency in the sector improved through reform, the right-hand side of equation (5) will be positive and reform is expected to benefit farmers, as long as contracting is sustained.

A crucial issue is the sustainability of contracting with reforms. Using equation (3), the aggregate effect of orthodox reform on contract sustainability can be summed up as follows:

$$\frac{\partial p_{\min}}{\partial R} = \frac{\partial p_{\min}}{\partial \gamma} \frac{\partial \gamma}{\partial R} + \frac{\partial p_{\min}}{\partial \bar{l}} \frac{\partial \bar{l}}{\partial R} + \frac{\partial p_{\min}}{\partial \phi} \frac{\partial \phi}{\partial R} + \frac{\partial p_{\min}}{\partial c} \frac{\partial c}{\partial R} + \frac{\partial p_{\min}}{\partial t} \frac{\partial t}{\partial R} \quad (6)$$

Whereas the net contribution of the first three terms is expected to be positive, the sign of the last two terms depends on whether efficiency is improved (in which case the fourth term will be negative or zero) and on whether the sector used to be taxed or subsidized before reform. To the extent that a competitive sector can be achieved through liberalization, the constraint on  $p$  will be strengthened (as  $p_{\min}$  increases), unless efficiency improves enough to

offset the three first terms, as a result of increased processing efficiency and/or tax elimination. Alternatively, if pre-reform subsidies were preventing contracts from breaking down, and they are eliminated through reform, reform may result in a significant collapse of cotton schemes, with dramatic effects for the farmers involved in these schemes.

These predictions confirm the existence of a trade-off between competition and integration, or ‘coordination’, as pointed by Dorward, Kydd, Poulton and their co-authors (e. g. Dorward et al. 1998 ; Poulton et al. 2004 ; Tschirley et al., 2010).

### **3.2 Lessons for WCA reform prospects**

We will now use the theoretical framework described above, as well as the most relevant differences between ESA at the time of their reforms (in 1994/95) and WCA currently, in order to compare the observed reform effects in ESA with expected reform effects in WCA. We will focus on pre-reform market structures, pre-reform government intervention in pricing, as well as on inefficiencies in production and marketing processes. Based on these factors, we will try to derive the expected effects of reforms on producer prices and contract sustainability after reform.

#### *The level of the world price and government intervention*

Since the 1970s, the nominal rates of assistance (NRA) to cotton producers in Africa have on average been significantly negative (see Figures 10 and 11), implying that producer prices were below the estimated “reference” farm gate prices – defined, following Anderson and Masters (2009), as the export price approximated by the A-index, net of freight and

marketing costs, inland transport costs and ginning costs, in constant 2000 CFAF, deflated by the March-to-July average bilateral exchange rate.<sup>23</sup>

Such patterns of taxation have been observed for many other crops: the empirical political economy literature finds that African governments (like governments in other developing countries) have largely taxed agriculture, especially exportable cash crops (e.g. Krueger, Schiff and Valdes, 1988; Anderson and Masters, 2009; Swinnen et al., 2009; Bates and Block, 2010).<sup>24</sup> Apart from explicit taxation, these negative NRA figures also reflect various sources of implicit taxation which African cotton sectors have also been plagued with. One particular source of implicit taxation has in many cases been inefficient management of parastatals (which would be channelled through  $c$  in the model) and a publicly enforced monopolistic market structure (which would be channelled through a low  $\gamma$  and a low  $\bar{l}$  in the model).

However, current patterns of government intervention in price-setting in WCA seem to be entirely different from these broad historical intervention patterns and especially intervention patterns in ESA at the time of reform. Indeed, Figure 9 - 11 also display some periods of subsidization of WCA cotton farmers: while world prices underwent a strong decline in the late 1980s and since the early 2000s, producer prices were sustained at their

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<sup>23</sup> These figures should, however, be regarded cautiously: ginning costs are taken from declarations by the countries/companies but deflated by 25% as there is evidence that declarations were above real costs (Walet, 2005) and as, often, the companies financed infrastructure, such as road, improvement. The question is whether such financing should indeed be considered taxation. Besides, it is unclear whether research and extension costs were included, while there are reasons to believe they have been significant, especially in the first decades of existence of the '*filières*'.

