No. 01
January 2010

Impact Analysis Series

ExPost

Cotton and Poverty in West Africa:
A Comparative Analysis of Household Living Conditions in Mali and Burkina Faso

Sandrine Mesplé-Somps, IRD, DIAL, Paris
Anne-Sophie Robilliard, IRD, DIAL, Paris
Johannes Gräb, University of Göttingen
Denis Cogneau, IRD, DIAL, Paris
Michael Grimm, Institute of Social Studies, The Hague

Research Department
Evaluation and Capitalisation Division
Agence Française de Développement
5, rue Roland Barthes 75012 Paris - France
www.afd.fr

Foreword

The "Impact Analysis" series aims to publish work arising from impact evaluations and, more generally, retrospective analyses of the final results obtained in the framework of development policies or interventions.

This analysis of household living conditions in cotton-producing areas was produced by DIAL at the request of the AFD's Evaluation and Capitalisation Division.

Contacts for follow-up on impact evaluations: Tanguy Bernard (bernardt@afd.fr) and Jocelyne Delarue (delaruej@afd.fr).

Acknowledgments

We would like to thank Mr. Seydou Traoré, director of the *Direction Nationale de la Statistique et de l'Information* (DNSI) and his staff, and Sadio Keita from the AFD agency in Bamako, who welcomed us to Bamako and facilitated our work, notably by providing data. We would equally like to thank the *Institut National de la Statistique et de la Demographie* (INSD) of Burkina Faso, which gave us access to the survey data. Nevertheless, the conclusions in this report are the authors' responsibility alone.

Disclaimer

Director of Publication: Jean-Michel SEVERINO
Editorial Director: Jean-David NAUDET
ISSN: 2101-9657

Layout: Marcelle Larnicol / Eric Thauvin

CONTENTS

Introduction

Study Objectives

Cotton is one of the rare products for which Africa's share in global exports has increased over the past twenty years (Goreux and Macrae, 2003). Since the start of the 1980s, cotton production has grown twice as fast in sub-Saharan Africa as in the rest of the world and three times faster in the CFA zone than in the rest of sub-Saharan Africa. Today, West African countries produce more than 4% of the world's cotton and approximately 12% of world cotton exports. This large growth in the African cotton sector has gone hand in hand with specialization and an increased dependency on cotton exports for economies (Lagandre, 2005).

The cotton commodity chains in the CFA zone are in serious crisis today. From an exogenous standpoint, they are confronted with both the falling price of cotton fiber on the world market and the rising cost of certain chemical inputs, the price of which is linked to the price of oil. From the structural standpoint, the sector must face up to stagnating productivity and an integration model crisis. Indeed, the cotton commodity chains in countries in the CFA zone were built historically around public monopolies, the effectiveness of which is questionable and whose financial sustainability is now threatened.

In most West and Central African countries, cotton is produced by small family-operated farms whose economic situation has long been thought to be more satisfactory than that of farmers who grow food crops. Cotton-producing areas have thus always been seen as the “wealthy” zones of cotton-producing countries. Indeed, cotton farmers—like others who grow industrial or cash crops—benefit from supervision that notably guarantees prices set in advance, and access to inputs, credit and technical extension services.

However, the publication of national poverty profiles did not confirm this favorable assumption. In the specific case of Mali, the analysis of large-scale surveys, which made it possible to compare the situation of households in cotton-producing areas with that of households in non-cotton-producing zones, even suggests that the cotton-producing region—that is to say essentially the Sikasso region—is among the poorest in the country The “Sikasso paradox” has thus entered the public debate.

Scope of the Study

We propose to re-examine this paradox and, more generally, examine the question of the impact of cotton cropping on household living conditions through analysis of Mali and Burkina Faso.

The aim is notably to explore the hypotheses that have been put forth to explain the “paradoxical” results of quantitative analyses of household living conditions in Mali. Several hypotheses can in fact be looked at to explain the poor results of cotton-producing areas in 2001 following analysis of the Mali poverty assessment survey (the « *Enquête Malienne sur l'Évaluation de la Pauvreté* » or EMEP):

- the first hypothesis is temporal in nature. Indeed, the year 2001 was marked by the cotton strike during which numerous farmers cut production to protest against the low producer prices granted by the *Compagnie Malienne pour le Développement des Textiles* (CMDT), the cotton company that holds a monopoly on the sale of cotton. This strike caused a 60% drop in production, which resulted in a 29% drop in consumption (*Wodon et al., 2006*).

- the second explanation is methodological and statistical in nature. More specifically, it raises the question of the quality and representativeness of the data. What is questionable is the measurement bias in the surveys due to poor regional representation or even under-declaration by the wealthiest. What is more, the calculation decisions raise several questions when it comes to over-estimation and relevance.

- a final category of explanations is economic in nature: (i) the heterogeneity in the quantities of cotton produced could cloud the diagnosis; (ii) the profits from cotton growing may have served to finance the provision of public goods to the communities concerned; and (iii) the *ex ante* prosperity of the cotton-producing area could cause standards of living to converge between regions by attracting a large number of immigrants, and new cotton farmers with less experience and/or more modest (or less specialized) means.

Methodology

This study relies primarily on analysis of data from surveys conducted by the national statistics institutes.[1] These surveys were national household surveys conducted in 1994, 2001 and 2006 in Mali and in 1994, 1998 and 2003 in Burkina Faso. They gathered information on the population's standard of living in terms of consumption, income, education of each household member, children's health status, acquisition of durable goods, degree of housing comfort, energy and water supply, and possession of farm equipment. Several elements unique to these surveys justify addressing the question of how cotton production contributes to the population's living conditions by examining this type of data:

1. Because the data are nationally representative, cotton farmers can be compared to other population groups.

2. Several monetary and non-monetary indicators of well-being can be mobilized to support the diagnosis in regard to differences in the standards of living of population categories.

