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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 West and Central Africa (WCA), and still is to a large extent, 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

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1. INTRODUCTION

Cotton is often referred to as West African 'white gold' (Moseley, 2008): it represents a crucial source of income in West and Central Africa (WCA), both for rural populations and for national economies.[4] For several decades, its production has been described as a unique 'success-story' (e.g. Lele et al., 1989). Yields grew spectacularly from the early 1970s up to the early 1990s (Figure 1), and production increased impressively since the mid-1980s until very recently (Figure 2), not only through yield increases, but also through a considerable expansion of the area under cultivation. Due to its wide spread and substantial smallholder involvement, cotton is considered to play a key role for development and poverty reduction in WCA (e.g. Badiane et al., 2002; USAID, 2004; Moseley, 2008), which is why Burkina Faso, Benin, Mali and Chad (the "cotton C-4") have been advocating the explicit recognition of cotton as a "special product" under the WTO agreements and the subsequent elimination of the developed countries' cotton subsidies since the WTO conference in Cancun in 2003. Because producing cotton requires the use of various external inputs that most smallholders cannot afford without resorting to credit, and 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'. This contracting has taken place in a particularly regulated environment ever since the promotion of cotton growing by the French colonizers in the 1950s, and this largely remains the case to date. The majority of the output is ginned by parastatal companies, and competition between ginners remains nil or very limited.

[4] 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 in zones where it is a key cash crop." 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). Spill-over effects result, among other things, from the need for inputs provision and techniques dissemination, from the need to maintain and expand road networks and from the creation of activity for banks and transport companies (Azam and Djimtoingar, 2004). Cotton revenues also contribute to fuelling commercial activity in the informal sector and the need for tools stimulates demand for craftsmen's work (Magrin, 2001).

[5] Regulation has also allowed governments to intervene in price setting, and to date, cotton prices in the C-4 countries are fixed pan-territorially and pan-seasonally.[6]

Many stakeholders in WCA believe that input supply-credit schemes and the promotion of intensive cropping practices would not be feasible in the absence of an integrated supply-chain and without state support (e.g. AFD, 2004).[7] 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[8], with positive residual effects on food crops through crop rotation (e. g. chapter 3 in Hussein et al., 2006). For several decades, these cotton parastatals have been perceived as relatively efficient, even by proponents of orthodox market institutions.[9]

However, state control of cotton markets has come under attack of international donors such as the World Bank (WB) and the International Monetary Fund (IMF) since the late 1980s, and increasingly since the late 1990s. The main reason behind these calls for changes is the fact that the applied price setting mechanisms do not allow producer prices to reflect world prices, leading to distortions to production incentives. More specifically, as can

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[5] Typically, the parastatal would also be responsible for developing new seeds (to varying degrees, with public budget support and in collaboration with a French public research centre), 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 Delpeuch (forthcoming).

[6] In Burkina Faso, for example, the 2009/2010 campaign producer price was set to 160 and 135 CFAF/kg, for 1st and 2nd 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).

[7] 'Integrated supply-chains' are also sometimes referred to as 'single channel systems', or in French, as 'fi*lières intégrées*'.

[8] 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).

[9] 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).

be seen from Figures 5 and 6, producer prices in WCA have remained largely constant since the 1970s until today, while the world price has fluctuated considerably in the same period.[10] This implies that at times when the world price for cotton was high, such as in the 1980s, producers were taxed,[11] 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. More recently, the increasing inefficiencies in parastatal ginning (Tschirley et al. 2009) have become an additional concern. Pan-territorial pricing schemes are also considered to be poorly effective 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 at the farm and firm levels, ensuring their long-term financial sustainability and allowing a fair sharing of the profits between producers and ginners. [12]

Resistance to reform has nevertheless been unusually fierce and successful. In Benin, in Ivory Coast and in Burkina Faso, some reforms took place in the cotton sector. However, while private entry has been allowed to some extent, liberalization can only be said to be very partially realized. In Burkina Faso and in the Coast, private investment has been allowed in cotton ginning since 2004, and 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 prices to avoid opportunistic sales of cotton to the highest bidder at harvest. Everywhere, prices are still administratively fixed. Several pricing mechanisms have been considered to establish a

[10] See Figure 6, in the Annex, for more details in the variation of producer prices in WCA, in a graph with another scale.

[11] 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.

[12] Along these lines, Baffes (2005) advocates in his paper "The Cotton Problem" further privatization of the State monopsonist ginning companies as well as the liberalization of African cotton sectors and associated sub-sectors (mainly transport and inputs).

link between producer prices and the world price but they still have not been applied, despite increasingly tense financial situation of most ginning companies. Such 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.

The highly complicated nature and the particular importance of local institutions in cotton sector reform is not a recent discovery: important lessons have been drawn from earlier reform experiences of the cotton sectors in East and Southern Africa (ESA), which were privatized and more strongly liberalized under similar impulse from international donors in the early to mid 1990s.