<sup>24</sup> Various reasons have been put forward to explain this. First, exported cash crops are considered to be a relatively easy target for taxation, because it is easier to control exports than domestic market products, and because there are no local consumers for whom prices should be kept low. Second, taxation of agricultural products is expected to be higher if agriculture occupies a larger share of the national GDP, and if the government has less alternative sources of income at its disposal. And effectively, in the C-4 countries governments currently seem to have few other options than the cotton sector to source their public budgets from, especially in Benin and Burkina Faso, where cotton accounts for more than 50 % of the total merchandise export value (see Figure 7). Third, the more numerous farmers are, (i) the more costly it is to organize them (Olson, 1985) and (ii) the higher the costs on the rest of society are for supporting them (Swinnen 1994; 2010).

historical level.<sup>25</sup> This resulted in financial losses for the ginning companies, which ultimately had to be covered by budget support.<sup>26</sup>

### *The level of post-reform competition*

The empirical literature on the impact of reforms in ESA reveals that market structure after liberalization has in all cases strongly resembled market structure before liberalization. On the one hand, in Tanzania and Uganda, where cotton sectors were organized according to a cooperative structure prior to reforms, liberalization brought many private actors and hence a significant degree of competition. On the other hand, where cotton supply chains were organized according to a single-channel based marketing system prior to reform, the level of concentration has tended to remain relatively high post-reform, especially in the first decades after liberalization. In Zambia and Zimbabwe, where a single channel supply chain prevailed as in most WCA countries, the market remained highly concentrated for years after the reform with the two major firms procuring at least 90 % of total cotton production (Tschirley et al., 2009). Only in recent years, has an upsurge in competition been observed (Ibid.; Brambilla and Porto, 2008). In these countries, input supply systems have to a large extent been sustained. More specifically, in such systems, firms seem to be more likely to compete on

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<sup>25</sup> Unfortunately, we do not have the required data to calculate NRAs for the most recent years. Yet, plenty of evidence suggests that, in WCA, subsidization has been taking place without exception.

<sup>26</sup> The countercyclicity of support to the agricultural sector is believed to be a common feature of agricultural policies (e.g. Swinnen, 2010; Gawande and Krishna, 2003). One possible explanation is that government preferences exhibit loss aversion (Tovar, 2009) and therefore tend to protect especially the sectors where profitability is on the decline. Another argument can be understood from a simple perspective of rent maximization: if cotton is governments' major source of income, it is rational for governments to subsidize their cotton sectors at times of low world prices. Nubupko and Keita (2005) for example find that, in Mali, the negative macroeconomic impact of a 20% drop in producer prices would be bigger than the positive impact of the budget saving that would allow such a reduction. Finally, some authors argue that subsidization could be a consequence of the fact that WCA governments have limited discretion over the cotton policies, as a result of strong bargaining power of a rent-seeking urban elite and farmer associations. According to Kaminski et al. (2009) or Bingen (1998), decades of extension and information dissemination by cotton companies and financial and capacity-building support by donors in WCA have favoured cotton farmers over other farmers in this respect. This would partly explain recent increases in producers' price share (e.g. Savadogo and Mangenot, forth.). There also seems to be some pressure exerted by bilateral donors, notably France according to Bourdet (2004), to prevent sector collapse, with a view on the importance of the cotton sector for development and poverty reduction, and particularly the positive spillover effects of input use for food crops production (Araujo Bonjean, 2003; Levrat, 2009).



services (ex-ante) instead of on prices (ex-post, by trying to lure away farmers who are already under contract with other buyers).

While the experiences in Tanzania and Uganda provide benchmark insights into the consequences of drastic surges in the level of competition, it seems that the experiences in Zambia and Zimbabwe are more relevant benchmarks of what could happen in WCA, especially as the current low level of the world price and the bleak prospects for price recovery can be expected to put a serious damper on new private investment in the WCA cotton sector.<sup>27</sup>

In WCA, there are already signs that competition will be hard to achieve. In Benin, where the private sector has been allowed to enter ginning, after initial numerous firm entries, the degree of concentration is increasing to the point where the sector is said to resemble a private monopsony (Babin, 2009). There are also concerns that the privatization of input supply in Benin and in Burkina Faso has led to collusion (respectively Goreux and Mc Rae, 2003; Bassett, 2008).

Besides, in contrast with ESA, WCA farmers at first sight seem to have less alternative crops to switch to if cotton schemes collapse. Goreux (2003) argues that in most cases, the farmers' only alternative to the cotton/maize rotation scheme, is planting cowpea, with lower yields, and in particular worse health effects, according to a World Health Organisation study. This would imply that in WCA, the farmer's ex-ante outside option ( $\bar{l}$  in our model) is lower than in ESA, and consequently, that cotton schemes could be sustained at lower levels of  $p$ , but also that producer prices for cotton in a market-based system might be lower in WCA than in ESA.

