



The Elusive Quest for Supply Response to Cash-Crop Market Reforms in Sub-Saharan Africa: The Case of Cotton

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Summary. — Empirical evidence from comparative studies on the impact of structural adjustment on Sub-Saharan African agricultural performance remains largely inconclusive. To illuminate this debate, we estimate the impact of liberalization on productivity, acreage, and production while controlling for potential sources of supply response variation, notably the pace and depth of reforms, the nature of pre-reform policies, and weather. We find that the impact of reforms varied both with the degree of liberalization and pre-reform policies: the clear positive impact on productivity was stronger in East and Southern Africa, especially where competition increased most. The impact on cultivated areas and production is less clear.

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1. INTRODUCTION

While there is widespread agreement that cash-crop markets in Sub-Saharan Africa (SSA) have been significantly liberalized since the early 1990s (Anderson & Masters, 2009; Delpeuch & Poulton, 2011), the effects of such reforms largely remain elusive. The impact of structural adjustment on agricultural performance has been widely researched. Positive supply and productivity responses have been identified in Asia (e.g., Rozelle & Swinnen, 2004) as well as, to a lesser extent and with a lag, in some of the European transition countries (e.g., Swinnen & Vranken, 2010). In contrast, in SSA, if any, the impact of reforms is found to have varied in direction and magnitude. No cross-cutting conclusions emerge from comparative studies in SSA, except for the timidity of impacts (e.g., Akiyama, Baffes, Larson, & Varangis, 2003; Kherallah, Delgado, Gabre-madhin, Minot, & Jonson, 2002).

Reviewing the literature on agricultural transition in developing countries (DCs) and on agricultural productivity in Africa, we identified four potential sources of supply and productivity response variation, which could conceal overarching trends: the depth of reforms and resulting post-reform market organization, the nature of pre-reform policies, the institutional requirements of production processes, and external forces such as weather or conflict.

The relatively limited scope of reforms, or their imperfect implementation, has long been identified as one potential explanation for their overall timid impact in DCs (Krueger, Schiff, & Valdes, 1988). Delpeuch and Leblois (2013) however offer evidence on the fact that reforms in the cotton sectors of SSA have not all been of limited scope and that they have instead brought about changes in market organization that vary widely in scope both across countries and over time. A long-term perspective and precise knowledge of the nature of post-reform market organization hence seem to be necessary to capture the effects of reforms.

Second, there is growing evidence that pre-reform state control of cash crop markets also varied in nature across countries and crops as well as over time, with policies ranging from direct support to taxation, depending on governments' objectives and on the level of the world price for different commod-

ities (Anderson & Masters, 2009; Delpeuch & Poulton, 2011; Kasara, 2007). The nature of pre-reform agricultural policies has been identified as a key determinant of supply response in Asia (Rozelle & Swinnen, 2004). There are thus reasons to expect the impact of reforms in SSA to be crop- and country-specific and to have varied depending on the time of their introduction.

Third, the imperfect nature of inputs and credit markets in Africa and the difficulty to enforce contracts, imply that the impact of reforms could vary depending on the size of input requirements for different crops. Indeed, when production requires the use of costly inputs and interlocking of input and output markets is necessary, introducing competition not only affects the prices received by farmers, but also the sustainability of input-credit schemes (Delpeuch & Vandeplass, 2012; Dorward, Kydd, & Poulton, 2004).

Finally, many external factors influence performance post-reform, among which are, variations in world market conditions, domestic macro-economic policies, conflicts and, most importantly, weather conditions (Meerman, 1997).¹ With a few exceptions (e.g., Brambilla & Porto, 2011; Kaminski, Headey, & Bernard, 2011), these external factors—in particular weather conditions—are rarely formally accounted for in studies of agricultural transition in SSA.

This paper thus aims to illuminate long-standing debates about the impact of structural adjustment in SSA agriculture by adopting a novel quantitative, sectoral and long-term approach, in which we consider all of the above-mentioned sources of potential supply response variation. The methodology chosen is deliberately quantitative and comparative to complement an existing literature that is largely qualitative (for example Tschirley *et al.*, 2009) and case-study based (for example Brambilla & Porto, 2011 or Kaminski *et al.*, 2011).

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The comparative nature of this paper places the analysis at the level of national data: it abstracts from within country and household-specific dynamics to analyze the broader picture.

The cotton sector is the focus of this paper because of its particularly interesting institutional history which has put the sector at the center of a passionate political economy debate. Cotton remains at the core of vivid policy discussions, both around domestic market organization and the role of international financial institutions in the reform processes, and, on the international scene, around rich countries' subsidies (Delpuech, 2011; Moseley & Gray, 2008). A large number of countries in SSA have had very similar cotton market organizations for decades (a legacy of colonial policies) but have chosen reform options that differ in several dimensions. This situation offers a privileged set-up for examining variations in post-reform performance and identifying the reasons for those variations. The policy implications of our results should be of widespread interest in SSA: cotton is the main source of cash revenue for more than two million rural households and a major source of foreign exchange for about fifteen countries on the continent (Tschirley *et al.*, 2009).