Only in Zambia and Zimbabwe, cotton supply chains were organized in a similar way as in WCA, based on a parastatal single-channel supply chain. In Tanzania and Uganda, cotton ginning was operated through village level cooperative societies, which were rewarded with exclusive procurement rights by the respective governments. The general trend all over ESA was however that government-controlled organizations increased their involvement in the cotton sector between the 1960s and the 1990s. Yet, contrary to WCA, performance declined in most ESA countries during the same period, eventually resulting in debts and delayed payments to farmers (Tschirley et al., 2009). Cotton yields were on average almost 40% lower than in WCA in 1990, i.e. right before the reforms in ESA (see Figures 1 and 3). 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.

Extensive comparative research performed by Tschirley et al. (2009) reveals a few 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 involving any type of budgetary pressure, 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 is often 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). Moreover, in some cases, collusion has been observed to result in overpriced inputs. [13] In fact, different market structures and different local institutions resulted in very different reform experiences in the ESA countries; as a result no market sector type seems to have performed so well that it could be used as a reference for other countries (Tschirley et al. 2009).

These insights could be very useful in trying to assess ex ante the expected reform impacts for WCA, and to try to understand the fierce resistance to reform in the C-4 countries. This is the main objective of this paper. While Tschirley et al. (2009) offer an excellent comparative overview of different reform experiences in ESA and WCA, our paper tries to go one step further, by assessing the expected effects of reform 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.

[13] Another important issue, which we will not discuss in this paper, is cotton quality, which has often been strongly affected by the respective reforms.

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. THE MODEL

In the absence of efficient credit markets in rural areas (among other reasons because of the absence of transferrable land-property rights, which precludes the use of land as credit guarantee), inputs have traditionally been provided to producers on credit by the processing companies who recover the cost of these inputs when purchasing the cotton. Once ginned, the crop is entirely exported, as the local demand for raw cotton is extremely limited (local consumption is believed to be inferior to 5 percent in francophone WCA). The question is how market structure, and, specifically, the degree of competition and the nature of ownership, impact the outcomes of such contracting in a context of factor market imperfections and weak contract enforcement.

The model presented here builds on the Swinnen et al. (2009) extension of a model by Kranton and Swamy (2008). Cotton fibre is exported by the processor at price p, the exogenous world price for cotton[14], which may be trader- or processor- specific, based on their reputation for quality of the cotton (lint). We assume an indivisible production function and a fixed proportions production technology.[15]

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). The farmer's opportunity cost of labour is $\bar{l}$. If the farmer's only alternative is to

[14] Indeed, WCA remains a "small" exporter on the World market, unable to influence the world price. In 2007, the C-4 countries accounted for just below 3% of world exports, while, for example, the US accounted for above 19% and Uzbekistan for above 5% (Comtrade, 2007).
[15] Note that perfect information is assumed, hence we do not consider production, price nor market risks.

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 (mainly a credit constraint, but it might as well be a shallow input market). The processor has better access to credit and/or inputs, such that he can provide inputs on credit to the farmers. However, the processor does not have the skill (or land) to produce directly. 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 $\bar{k}$.[16] Besides, inefficient processors face extra processing and marketing costs denoted *c*. These costs encompass very different inefficiencies, such as excessive transport and storage costs (Kherallah et al. 2003), or uncompetitive sales strategies, risk 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 ($t \leq 0$). 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*.

We refer to the net value that is created if a contract is agreed and enforced as "surplus" and denote it as θ, with

$$\theta = p - \bar{k} - \bar{l} - c - t \qquad (1)$$

[16] $\bar{k}$ depends both on the capital intensity of the crop, and on the buyer's potential return to alternative investments.

If a surplus is realised (i.e. $\theta > 0$), it is 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 θ (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 arrangements, the geographical dispersion of agents and the weakness of judiciary systems), we consider the case without any credible affordable enforcement mechanism.[17] 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. While processors' incentives to default (for example by postponing payment) are discussed by both Kranton and Swamy (2008) and Swinnen and Vandeplas (2009); we focus on the farmer's defaulting opportunities.[18] 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 $\bar{k} + \bar{l}$.[19] 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 γ as the share of p offered by potential competing processors, such that γp can be considered the spot market price for cotton. One can think of γ 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

[17] 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."

[18] Adding the option of opportunistic behaviour by the processor would not significantly affect our conclusions.

[19] 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.

market, resulting in a different sales price. By defaulting on contract obligations, in both cases, however, the farmer incurs a reputation cost (φ).[20] 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:

$$Y = max\ (\bar{l}+\beta\theta;\ \bar{k} + \bar{l} - \varphi\ ;\ \gamma p - \varphi) \quad (1)$$

$$\Pi = p - c - t - Y \quad (2)$$

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

$$p \geq p_{\min} = max\ \{\bar{l};\ \bar{k} + \bar{l} - \varphi\ ;\ \gamma p - \varphi\} + \bar{k} + t + c \quad (3)$$

Condition (3) shows that single-market channel systems (with low $\bar{l}$, low γ, and high φ) 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 (1) 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.