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<sup>27</sup> The privatization of the Malian is said to have been delayed in part because of the absence of serious interested investors.

As a result, rather than overly focusing on possible effects of fierce competition in the sector, in first instance, we should probably be more concerned about potential equity problems of concentrated sectors. In Zimbabwe, for example, according to Poulton and Hamayani-Mlambo (2009), “the entry of numerous, but mostly small, new firms has had only limited impact in raising seed cotton prices.”<sup>28</sup>

### *Processing inefficiencies*

The comparative literature on cotton policies in SSA reveals that parastatals have historically been less inefficient in WCA than in ESA. One indication of this is that, contrary to WCA, from the 1960s through the 1980s, as government-controlled organizations increased their involvement in the cotton sector, performance declined in most ESA countries, eventually resulting in debts and delayed payments to farmers (Tschirley et al., 2009). This can also be observed from the large yield gaps between WCA and ESA from the 1980s onwards with cotton yields in ESA on average almost 40% lower than in WCA in 1990 (see Figures 1 and 3). Indeed, there is some evidence that, in times of taxation, WCA governments were at least partially using the collected funds for research and extension, as well as the development of infrastructure, hereby benefiting the farmers (Townsend, 1999).<sup>29</sup> According to Boughton et al. (2003), “in WCA, colonial governments and then independent states made cotton an engine of development and organized the *filière* (supply chain) to serve that objective” while in ESA, “cotton cultivation [...] typically had its origins in commercial or missionary activity, with the government assuming a greater role over time.” The efficiency

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<sup>28</sup> However, as noted by Tschirley et al. (2010), concentrated sectors “tend to be unstable, with a recurring tendency to move to a more competitive structure”. If this is the case, they find that increased competition may undermine input-credit provision before having any positive impact on producer prices (as was observed in Zimbabwe).

<sup>29</sup> Gillham et al. (1995) comparing the performance of cotton sectors in Tanzania and in Mali and find that (i) “Tanzania is reflective of other East African countries where there was poor training of cotton professionals, inefficient administration and an absence of any integration of research, extension, production and marketing”, while (ii) “good leadership and management and integration of adaptive research, extension and production in Mali ensured that supplies of pure, quality seed were available to the farmers and that, new developments in varieties and production technology reached them rapidly”.

of WCA parastatals is now said to be declining, however the benefits of past investment seem to have enduring positive effects (Tschirley et al., 2009); suggesting less scope for efficiency gains from reform in WCA than there was in ESA.

#### *Overall impact on producer prices*

While reforms in ESA in the 1990s were expected to bring higher prices to farmers, orthodox reforms yield more limited expectations in WCA today.<sup>30</sup> First, the removal of subsidies is likely to have a negative impact on producer prices (especially for farmers facing higher transaction costs, which were subsidized to an even greater extent because of pan-territorial pricing).

Second, reform experiences from ESA teach that post-reform market structures are likely to strongly resemble pre-reform market structures. Scarce opportunities for switching to other crops would reinforce the effects of concentration within the cotton sector.

Third, although efficiency gains are expected, it seems that in general, they will be more moderate than in ESA, especially as cotton sectors are not likely to become fully competitive in the first decade, if reforms are pushed through today.

#### *Overall impact on contract sustainability*

As has been mentioned before, a key aspect of market performance for cotton is the timely supply of adequate inputs. On the one hand, the expected moderate increase in the level of competition (within the sector) and the apparent scarcity of opportunities for farmers outside the cotton sector suggests that the scope for contract breakdown would widen only moderately: in Zambia and in Zimbabwe, contracts have largely been sustained after reform.

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<sup>30</sup> In fact in Zimbabwe, producer prices were higher under the national monopoly system than since liberalization. Poulton and Hamayani-Mlambo (2009) suggest this might have been the “result of the continued (albeit declining) lobbying power of commercial growers during these years.” While it is beyond the scope of this paper to investigate such an issue, the level of support observed in WCA suggest that this could be the case in WCA to an even greater extent.