3. Their large samples (from 4,500 to 9,500 households, or from 40 to 80 thousand individuals surveyed) and their random and nationally and regionally representative sampling make it possible to extend the diagnosis beyond category or regional averages. The data are also adequate to examine standard of living differences at all income distribution levels and even according to cotton's weight in income, for instance.

4. Since the surveys are available for two countries and over two long periods (twelve years in Mali and nine years in Burkina Faso), the diagnosis can also be viewed in terms of trends. In addition, this makes it possible to analyze how macroeconomic circumstances influence the distribution of standards of living across categories of households.

Obviously, these surveys also have their limitations:

1. The data collected on incomes are not high quality, for instance when it comes to informal and agricultural

[1] In Mali, the *Direction Nationale de la Statistique et de l'Information* (DNSI); in Burkina Faso, the *Institut National de la Statistique et de la Démographie* (INSD).

activities. This is why income was not used as an indicator of standard of living in this study.

2. Since they were not agricultural surveys, they are "flimsy" when it comes to modes of production and therefore do not permit agricultural production functions to be analyzed.

3. Although they are available over several years, they are not panel surveys and therefore do not track the same households at different points in time.

4. They contain very little retrospective information on household itineraries, whether on their migration decisions or previous changes (how long ago crops were chosen, demographic shocks, migration by household members, etc.).

5. They are not of uniform quality, which can seriously "muddy" the diagnosis. This is one of the reasons why six surveys are mobilized to see to what extent the results obtained vary according to the survey methodology and/or the economic context during the survey year.

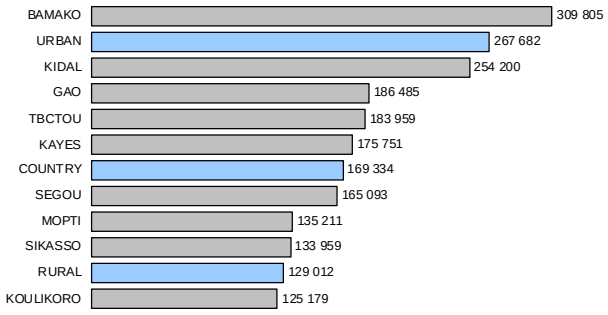
Outline

The present study is made up of three sections. The first lays out the terms of the debate on the "Sikasso paradox" as a preamble. The second offers a statistical diagnosis of the standards of living of cotton farmers in Mali and Burkina Faso since the mid-1990s based on the above-mentioned household surveys. Several indicators are used for this: consumption levels, information on households' assets, adults' and children's education levels, children's nutritional status, and subjective poverty. This allows us to see how cotton farmers in Mali and Burkina Faso are similar and examine how their situation has evolved from the mid-1990s to today. It also allows us to discuss how the choice of statistical measurements effects the standard of living diagnosis. Building on these results, the third section attempts to discuss various economic explanations of four types: (i) the influence of cotton production levels on standard of living; (ii) local public investment gaps between cotton farmers and others; (iii) the producer price of cotton; and (iv) migratory phenomena.

The Sikasso paradox

In Mali, the "contradiction" that emerged between a fairly widely shared perception of cotton-producing regions' relative prosperity and the results of quantitative poverty studies is often evoked under the name of the "Sikasso paradox", named after the country's main cotton-producing region (Güther *et al.*, 2006). This paradox was announced after the DNSI published the results of the 2001 EMEP survey in June 2004 (DNSI, 2004).[2] Indeed, this report portrayed the Sikasso region as one of the poorest in the country. In support of this claim, the report presents several indicators, notably regional measurements of average annual per capita spending (Figure 1).

Figure 1. Average annual per capita spending (in CFA francs)



Source: DNSI (2004, p. 20).
Note: Regional averages are in grey, national averages and rural/urban averages are in blue.

According to these data, the Sikasso region is ranked second to last, behind Koulikoro, when it comes to average annual per capita spending. What is more, it appears to be much poorer than the Ségou and Kayes regions from the standpoint of this monetary indicator.

There are several likely reasons for the Sikasso paradox. Later, we shall present several analyses that aim to shed light on these different hypotheses based on the survey data. In this first section, we shall examine only the two most immediate statistical explanations.

- The first is due to the fact that the DNSI graph elaborated using the 2001 EMEP database only shows average regional values and does not distinguish between urban and rural areas. Given that rural consumption spending is on average lower than urban spending, Sikasso's position in the inter-regional ranking could be explained by less urbanization than in the other regions.

- Next, the spending presented by the DNSI is daily expenditure and does not take into account possible regional price differences. In this way, if prices are on average lower in the Sikasso region, less daily spending does not necessarily equal less consumption.

In order to examine these two aspects, we wanted to present the results by differentiating between rural and urban

[2] In September 2007, the publication of the results of the light integrated household survey (the *Enquête légère intégrée auprès des ménages* or ELIM, 2006) gave rise to the presentation of a new report (DNSI, 2007) that confirmed the diagnosis established in 2004 in regard to household living conditions in cotton-producing regions. More specifically, the authors of the report noted that "the poorest group of households is the group headed by farmers and notably cotton farmers in the Sikasso region." An analysis of the results of this second report can be found in Appendix G.

areas and then calculating a new consumption aggregate that takes into account regional prices. This calculation is unfortunately only possible for food consumption because we do not have a convincing price system to deflate non-food consumption. However, for food consumption, it is possible to value the quantities of food consumed by households using a single price system. Indeed, these quantities were recorded thanks to a fairly ambitious survey system: all food eaten during the three daily meals was weighed for seven days during four yearly visits. The same system contains declared food purchases, making it possible to elaborate a reference price system (the Bamako price) to value food consumption.

Table 1 presents the results of this statistical exercise.