Our estimation strategy builds on two new datasets. First, we use the market organization indices compiled in a companion paper (Delpuech & Leblois, 2013) to inform the timing of reforms and characterize the nature of post-reform market organization and pre-reform policies. Second, we construct precise indices of weather conditions at the level of national cotton cultivation zones, using the Climatic Research Unit of the University of East Anglia (2011) monthly weather data. Most of the other traditional determinants of the supply-function are controlled for by country and year fixed-effects in a reduced-form model. The model is estimated statically (OLS) and dynamically (GMM).

We find that yields were positively impacted by reforms, but the magnitude of this effect varies significantly, with at least twice as much impact in countries where reforms led to strong competition than in those where competition remained constrained post-reform.

The impact on production, on the contrary, appears to be significantly positive in countries where reforms led to the establishment of regulated sectors with very little competition due to increases in the area under cultivation. Where stronger competition was introduced, we find that the gains in land productivity did not materialize into significant production growth. We attribute the lack of supply response in these countries to the selection effect described by Brambilla and Porto (2011): the introduction of strong competition would have pushed the least efficient farmers out of the sector, hence causing average yields to increase but production to shrink because of declining area under cultivation. Additional investigation into household-level data would help confirm these findings which are in line with the observations of a number of case studies referred to in this paper.

These contrasted results confirm the necessity to distinguish between different reform types and pre-reform policies.

The remaining of this paper is organized as follows. In Section 2 we describe the reforms undertaken in SSA cotton sectors and the expected relation between market organization and performance. We also display graphical evidence on the empirical relation between market organization and performance. In Section 3 we describe the estimation strategy and its theoretical underpinnings. Section 4 describes our variables and data sources. Section 5 discusses and addresses endogeneity issues. Section 6 discusses results and robustness checks. Section 7 concludes.

2. REFORMS AND PERFORMANCE

(a) *Reforms in SSA cotton sectors*

Traditionally, most African cotton sectors have been organized around state-owned enterprises enjoying both a monopsony for seed cotton purchase and a monopoly for cotton input sale. In addition, prices were fixed by governments or administrative bodies, and sales were guaranteed for producers. In some countries, the "parastatals" or "boards" also supplied services related to production and marketing including research dissemination, transport, ginning, and exporting. Notably in ex-French colonies, these companies sometimes even provided public services in the rural cotton areas. Following recommendations by the World Bank and the International Monetary Fund, SSA cotton sectors have however seen their share of reforms starting in the mid-1980s in ESA and Anglophone WCA and since the mid-1990s in Francophone WCA.

The nature of the changes in market organization brought about by these reforms has widely varied across regions, ranging from the introduction of strong competition following far-reaching market and price liberalizations, to only marginal adjustments. While an increasing number of markets have become competitive, in 2008, 50% of production in SSA still originated from markets with pan-seasonally and pan-territorially fixed prices (Delpuech & Leblois, 2013). Schematically, former British colonies have implemented far-reaching reforms up to the mid-1990s and former French colonies in WCA have introduced more modest reforms, if any, starting in the mid 1990s. What follows briefly illustrates how the degree of competition has been affected as a result of both private sector responses to reform and introduction of new regulations. Delpuech and Leblois (2013) describe these reform processes and resulting evolutions in market structure in more details.

Markets were thoroughly liberalized in Nigeria in 1986; Kenya in 1993; Malawi; Uganda, Zambia, Zimbabwe in 1994, and Tanzania in 1995. However, the degree of competition has also fluctuated, among these countries and over time. In Zambia, for example, the level of competition is said to have declined during the first half of the 2000s when the two biggest ginning companies began to cooperate in an attempt to fight side-selling (Brambilla & Porto, 2011). In Zimbabwe and in Uganda, limits to the degree of competition were imposed by the state with the aim of containing the detrimental effect of competition on the provision of inputs and extension: in Zimbabwe legal requirements with respect to inputs provision by cotton ginners were enforced in 2006 effectively limiting the number of companies authorized to operate in the ginning sector and, in Uganda, regional monopsony rights were established during 2003–08.

The reforms implemented in Benin (1995), Burkina Faso (2004), Côte d'Ivoire (1994), and Togo (2000) have not given rise to competitive but 'hybrid' markets characterized by regulation and mixed private-public ownership. Where private companies are allowed to operate in addition to, or *in lieu* of the parastatals, they have been granted regional monopsony rights. Alternatively, ginning firms are administratively attributed purchasing quotas (with indications on where to source). What is more, prices remain administratively fixed pan-territorially and pan-seasonally everywhere. The price fixation method has however been revised in some countries. Instead of being decided unilaterally by the state or the parastatals, prices are increasingly determined by inter-professional

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