However, three other factors might contribute to a more extensive collapse of cotton schemes in WCA as compared to ESA in the 1990s. First, the removal of subsidies is expected to result in a substantial reduction of contract feasibility at the current level of world prices. Second, the capacity of efficiency gains to compensate for the loss of subsidies seems limited, for the reasons mentioned above. And third, input requirements seem to be bigger and more pressing in WCA (i.e. a bigger  $\bar{k}$ ) because of a particularly low soil fertility and unreliable rainfall, as suggested by Tschirley et al. (2010).<sup>31</sup>

## 5. CONCLUSION

This paper uses a stylized contracting model to investigate the link between market structure and equity and efficiency in Sub-Saharan cotton sectors and analyze the potential consequences of orthodox reforms in WCA. We argue that the level of the world price and of government intervention, the degree of post-reform competition, as well as the degree of parastatal inefficiency, all contribute to making reforms less attractive to farmers and governments in WCA today, as compared to ESA in the 1990s, and illustrate our arguments with empirical observations on the performance of cotton sectors across sub-Saharan Africa.

While pointing at the limitations of orthodox market reforms in the West and Central African context, however, we do not intend to minimize the need for change: the present system is rapidly depleting public budgets, while failing to bring about any yield increases. By shifting the objective of the cotton policy from maximal production to efficient production, orthodox reforms would likely have detrimental effects on cotton returns for many farmers in WCA, especially the more inefficient producers, which are often the poorest. However, the breakdown of inefficient contracts might ultimately be beneficial to the national economy, if freed resources can be used in alternative ways to support poor farmers in finding

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<sup>31</sup> By contrast, according to Larsen (2003), the use of fertilisers has historically been very limited in Tanzania: less than 10 percent of farmers would have used any before liberalization.

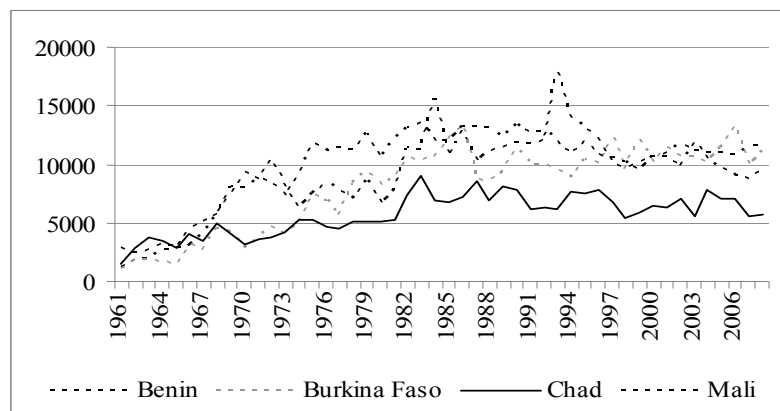
alternative sources of income, for example by improving opportunities for diversification, or in designing more efficient (and better targeted) social safety nets.

Whereas governments in WCA have historically presented cotton production promotion as one of the most efficient ways of pulling rural populations out of poverty, they should now try to find ways to respond to an evolving global reality in which the outlook for cotton price recovery seems bleak (Babin, 2009).<sup>32</sup> Moreover, from a macro-economic perspective, a movement out of cotton production of the less efficient farmers could help to reduce the strong dependency on a single commodity. While this is all easier said than done, this suggests that the very strong focus on cotton reforms, both by donors and governments, should maybe be put into perspective and more attention should be paid to designing reforms that create opportunities for farmers to move out of cotton production.

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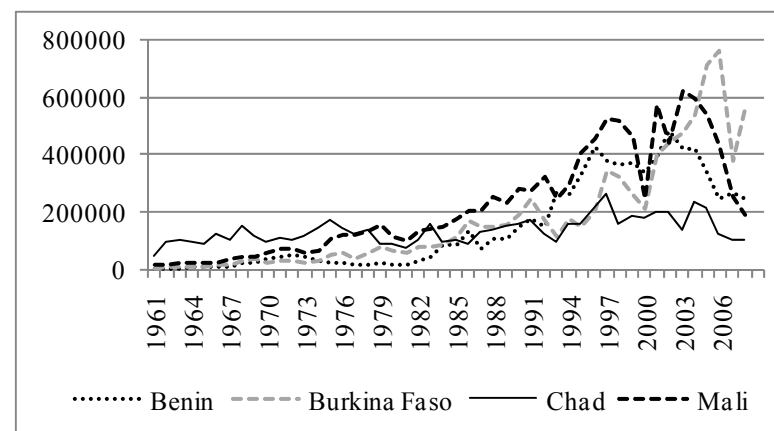
<sup>32</sup> All the more that yields have been stagnating for a decade (compared to worldwide growth over the past fifteen years) and that even production is now declining repeatedly since 2007 (Tschirley et al., 2010).