Table 1. Annual per capita food consumption by region and by milieu, Bamako price, Mali 2001

Per Capita Food Consumption	National	Urban	Rural
Kayes	85 250	127 206	75 007
Koulikoro	77 252	102 986	74 172
Sikasso	87 281	144 195	78 082
Ségou	111 552	133 868	106 947
Mopti	104 775	157 642	92 747
Tombouctou-Gao-Kidal	124 344	148 301	113 148
Bamako	115 041	115 041	
Country	98 365	128 193	87 572
Poverty Rate[a]	National	Urban	Rural
Kayes	63.9	38.8	70.0
Koulikoro	73.9	51.0	76.6
Sikasso	63.0	34.3	67.6
Ségou	43.3	27.0	46.7
Mopti	53.4	13.6	62.5
Tombouctou-Gao-Kidal	33.6	15.3	42.2
Bamako	41.6	41.6	
Country	55.2	34.0	62.9

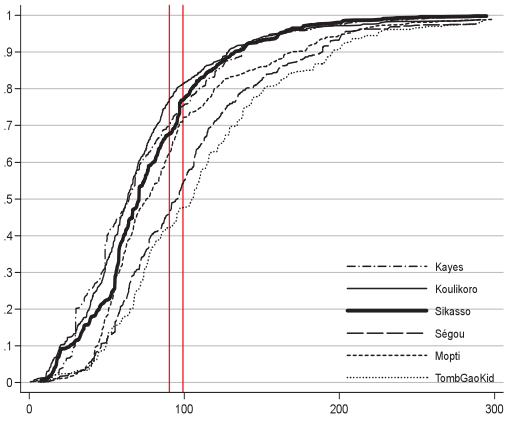
a. Per capita food consumption, Bamako prices, 2001. Food poverty line: 90.3 thousand CFA francs per year.
Source: EMEP 2001, authors' calculations.

The numbers in Table 1 call for several remarks. In regard to urban areas first, the city of Bamako finds itself ranked second to last. This result, which is surprising to say the least, can be partially explained by the fact that the inhabitants of Bamako eat out (*gargotes*, restaurants) more often than the inhabitants of other cities, and this mode of consumption is not included in our aggregate. What is more, the figures cause one to re-examine Sikasso's regional ranking in regard to food consumption: in fact, the rural areas of the Sikasso region rank above the Kayes and Koulikoro regions.

Comparing averages nevertheless masks the distributive aspect of the problem posed: is Sikasso's ranking stable at all distributions for this indicator? This question can be examined with cumulative consumption curves. These curves are presented for the rural areas of each region in Figure 2. They are read as follows: the x-axis shows various levels of per capita food consumption in thousands of CFA francs; the y-axis shows cumulative density, that is to say, the cumulative proportion of individuals in the sample. The curves therefore indicate for each level of per capita food consumption what

proportion of individuals in the sample falls under this level of consumption. In addition to these cumulative consumption curves, we have added two vertical lines that correspond to two food poverty lines, one calculated by the DNSI (99,038 CFA francs) and the other calculated by us (90,287 CFA francs: see Appendix B). Thus, the poverty rate can be read on the y-axis where the consumption curves cross the poverty lines.

Figure 2. Cumulative food consumption curves, Mali, rural areas, 2001



Source: EMEP 2001, authors' calculations.

This graph shows several things.

- The Tombouctou-Gao-Kidal, Ségou and Mopti regions appear, in that order, to be the wealthiest regions in terms of per capita food consumption.

- The Sikasso, Koulikoro and Kayes regions are difficult to "differentiate" given how similar their rural populations' standards of living are when it comes to per capita food consumption.

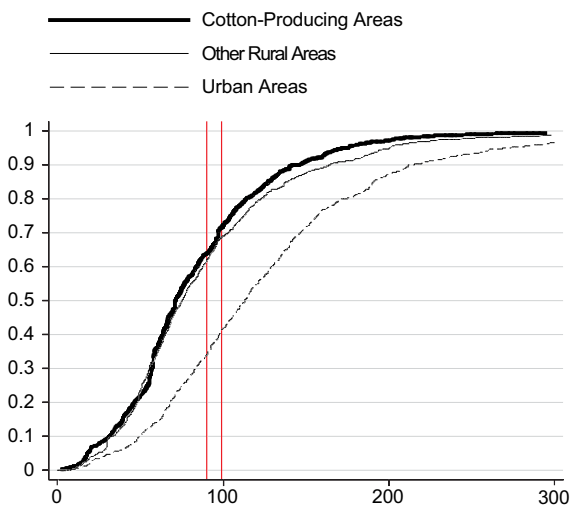
- The Koulikoro region appears to be the poorest of the three regions using both the DNSI's and our poverty lines

- Food poverty in the Sikasso region is higher than in Kayes when one uses the DNSI's poverty line. It is, however, lower when one uses our poverty line.

Based on these preliminary elements, it is clear that the DNSI diagnosis based on the EMEP survey appears relatively solid in regard to Sikasso's per capita consumption in 2001: Sikasso is one of the three poorest regions in the country. However, the cumulative curves clearly show that Sikasso's relative position compared to the Kayes and Koulikoro regions varies according to what part of the distribution one considers.

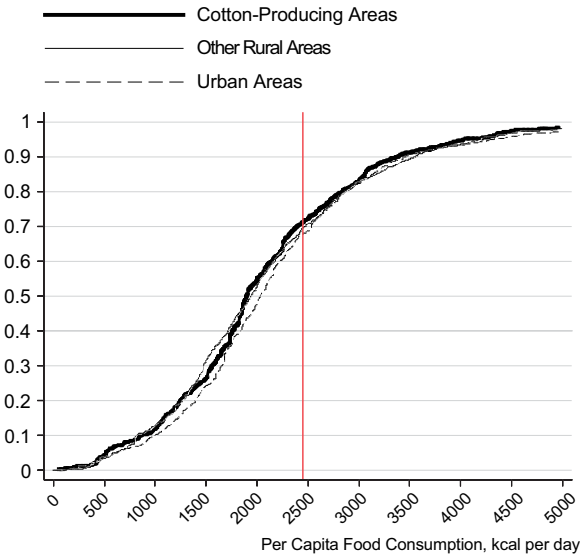
The 2001 survey data do not allow us to distinguish between cotton farmers and other farmers in the households surveyed. We can, however, partition the region to isolate all of the cotton-producing areas (as identified by the CMDT) from other rural areas. In 2001, the CMDT cotton-producing zone consisted of most of the rural areas in Sikasso region, the southern edge of the Ségou region, and the Kita area contained in the Kayes region (see Appendix D for a detailed description of how the area was partitioned). Figure 3 compares standards of living in the cotton-producing area with standards of living in other rural areas and in urban areas.