[20] 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.

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 and $0 \leq R \leq 1$.

First, the introduction of competition is hypothesized to affect γ, $\bar{\imath}$ and φ (Swinnen et al., 2009). New options to side-sell appear: γ 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, $\bar{\imath}$ is expected to increase, hence: $\partial\bar{\imath}/\partial R \geq 0$. [21] The farmer's reputation cost φ 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 might 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. However, competition might as well 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

[21] 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.

(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.[22]

Finally, through price liberalization, government intervention in price-setting is expected to be removed. 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 (1), we can derive the impact of the orthodox reforms on the farmer's returns, at the condition that contracts can be sustained:

$$\frac{\partial Y}{\partial R} = \frac{\partial Y}{\partial \gamma}\frac{\partial \gamma}{\partial R} + \frac{\partial Y}{\partial \bar{l}}\frac{\partial \bar{l}}{\partial R} + \frac{\partial Y}{\partial \phi}\frac{\partial \phi}{\partial R} + \frac{\partial Y}{\partial c}\frac{\partial c}{\partial R} + \frac{\partial Y}{\partial t}\frac{\partial t}{\partial R} \qquad (4)$$

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 (4) will be positive and reform is expected to benefit farmers, as long as contracting is sustained.

However, the sustainability of contracting has been a crucial determinant of reform success in ESA, as well as a major cause of reluctance to reform in WCA. Using equation (3),

[22] [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.). More evidence?] This would underscore the importance of examining this effect on a case-by-case basis.

the aggregate effect of orthodox reform on contract sustainability can be summed up as follows:

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

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. Because the quality standards which are imposed by the international textile market are fairly standardized, and as the prices that are fetched at the world market are highly linked to the country of origin, rather than the specific seller within that country (Larsen, 2003), processor-specificity is expected to be low both in terms of their demand and in terms of the prices they fetch on the international market. In those countries where the monopsony of parastatals was well-enforced before reform, liberalization might thus give rise to a substantial increase in γ, hereby further increasing p_{min}. 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 t (e. g. Dorward et al. 1998 ; Poulton et al. 2004 ; Poulton, 2006).

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 in case reforms are pushed through. We will focus on pre-reform market structures, pre-reform government intervention in pricing, as well as on perceived inefficiencies in production and marketing processes. Based on these issues, 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 to cotton producers in WCA and ESA have been significantly negative (see Figures 10 and 11), implying that producer prices were below the estimated "reference" farm gate prices (defined, following Anderson, 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).[23]

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

[23] 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'*.

and Block, 2010). Various reasons have been put forward to explain this. First, 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. This means for instance that agriculture is more likely to be taxed if a country disposes of less natural resources such as oil or minerals, and if most of the economy is informal (as in such a case, the government's capacity for tax collection from the labor market will be limited). 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).

Second, exported cash crops are considered to be a relatively easy target for taxation as compared to for example food crops, on the one hand because it is easier to control exports than domestic market products, on the other hand because governments generally want to keep food crops cheap for consumers and are therefore more reluctant to tax these.

Third, the more numerous farmers are, the more likely they are to be poorly organized to resist taxation or ask for support because of a high organization cost (Olson, 1985); unless they are able to use their multitude to their advantage through democratic elections (Bates and Block, 2010). Along the same lines, it is argued that with a higher share of agricultural producers in the population, deadweight losses from supporting them will be higher, and that farm subsidies are more likely to occur in developed societies, where consumers spend a smaller share of their disposable income on food and farm incomes usually grow slower than incomes in other sectors (Swinnen 1994; Swinnen 2010).

Apart from explicit taxation, 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 $\bar{l}$ 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: producer prices were sustained at their historical levels both in the late 1980s and since the early 2000s. Indeed, world prices underwent a strong decline and resulted in financial losses for the ginning companies, which ultimately had to be covered by budget support.[24] There are many reasons to explain such subsidization.

First, the countercyclicality 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 (cfr. Tovar, 2009) and therefore tend to protect especially the sectors where profitability is on the decline. In all WCA countries, governments explicitly created so-called stabilization funds, which were explicitly targeted at smoothing out fluctuations in producer prices over time. Through mismanagement and diversion of funds, however, most stabilization funds ended up to be depleted by the time world prices declined (Goreux and Macrae, 2003).