**Figure 1: Yields (Hg/Ha) in WCA**



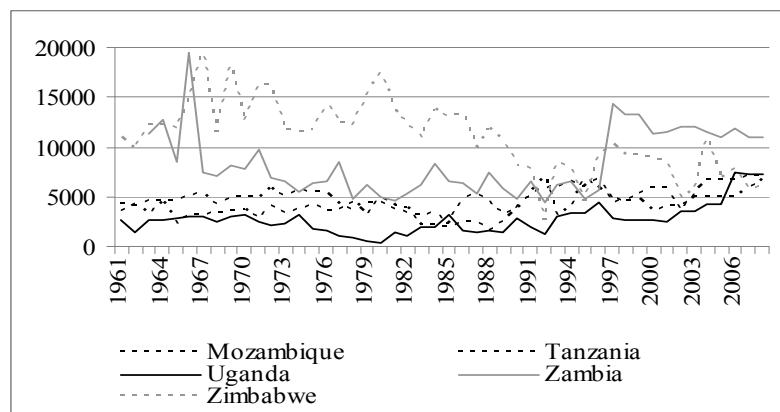
Source: FAOSTAT

**Figure 2 : Production (tonnes) in WCA**



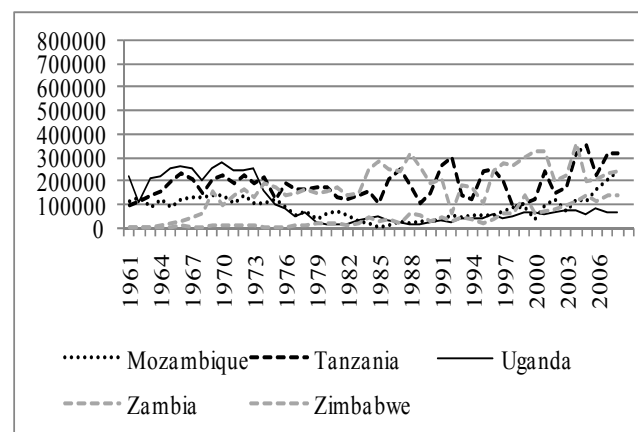
Source: FAOSTAT

**Figure 3: Yields (Hg/Ha) in ESA**



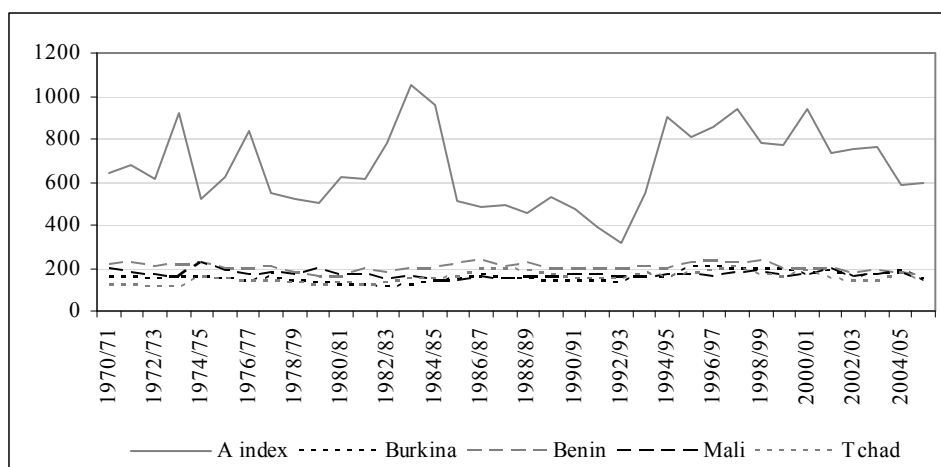
Source: FAOSTAT