Figure 3. Cumulative food consumption curves, Mali, 2001



Source: EMEP 2001, authors' calculations.

Figure 4. Cumulative calorie consumption curves, Mali 2001



Source: EMEP 2001, authors' calculations.

In this case, the relative position of households in the cotton-producing zone is less favorable. Indeed, they appear to be systematically poorer than households in other rural zones.

The preceding curves are drawn using food consumption valued at Bamako prices. We can test the robustness of the results using a system that assigns a calorie value to food consumption (Figure 4). The results are different: households in the cotton-producing zone no longer appear to be systematically the poorest. In this case, the position of cotton-producing areas relative to other rural areas cannot be determined definitively as the curves cross each other at several points in the distribution.

Later, we shall provide other elements to analyze Sikasso's position and, more specifically, the situation of cotton farmers compared to other regions and other households in Mali and Burkina Faso.

1. Cotton-Producing Households' Living Conditions in Mali and Burkina Faso

The cotton-producing regions' "poor" performance in 2001 cannot necessarily be attributed to cotton farmers' normal situation. The year 2001 was exceptional because of the drought and the cotton farmers' strike during the 2000-2001 crop year. Among other things, cotton-producing areas are not homogenous: crops are varied and farmers depend more or less heavily on this cash crop. Finally, collected consumption data are not an adequate indicator of the relative poverty of regions or socio-professional categories. We shall therefore continue the analysis focusing on cotton farmers' position relative to other farmers and using a larger number of surveys and indicators. Among other things, we shall examine cotton farmers' situation in Burkina Faso.

Prior to this, we will take another look at the surveys on which our diagnosis is based and explain the choices we were obliged to make to measure monetary standards of living. Indeed, data constraints and statistical decisions are important. Readers who wish to know the factual content of the report may skip this rather technical sub-section.

1.1 Data availability and choice of a monetary measurement of standard of living

Mali: heterogeneity of the surveys

• *Different surveys make it difficult to diagnose changes in consumption levels over time.*

In addition to the survey conducted in 2001, we analyze the data provided by the 1994 Mali survey of current economic and social conditions (*Enquête malienne de conjoncture économique et sociale* or EMCES) survey and the 2006 ELIM survey.[3] The quality of these surveys is highly variable when it comes to information on monetary standards of living, notably because they use different methods to gather consumption information:

- The 1994 EMCES survey, the least extensive of the three, only collected values for purchases intended for daily consumption. Self-consumption data were therefore not collected. The questionnaire was a retrospective questionnaire on spending over the 15 days prior to the survey for food and 12 months prior to the survey for other types of spending. The number of items produced was very low—only ten for food. This generated a considerable risk of under-estimating consumption levels. What is more, it was not possible to control for the seasonality of spending or frequency of purchases. Insomuch as the survey was conducted during the pre-harvest period, there is a risk that the data under estimate annual consumption levels.

- The 2001 EMEP survey is characterized by its very detailed questions on food consumption. Indeed, four annual visits made it possible to weigh the food used in meals. This system provided an estimate of the quantity of each household's annual consumption of several hundred food products. What is more, each household had to indicate purchased quantities and values, which made it possible to calculate unit prices.

[3] The primary socio-demographic characteristics by administrative region and by milieu of the households in the three surveys discussed here can be found in Appendix A.

- The 2006 ELIM survey consisted of four modules on consumption: self-consumption, daily spending, less frequent spending, and non-monetary gifts received. The list of product items is fairly long (86 in the self-consumption module, for example). For each product (with the exception of less frequent expenditures), the households had to indicate how much they consumed, the frequency of consumption, the number of months in the year during which the product was consumed, and the estimated average price of each product consumed.

These differences in method and quality complicate the diagnosis of changes in consumption over time. We have not therefore deflated the consumption aggregates by changes in prices over time. We can, however, examine regional and categorical differences and changes in these differences over time as long as the consumption aggregates can be deflated properly by regional price differences.

- *The interest of regional price differences*

The debate around the Sikasso paradox requires us to be particularly attentive to the issue of the inter-regional comparativeness of the consumption aggregate. For this, we need to have a price index that allows us to correct for regional price differences. We can correct for these differences in two ways:

1. First, one could value the quantities consumed in a single price system. Here, one kilogram of rice in Kayes would be assigned the same value as a kilogram of rice in Mopti. This method is only possible when the surveys collect, simultaneously, the quantities consumed and unit prices of each product at a given location in the territory. This is only the case for food product consumption in the 2001 EMEP and 2006 ELIM surveys.
2. The second method is to deflate the consumed values by regional price indexes. This method must be applied to the consumption data values for food and non-food products in the 1994 EMCES survey and the non-food product consumption in the 2001 EMEP and 2006 ELIM surveys. This method is all the more satisfactory as regional prices are available at short intervals, on detailed geographic level (at least by milieu and by administrative region), and for sub-categories of products (food/non-food at the least and, at best, the following categories: food, clothing, housing, transport, leisure and other goods and services).

At the present time, the DNSI collects prices in each of Mali's regional capitals. It does not, however, produce indexes to measure inter-regional price differences but rather consumer price indexes for each regional capital (that is to say, indexes tracking inflation in these cities). Based on this, we have attempted to calculate these differences and estimated the extent to which we could use them to deflate consumption in 1994, 2001 and 2006.

Only unit prices and baskets of goods for each regional capital were available (for the year 1986) and inflation in each region and for each group of products from 1986 to 1993. With this information, we therefore calculated the regional price differences in 1993, with Bamako prices serving as base 100 (Table 2). We can see large price differences for nearly all non-food items between Bamako and the regional capitals where prices are in fact much lower than in the capital.