Another argument can be understood from a simple perspective of rent maximization by WCA governments: if cotton is their major source of income, it is rational for governments to subsidize their agricultural sectors at times of low world prices. More specifically, if the adjustment costs of a sector collapse are expected to be very high, and price recovery is expected within a reasonable time span, it may be less costly for governments to support the

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

sector than to allow breakdown.[25] As can be seen from the Figure 7, WCA governments have been much more dependent on the cotton sector than governments in ESA, which might contribute to explaining why cotton sectors in WCA have most of the time been less taxed (or even subsidized) than in ESA (before reform). As far as the expectations of price recovery are concerned, prospects are not very clear. [26] However, fierce lobbying by C-4 countries for the immediate elimination of domestic support to cotton farmers by developed countries at the World Trade Organization suggests that they expect to regain their competitiveness after the removal of subsidies.[27]

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[28] and some farmer associations.[29]

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

[25] 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. In this perspective, t could depend on the discount factor for future costs/benefits, the adjustment cost to rebuild the sector after breakdown (shouldn't it be also the adj. cost of unemployment etc.?), and the period during which the world price is expected to be low.

[26] The current low levels of cotton are considered to be a result of (i) competition from man-made fibre on the demand side, (ii) subsidization of cotton production in developed countries, notably the US (Goreux, 2003) and (iii) competition on the supply side which has driven down the costs of production (Tschirley et al., 2009). Particularly the adoption of genetically modified varieties of cotton has been crucial in increasing productivity for many of the world's major producers; while to date, only Burkina Faso has very recently allowed the use of these varieties.

[27] To what extent this will be realized, however, will strongly depend on supply responses in the C-4 countries, particularly their capacity to overcome failures in input and output markets, but also in other major producing countries (Shepherd and Delpeuch, 2007).

[28] Ginning companies face significant fixed costs; they thus have a strong interest in seeing cotton production maintained at least at its current level. Producer prices being close to the exit price already, they might have a clear interest to encourage government price support. This could be true in ESA too, but the reforms took place at times when the world price was higher. Besides, the greater dependence on cotton tax revenues in WCA mentioned above might mean that governments are more inclined to listening to lobbying by the ginning companies than in ESA.

[29] 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. Besides, recent decision-making reforms have offered increasing influence to farmer organizations (at least on paper) and cotton fosters growing political and media attention. Empirical studies already recognize this issue (e.g. Savadogo and Mangenot, forth.), though it remains to be investigated further to provide more motivated evidence.

effects of input use in cotton cultivation for maize production (which is mostly grown in alternation with cotton).[30] In addition to this, in landlocked countries, even consumers could suffer from the decline of the cotton sector, since a decreasing need for cotton transportation (truck and containers) would increase the cost of food imports (Babin, 2009).

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, there were 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. Only in recent years, an upsurge in competition has been observed here (Tschirley et al., 2009; Brambilla and Porto, 2008). In these countries, input supply systems have to a large extent been sustained. More specifically, Tschirley et al. (2009) report that the cotton sector in Zambia and in Zimbabwe has been closely resembling duopsony systems, where the two major firms procured at least 90 % of total cotton production. In such systems, firms seem to be more likely to compete on services (ex ante) instead of on prices (ex post, by trying to lure away farmers who are already under contract with other buyers). Competition on services is

[30] Cotton has traditionally played the role of a 'development-vector crop' because it offers a relatively certain outcome and a unique access to cash, inputs and credit in an environment of insurance, credit and input market failure (Araujo Bonjean, 2003; Levrat, 2009). [Especially in the last decades, lots of poor smallholders entered took up cotton production for this reason – need to find evidence].

more likely to benefit the long term sustainability and growth prospects of the sector, especially for smallholders, for whom the provision of inputs might be essential for participation in the supply chain. Hence, 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.[31]

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 problems of concentrated sectors, such as the risk of collusion in input and or output markets. For example, in Benin, where the private sector has been allowed to enter ginning, the degree of concentration is increasing (Babin, 2009), and there are concerns that the privatization of input supply has led to higher prices because of collusion (Goreux and Mc Rae, 2003 for Benin; Bassett, 2008 for Burkina Faso).

Finally, 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 WHO study. This would imply that in WSA, 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.

[31] The privatization of the Malian is said to have been delayed in part because of the absence of serious interested investors.

Processing inefficiencies

The comparative literature on cotton policies in SSA reveals that parastatals have historically been less inefficient in WCA than in ESA. This can also be observed from the large yield gaps between WCA and ESA from the 1980s onwards (see Figures 1 and 3). Moreover, in times of taxation, there is some evidence that 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).[32] While efficiency of the parastatals is said to be declining in WCA (Tschirley et al., 2009), the benefits of past investment do seem to have enduring positive effects, 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. 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 panterritorial pricing).

Second, reform experiences from ESA teach that post-reform market structures are likely to strongly resemble pre-reform market structures, and competition between ginners has remained limited in each of the C4-countries, even in Benin and Burkina Faso where privatization has occurred. Scarce opportunities for switching to other crops would reinforce the effects of concentration within the cotton sector.

[32] 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".

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.