**Figure 4 : Production (tonnes) in ESA**



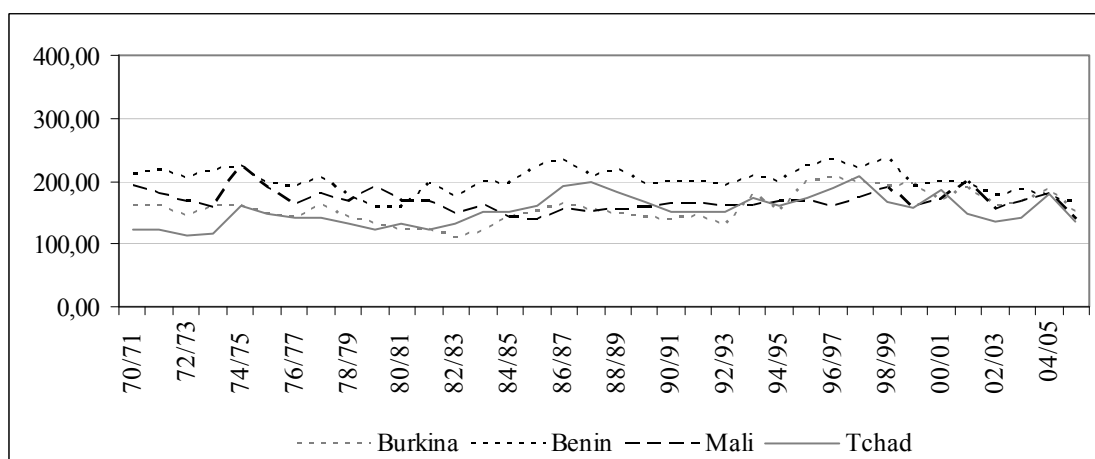
Source: FAOSTAT

**Figure 5: A index and producer prices in four countries of WCA (CFAf/kg, real 2000), 1971-2006**



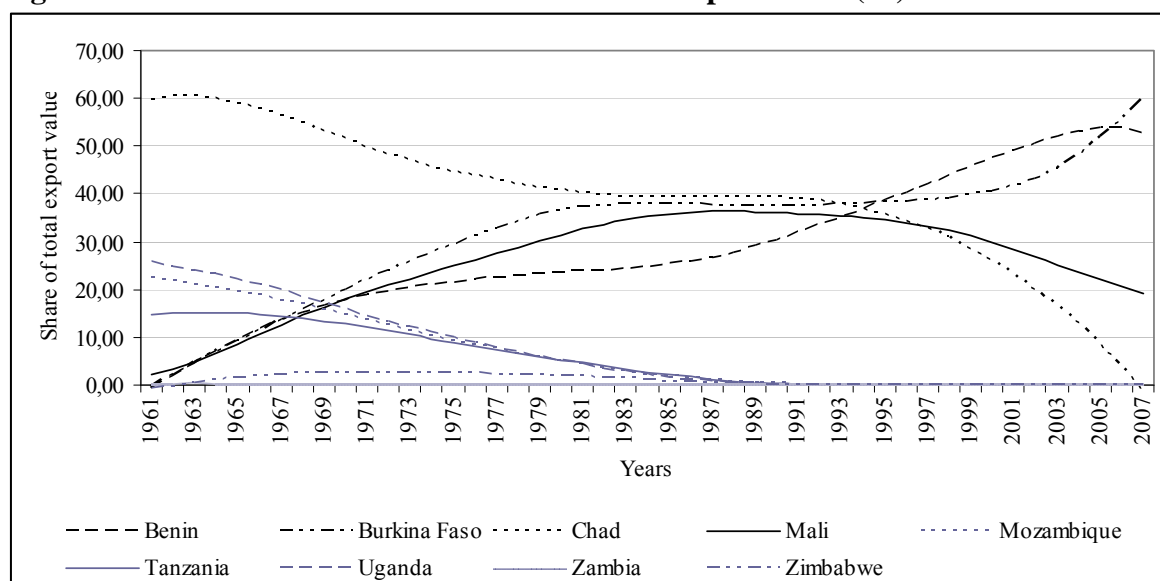
Source: producer prices and GDP deflators (Baffes, 2007), A index and MUV deflator (WB, 2008).