[4] The following Paasche index formula was applied: $I^R = \frac{P^R . q^R}{P^0 q^R}$.
where P^R is the per product prices in region *R*,
P^0 is the per product price in Bamako,
and q^R is the average basket of goods in region *R*
used by the DNSI's consumer price index (CPI).

Table 2. Regional price deflators, Mali 1993

	Food	Clothing	Housing	Furniture & Household Items	Health	Transport and Communication	Leisure	Other Goods and Services	Overall Index	Index (excluding furniture and health)
Kayes	98.4	70.8	92.7	89.7	95.4	81.8	71.7	69,3	88.3	88.2
Sikasso	91.8	38.8	40.6	138.9	66.4	47.4	95	77.9	76.7	72.5
Ségou	89.5	53	66.2	100.4	66	37.2	94.8	39.7	80.2	74.2
Mopti	95.5	68.3	73.8	114.2	72.9	68.1	67.5	87.7	95.4	88.2
Gao	82.3	30.6	41.9	71.1	105.2	46.5	67.3	90	72.7	73
Bamako	100	100	100	100	100	100	100	100	100	100

Source: IPC; DNSI; authors' calculations.

Nevertheless, using these regional deflators to deflate the consumption aggregates from the 2001 and 2006 surveys raises a certain number of difficulties. Indeed, doing so amounts to making two assumptions: *(i)* that price differences between urban and rural areas are small; and *(ii)* that regional differences were the same in 1993 and 2006. Given that the 2001 and 2006 surveys provide some unit prices for non-food products (oil, charcoal, soap and rent), we were able to test the validity of these two assumptions. As it happens, prices are considerably different in urban and rural areas, and prices in the regional capitals do not seem to be systematically lower than prices in the capital. We therefore felt that it would be preferable to limit ourselves to comparing food consumption levels in 2001 and 2006.

For 1994, it is only possible to construct a spending aggregate (and not total consumption). The fact that self-consumption was not measured greatly limits the analysis, as does the fact that the regional price differences are only for urban areas and only for 1993.

For the years 2001 and 2006, we have preferred to limit analysis of inter-household differences in standards of living to differences in food consumption alone. Appendix B discusses in more detail how the 1994 spending aggregates and the 2001 and 2006 food consumption aggregates were elaborated, as well as how poverty lines were calculated.

• *Method of identifying cotton-producing areas and cotton farmers*

The 1994 EMCES and 2006 ELIM surveys allow one to identify the cotton farmers in the surveyed households. We have defined them as households that say they grow cotton, irrespective of the head of household's primary activity. In 1994, 28% of farmers lived in cotton-growing households (or 20% of the Malian population), compared to 34% in 2006 (17% of the total population). In addition, we have re-partitioned the regions so as to identify the CMDT's areas of intervention for each of the surveys (Appendix D lists the *arrondissements* that make up each of these zones). Over the years, cotton-producing zones have grown, with most of the expansion being located in the Kita region and the Bougouni circle. In 1994, 37% of Mali's rural population lived in the cotton-producing zone (31% of the total population), compared to 39% in 2001 and 41% in 2006 (or, for both these years, 28% of the total population).

Analysis of farmer samples in the EMCES and ELIM surveys indicates that they are relatively satisfactorily representative in regard to the total number of farming households, notably those residing in the CMDT's zones (Appendix A). Production per household, however, seems under-estimated compared to the CMDT's numbers.

Burkina Faso: more homogenous surveys

Here, we worked from the 1994, 1998 and 2003 priority surveys *(Enquêtes prioritaires* or EP1, EP2 and EP3). The questions of homogeneity, comparability, consumption aggregate elaboration, and coherent poverty line choices from one year to the next were already addressed, notably by the working group on pro-poor growth in 14 countries, where Burkina Faso was studied by one of the co-authors of this study.[5] For more details on these decisions, readers can refer to Appendix C and the work of Grimm and Günther (2004, 2007a, 2007b), which describe the characteristics of these surveys and, notably, the choices made to correct seasonality biases and correctly take into account differences in baskets of goods between households and changes in food prices when calculating poverty lines.

Whatever the case, and even if survey harmonization issues needed to be ironed out, the surveys conducted in Burkina Faso were much more homogenous than the surveys in Mali and allow for dynamic analysis of monetary standard of living.

- *Method of identifying cotton-producing areas and cotton farmers*

The cotton farmers can be identified in each of the three surveys. In 1994, 8% of farmers grew cotton (or 10% of the total population), compared to 18% in 1998 and 20% in 2003 (or respectively 17% and 18% of the total population). We also elaborated indicators for production zones (cotton-producing areas, other rural areas). Cotton-producing areas are those where more than 20% of farmers grow cotton (see Appendix D, which also shows the expansion of cotton cropping in Burkina Faso). In 1994, 10% of the rural population lived in cotton-producing areas, compared to 31% in 1998 and 33% in 2003 (or respectively 7%, 21% and 23% of the total population).

Having stated these methodological preliminaries, a review of the economic context during the survey years is necessary to appreciate the temporary factors likely to influence the changes and relative differences in the standards of living of cotton farmers and other categories of households.

Economic context in the survey years

The years for which we have data on standards of living were fairly different from each other in regard to the economic context at the time, notably because of a wide variation in agricultural performances. Indeed, the agricultural sector, which is large in these countries, is very sensitive to weather variations. Furthermore, in the 1990s and again in early 2003, price liberalization sped up, notably for staple goods such as cereals.

The CFA franc was devalued in 1994. That year marks a recovery in per capita GDP growth in both countries, the expansion of cotton cropping, and an increase in prices for cotton farmers. Compared to 1993, the nominal increase was 32% in Mali and 7% in Burkina Faso but in real terms it was only 18% in Mali and nil in Burkina Faso (AFD, 2002).

Burkina Faso experienced a severe drought in 1988, which caused food production to drop by 20% and drove up cereal prices.