However, two 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.[33]

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

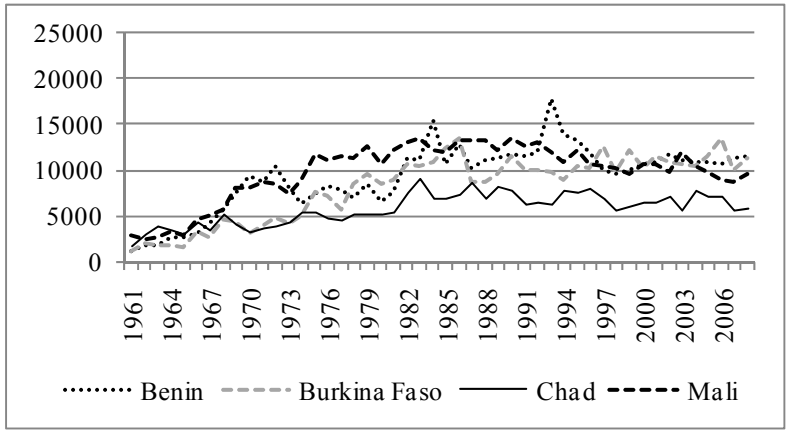
[33] [One additional factor could be the size of input requirements, which, according to the draft version of Tschirley et al. (2009) seem to be higher in WCA. This remains to be checked, as in the final version of their paper, they restrict this point to Tanzania only.]

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

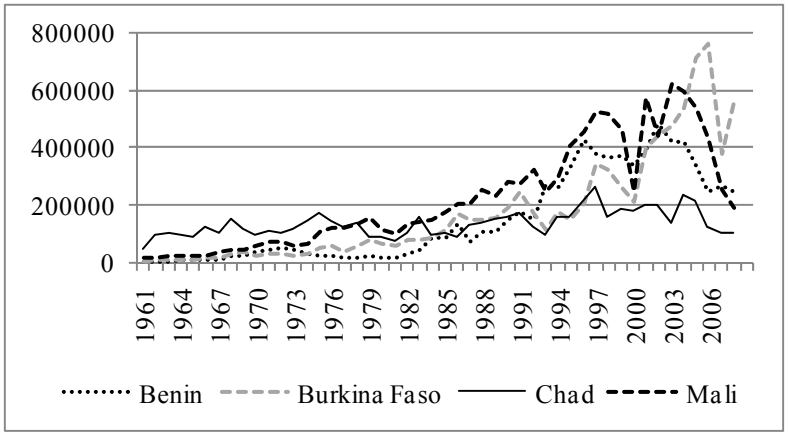
Whereas governments in WCA have historically presented cotton production promotion as one of the most efficient ways of pulling rural populations out of poverty, they should now try to find ways to respond to an evolving global reality in which the outlook for cotton price recovery seems bleak (Babin, 2009). Moreover, from a macro-economic perspective, a movement out of cotton production of the less efficient farmers could help to reduce the C-4's 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.