**Figure 6: Real producer prices in four countries of WCA (CFAf/kg, real 2000), 1971-2006**



Source: Baffes (2007)

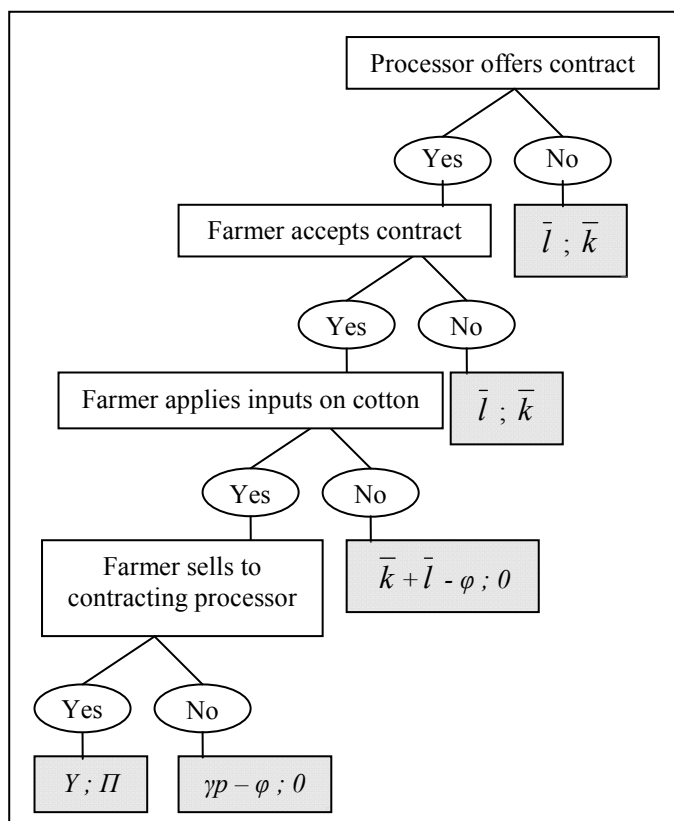
**Figure7: Cotton\* as a share of total merchandise export value (%)**



Note: "Cotton" includes cotton seed and cotton lint; "merchandise" includes agricultural products, fuel and mining products, and manufactured products.

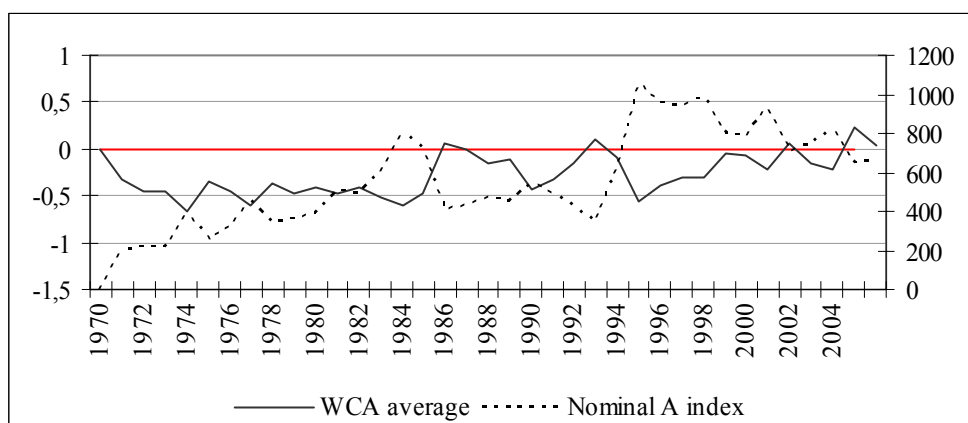
Source: FAO TRADESTAT

**Figure 8: Payoffs tree (farmer; processor)**





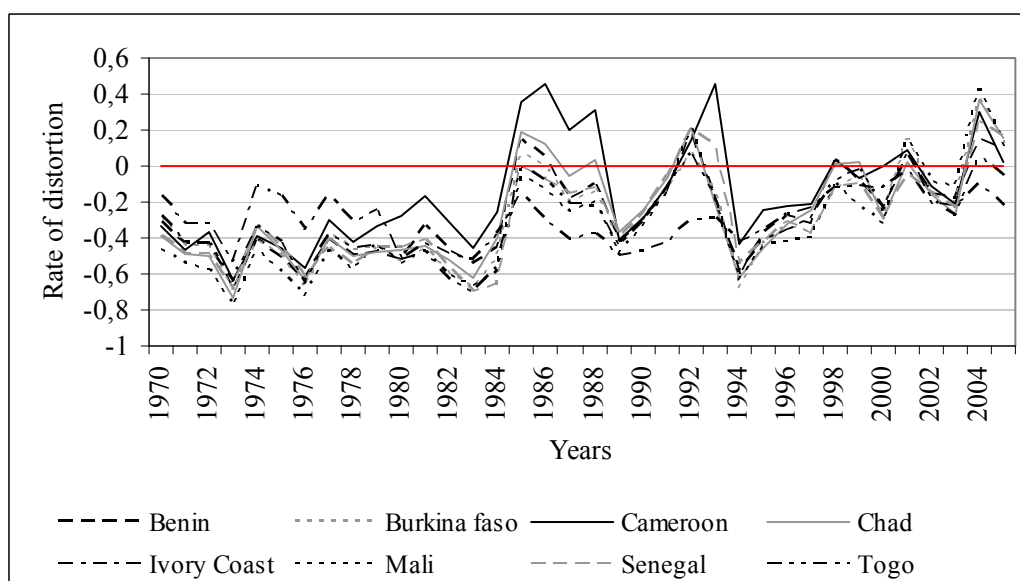
**Figure 9: Cotton NRA in WCA (1970-2005)**