For both countries, 2000 and 2001 were once again drought years, causing agricultural production to drop. In addition, in Mali, cotton farmers went on strike that year following an announced drop in prices: cotton production fell 60%. As national averages, Malian households' consumption seems to have regressed by 7.2% while consumer prices seem to have risen by 5.7% (AFD, 2006).

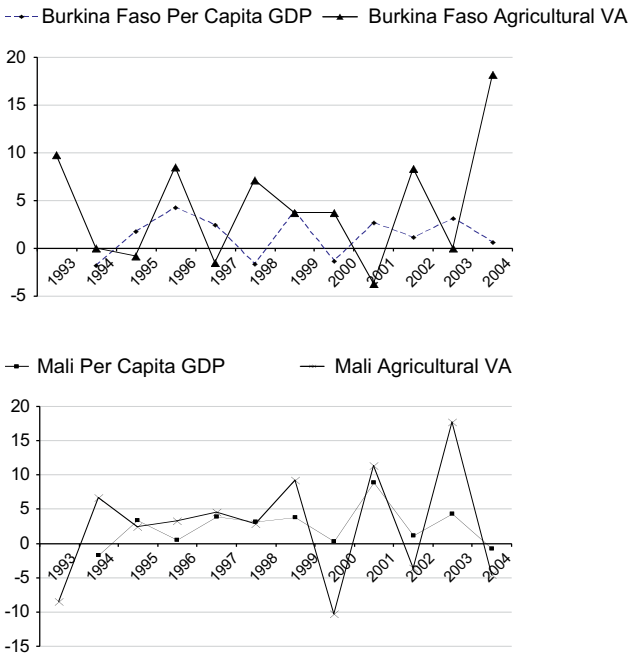
The year 2003 was more favorable in Burkina Faso, with household consumption increasing by approximately 4.6% (AFD, 2006). However, despite good agricultural production, food prices remained relatively high, probably because of

[5] The "Operationalizing Pro-Poor Growth" research program financed by the World Bank, DFID, AFD, GTZ and KFW. A summary of this research was published by the World Bank (2005). See also: http://www.afd.fr/jahia/webdav/site/myjahiasite/users/administrateur/public/pdf/croissance%20pro-pauvres.pdf

continued large purchases by national cereal offices and neighboring countries, marked by the 2000-2001 drought (Grimm and Günther, 2007b).

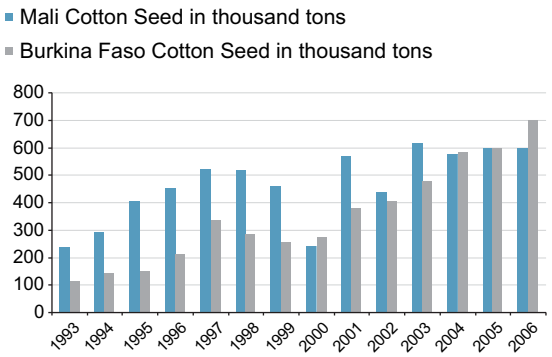
For Mali, the year 2006 seems to have had good rainfall and, therefore, good food-crop yields. Despite the drop in prices for cotton farmers in 2005, production had stabilized at 600,000 tons. Average household consumption seems to have risen by 5% over the previous year, and prices seem to have risen only moderately (inflation on the order of 2.2%).

Figure 5. Growth in per capita GDP and agricultural value-added, Mali and Burkina Faso, 1993-2004



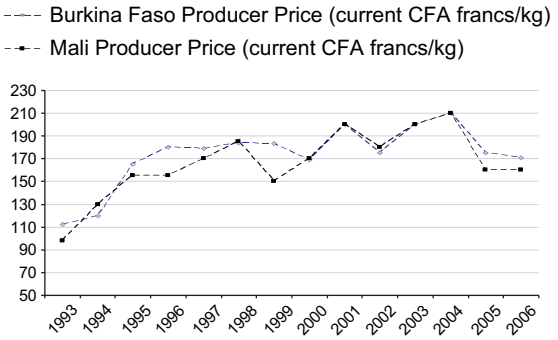
Source: World Development Indicators, CD-ROM, 2006. Source: EMEP 2001; authors' calculations.

Figure 6. Cotton seed production, Mali and Burkina Faso, 1993-2006



Source: AFD (2002 and 2006).

Figure 7. Producer price of cotton, Mali and Burkina Faso, 1993-2006



Source: AFD (2002 and 2006).