Figure 1: Yields (Hg/Ha) in WCA



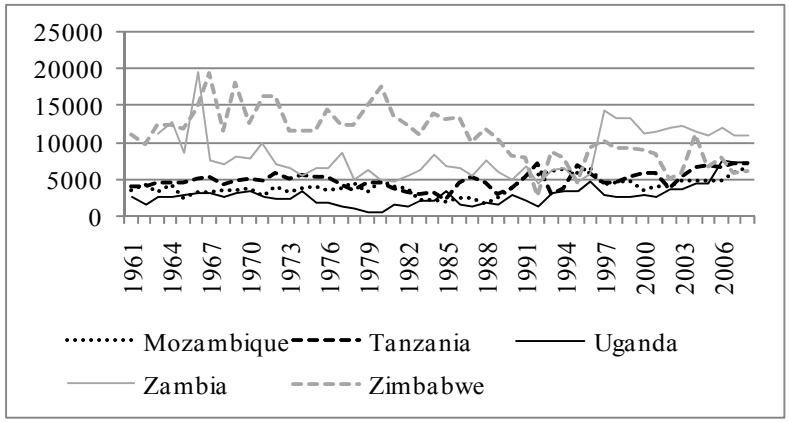
Source: FAOSTAT

Figure 2 : Production (tonnes) in WCA



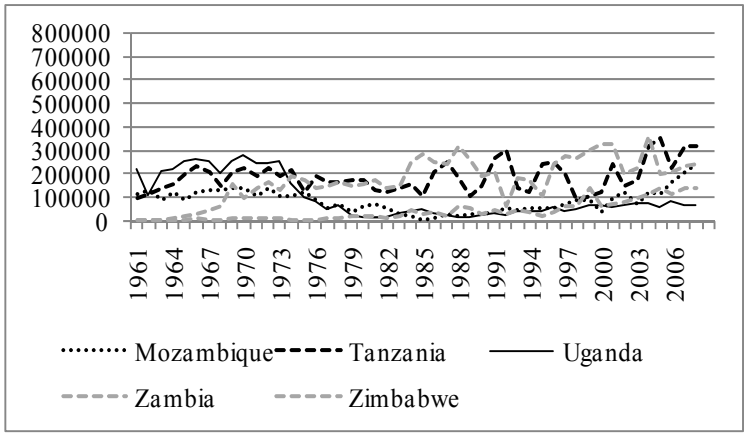
Source: FAOSTAT

Figure 3: Yields (Hg/Ha) in ESA



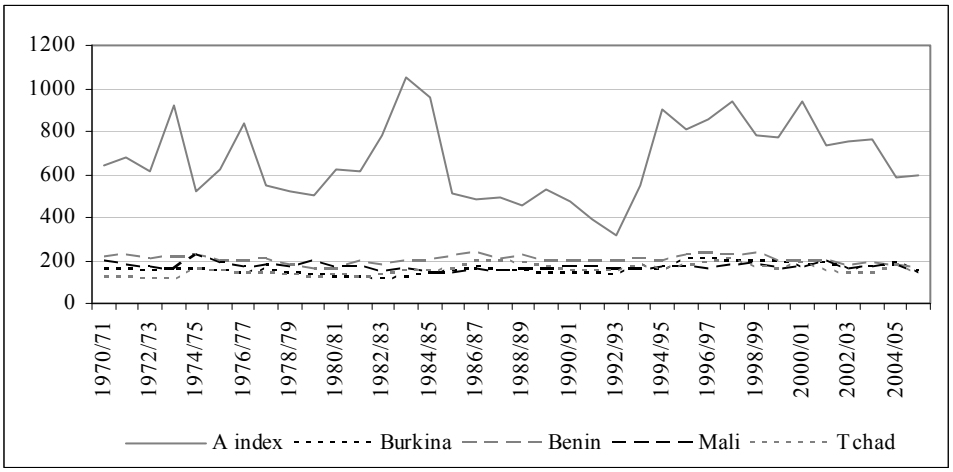
Source: FAOSTAT

Figure 4 : Production (tonnes) in ESA



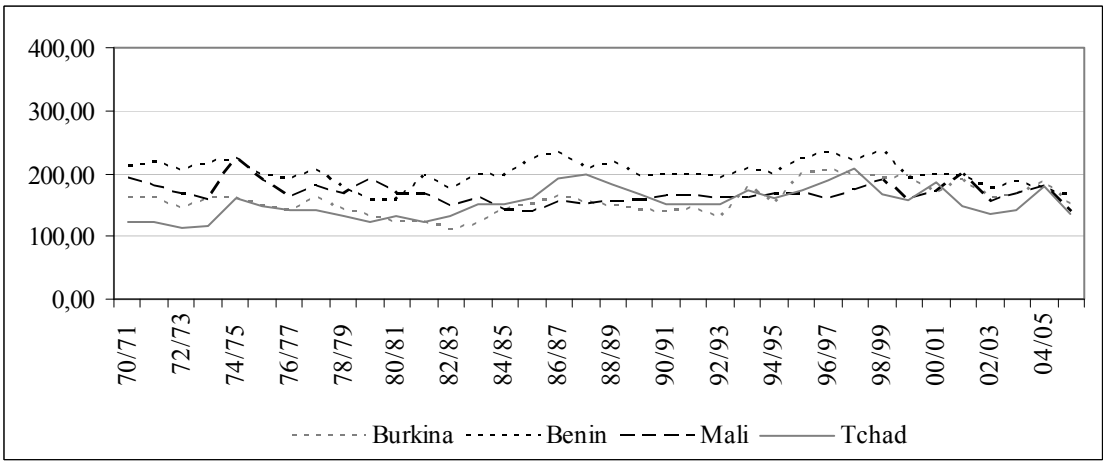
Source: FAOSTAT

Figure 5: A index and producer prices in the C4 (CFAf/kg, real 2000), 1971-2006



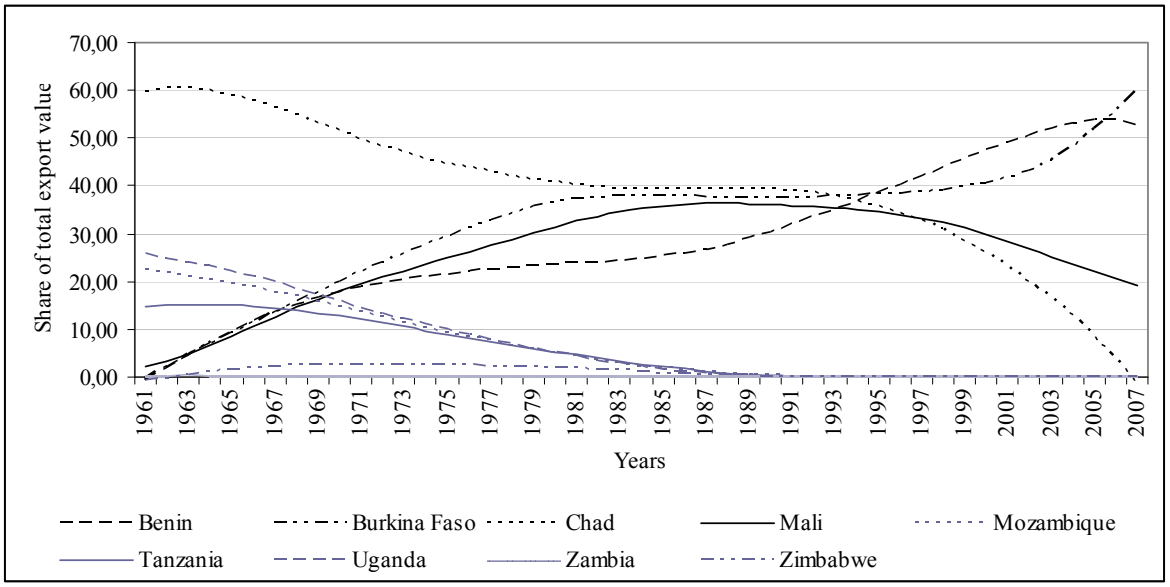
Source: producer prices and GDP deflators (Baffes, 2007), A index and MUV deflator (WB, 2008).