Note: “WCA average” includes all francophone WCA cotton producers for which data was available (i.e. those in figure 10).

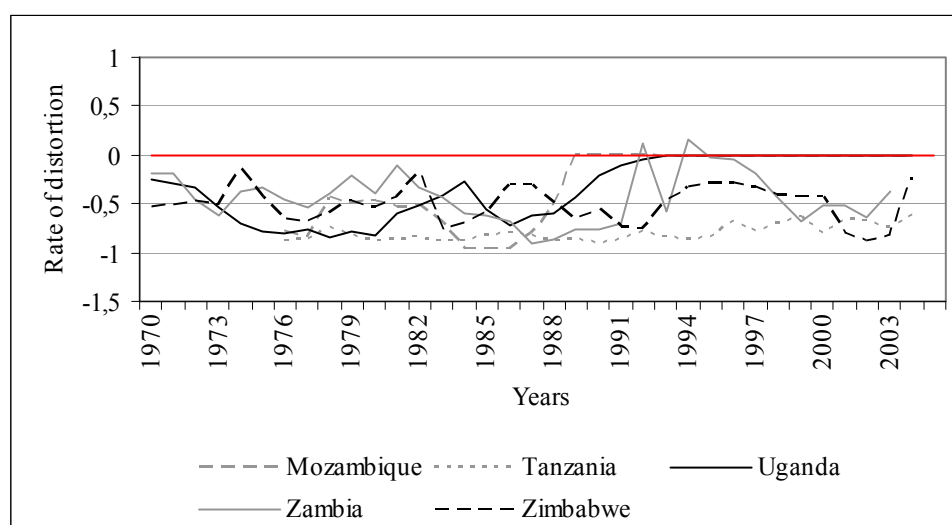
Source: Anderson and Masters (2009)

**Figure10: Cotton NRAs in all countries of WCA (1970-2005)**



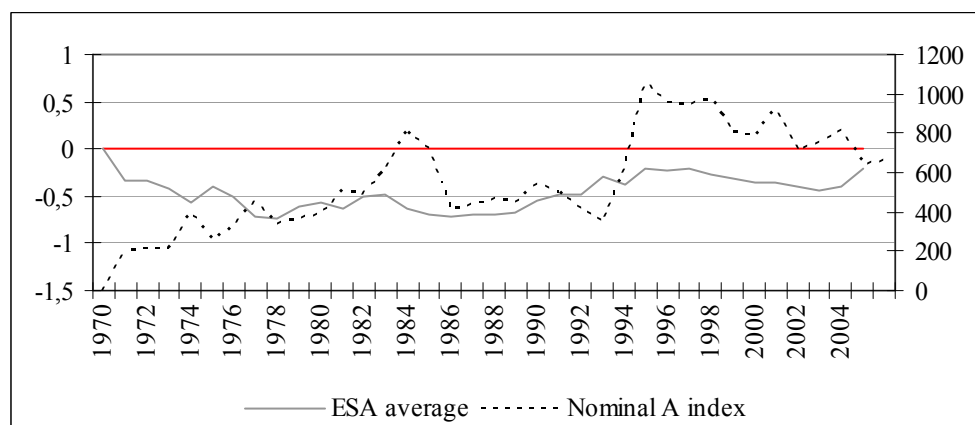
Source: Anderson and Masters (2009)

**Figure 11: Cotton NRAs in ESA (1970-2004)**



Source: Anderson and Masters (2009)

**Figure 12: Average cotton NRA in ESA (1970-2005)**



Note: “ESA average” includes the five ESA cotton producers for which data was available (i.e. those in figure 11).

Source: Anderson and Masters (2009)

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