1.2 Consumption and monetary poverty

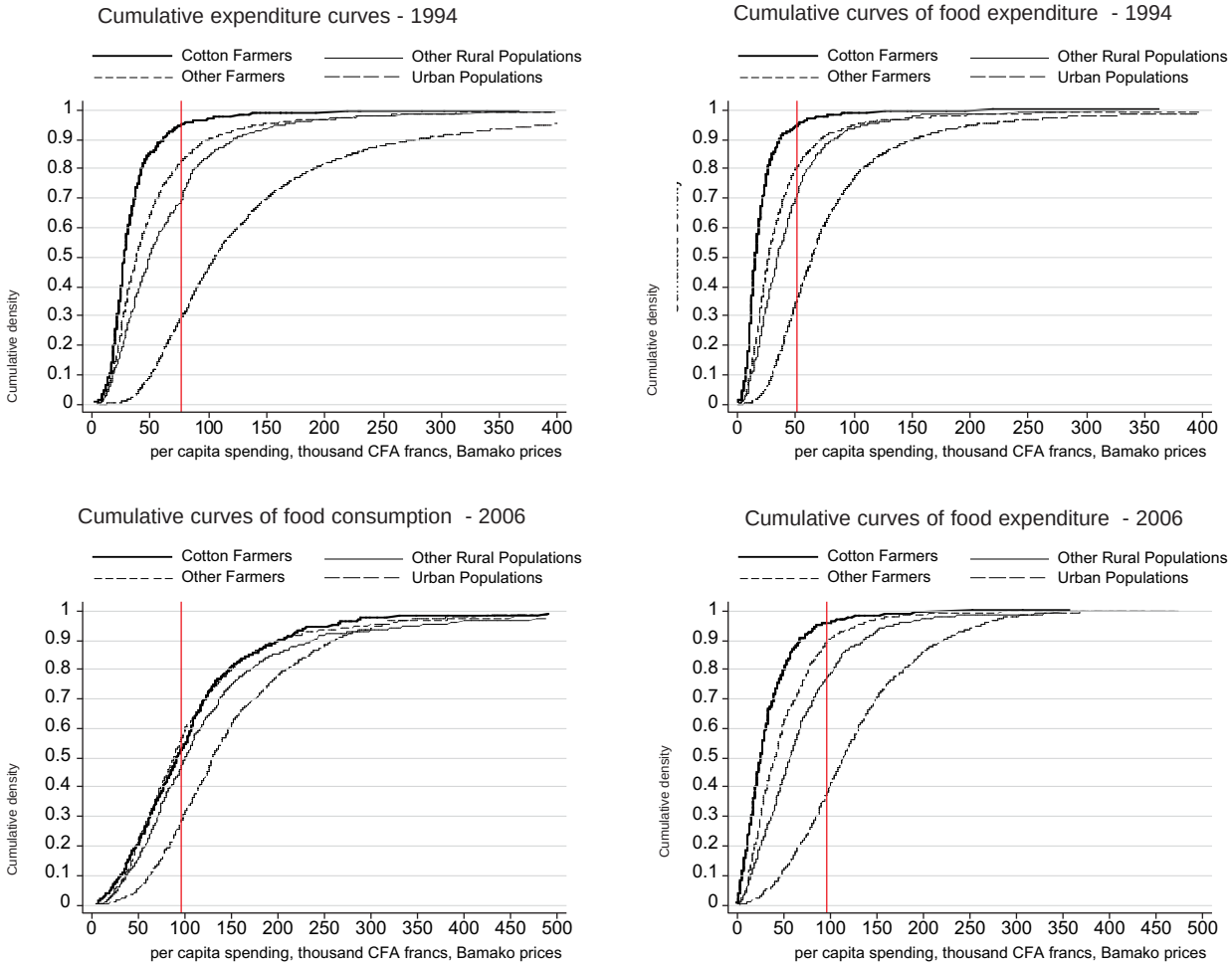
Mali

• *1994: An uneasy diagnosis because self-consumption was not measured*

First, we shall attempt to examine the situation described by the 1994 EMCES survey. Given that the survey took place in April and May—that is to say before the year-end cotton harvest—it was a "snapshot" of a time when the devaluation had not yet had all of its positive effects on supply but when increased prices of everyday goods had already begun to affect demand. Cotton production had not yet spread much and producer price conditions had progressed without being more favorable.

The first schema in Figure 8 shows per capita spending at Bamako prices while the second shows per capita food spending for 1994. Cotton farmers as a whole spend less per capita than the rest of the Malian population, even compared to other farmers, as a result of particularly high rates of poverty among cotton producers (Table 3). However, the

Figure 8. Cumulative consumption and expenditure curves, Mali, 1994 and 2006



Source: EMCES 1994, ELIM 2006; authors' calculations.

1994 EMCES survey contains numerous imperfections, notably by not counting self-consumption because of poor data collection. Yet, it would appear that cotton farmers have a larger share of food self-consumption than other rural groups do (and, even more so, than urban populations). For instance, in 2006, self-consumption made up 71% of cotton farmers' food consumption, compared to only 54% for other farmers and 41% for other rural groups. Since the standard of living indicator in 1994 was only a spending indicator, it is heavily biased and undoubtedly under-estimates cotton farmers' standard of living more than it does that of other categories of the population in Mali.

• *2006: The standards of living of cotton farmers and of other rural populations are roughly identical*

What do we see in 2006? That year was relatively favorable and cotton production remained high despite the appreciable drop in producer prices. The collected consumption data was of better quality than the 1994 data because spending and self-consumption were recorded. The third schema in Figure 8, which gives food consumption curves (spending and self-consumption) valued at average Bamako prices in 2006, shows that cotton farmers' standards of living are roughly identical to those of the rest of the rural population. The figures in Table 3 even reveal a certain advantage when it comes to poverty since the poverty rate is 51.2% among farmers compared to 55.6% among other farmers (the national average is 44.5%).

The diagnostic is therefore very different from the 1994 diagnostic. This is undoubtedly explained above all by a statistical artifact, as the last schema in Figure 8 seems to show. This schema presents cumulative food spending curves for 2006 and not total food consumption. One can clearly see that cotton farmers spend considerably less on food products than others do and that a larger share of their food consumption comes from a large amount of self-consumption.

Table 3. Poverty rate, Mali 1994, 2001, 2006

Poverty Rate (%)	1994 Total Spending[a]	1994 Food Spending[b]	2001 Food Consumption[c]	2006 Food Consumption[d]
National	75	75.1	55.2	44.5
Cotton Farmers[e]	94.5	94.3		51.2
Other Farmers	82.5	80.4		55.6
Other Rurals	70.2	73		46
Urbans	29.7	35.9	34	27.8
Cotton Zones[f]	92.6	92.7	63.8	52.2
Other Rural Areas	78.3	76.7	61.8	51.9

Note: Since the 1994 data do not include self-consumption, they cannot claim to measure the poverty level correctly and are not therefore comparable to the data from later years.

a. Total per capita spending, Bamako prices, 1994. Poverty line: 77.2 thousand CFA francs per year.

b. Per capita food spending, Bamako prices, 1994. Food poverty line: 51.4 thousand CFA francs per year.

c. Per capita food consumption, Bamako prices, 2001. Food poverty line: 90.3 thousand CFA francs per year.

d. Per capita food consumption, Bamako prices, 2006. Food poverty line: 95.8 thousand CFA francs per year.

e. Farmers who say they grow cotton.

f. CMDT cotton zones 1994, 2001 and 2006 (Appendix D).