Figure 6: Real producer prices in the C4 (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)

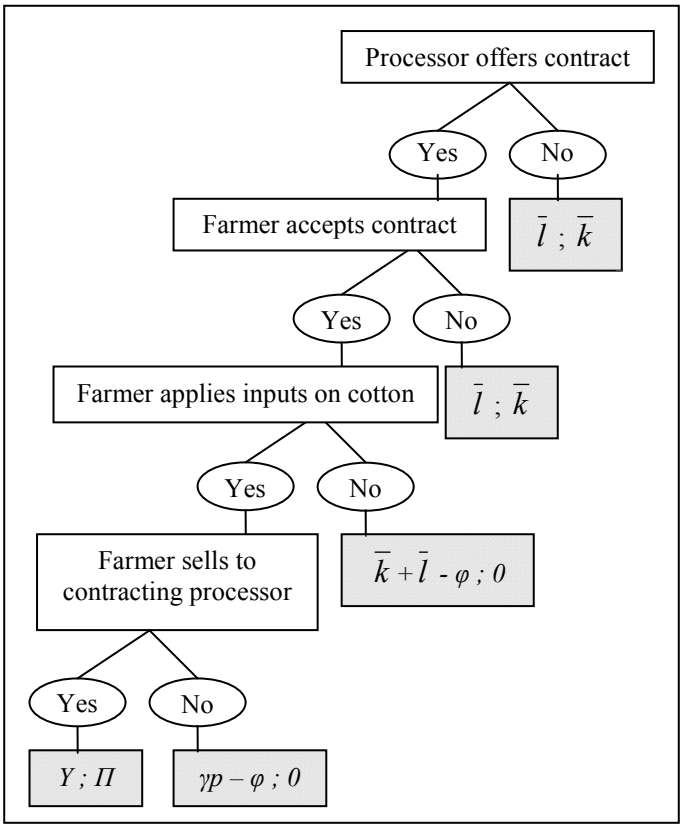
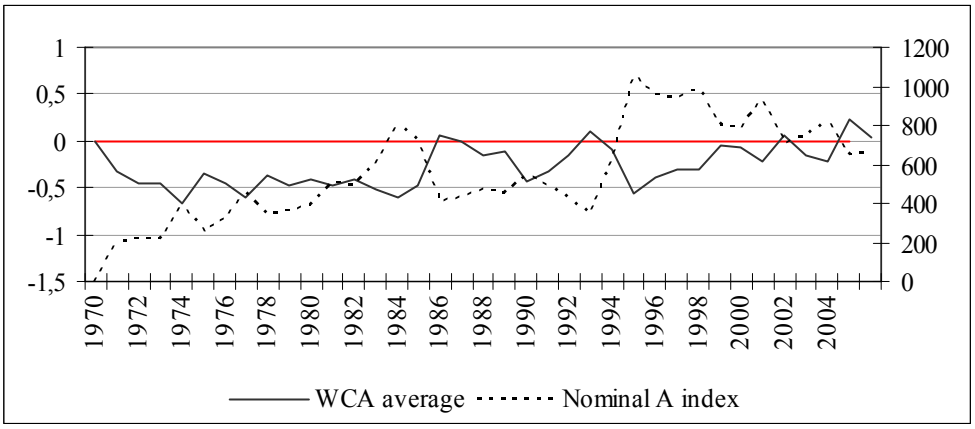
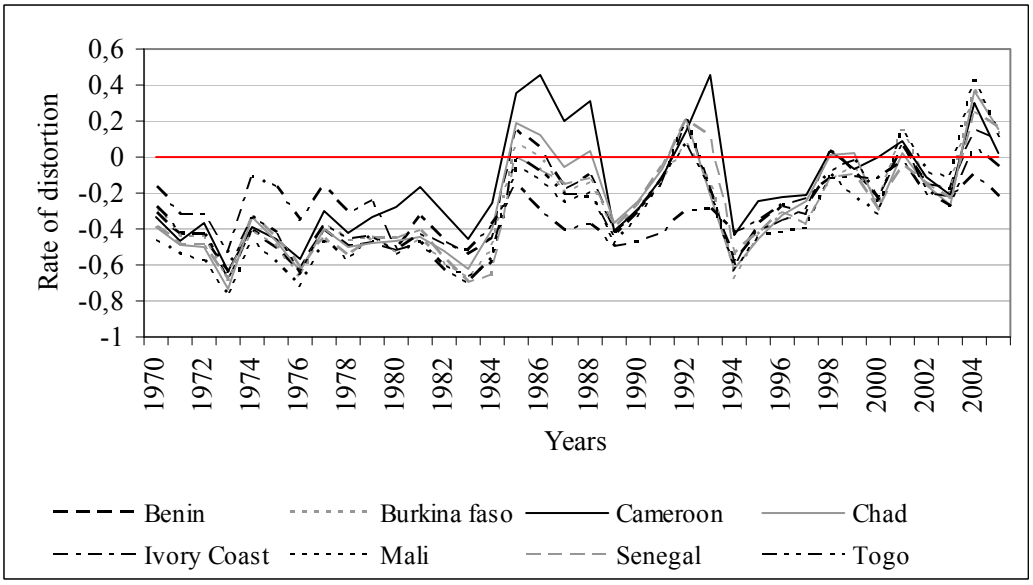


Figure 9: Cotton NRA in WCA (1970-2005)



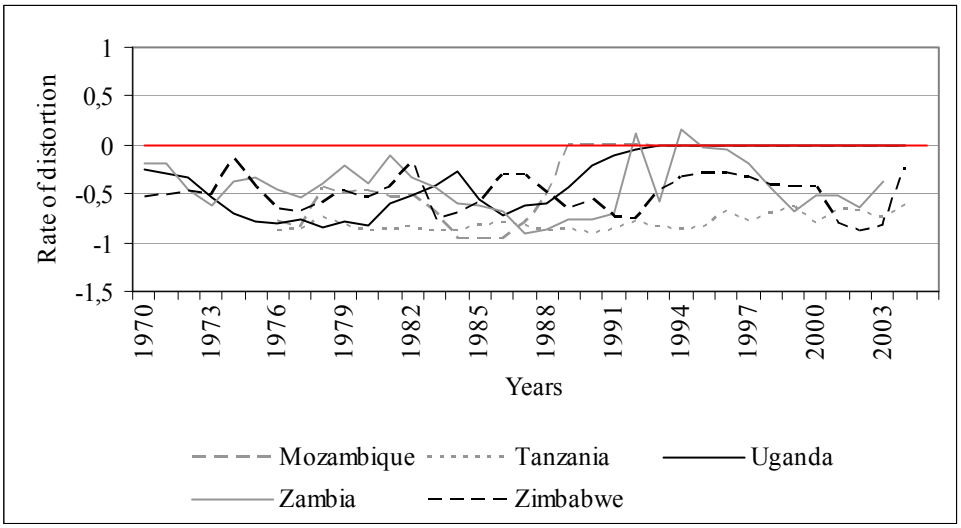
Note: "WCA average" includes all francophone WCA cotton producers for which data was available (i.e. those in figure 10).
Source: Anderson and Masters (2009)

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



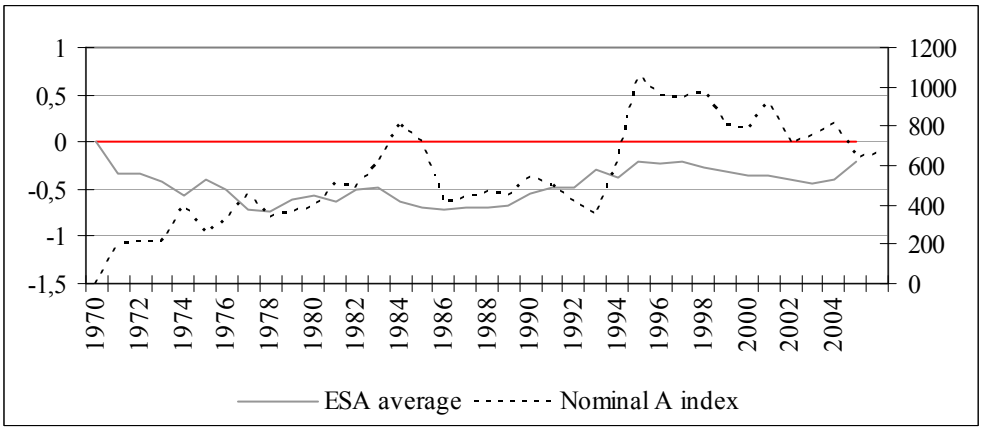
Source: Anderson and Masters (2009)

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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