Source: 1994 EMCES, 2001 EMEP, 2006 ELIM; authors' calculations.

How was the Sikasso region positioned in relation to other administrative regions in 2006? Table 4 shows that Sikasso is neither one of the poorest regions nor one of the richest. In rural areas, per capita food consumption is roughly identical to per capita food consumption in the Ségou and Koulikoro regions.

Table 4. Annual per capita food consumption, by region and milieu, Bamako prices, Mali 2006

Per Capita Food Consumption	National	Urban	Rural
Kayes	114 069	145 960	102 745
Koulikoro	132 039	148 786	127 757
Sikasso	126 959	149 255	118 080
Ségou	126 848	157 061	118 039
Mopti	147 753	147 473	147 806
Tombouctou-Gao-Kidal	151 206	143 404	155 891
Bamako	175 502	175 502	
Country	136 534	157 492	126 759
Poverty Rate[a]	National	Urban	Rural
Kayes	52.7	33.2	59.6
Koulikoro	47.1	27.8	52.1
Sikasso	51.8	49.3	52,7
Ségou	45.7	29.9	50.4
Mopti	50.3	25.5	55
Tombouctou-Gao-Kidal	28.9	21.8	33.1
Bamako	18.5	18.5	
Country	44.5	28.3	52

a. Per capita food consumption, Bamako prices, 2006. Food poverty line: 95.8 thousand CFA francs per year.
Source: 2006 ELIM; authors' calculations.

The regional ranking changed compared to 2001 (Table 1): the rural part of the Koulikoro region improved, whereas the Kayes and Mopti regions fell behind..

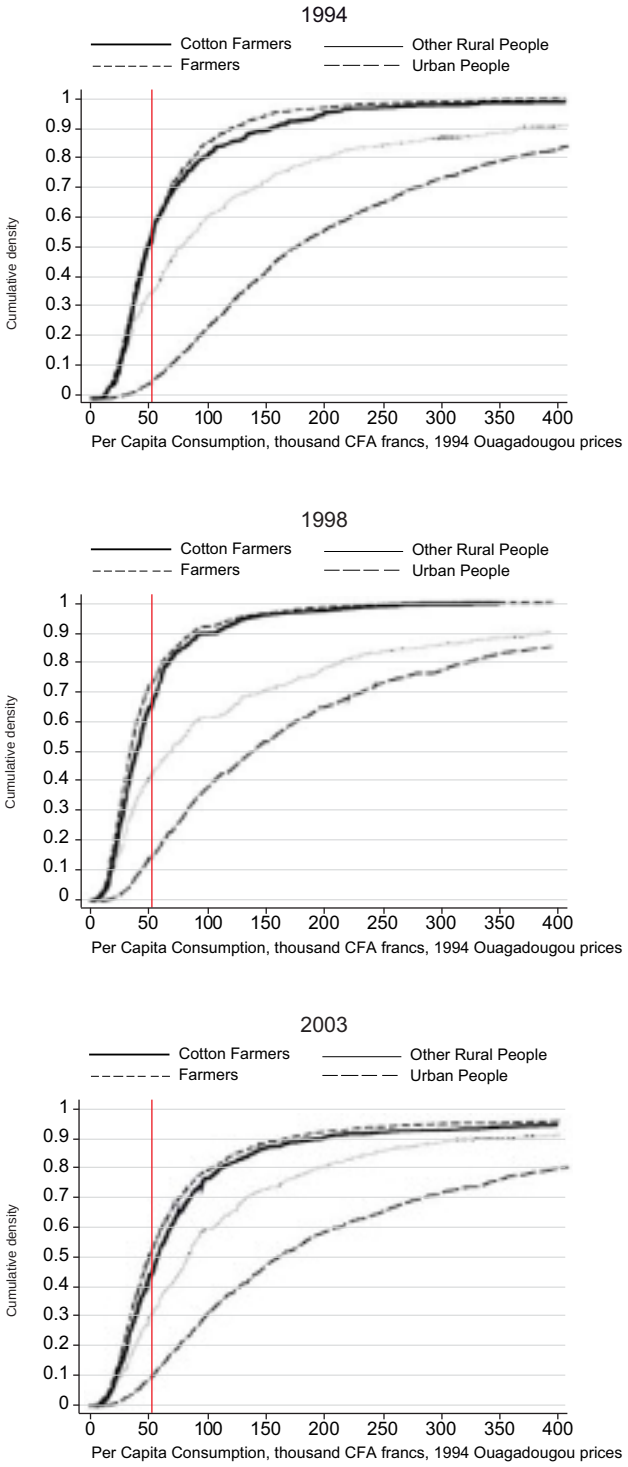
Burkina Faso

The surveys available for this country, which are much more uniform and comparable from one year to the next, make it easier to diagnose changes in cotton farmers financial situation from 1994 to 2003. What is more, the consumption aggregate that serves as the basis for this diagnosis is more inclusive because it comprises food (spending and self-consumption) and non-food consumption at constant 1994 Ouagadougou prices.

- *Differences between cotton farmers and other farmers are small regardless of year*

The schemas in Figure 9 allow one to see that the differences between cotton farmers' per capita consumption and other farmers' per capita consumption are always in cotton farmers' favor throughout the entire distribution. These differences are, however, relatively small in 1994, 1998 and 2003.

Figure 9. Cumulative consumption curves, Burkina Faso, 1994, 1998, 2003



Source: EP1 (1994), EP2 (1998), EP3 (2003); authors' calculations.

• *Trajectories are however appreciably different.*

Even though the differences between the curves for the three analyzed years hardly seem to vary, temporary shocks and economic policies nevertheless had very different effects depending on whether the farmers grew cotton or food crops. Indeed, their standards of living did not follow the same paths.

In 1994 (Table 5), there were relatively few differences between cotton farmers and others, whether in terms of average consumption levels or the poverty rate. The poverty rate among cotton farmers was high (62%) but lower than among other farmers (64%). Between 1994 and 1998 cotton farmers' standards of living fell less (-13% compared to -23% on average in real terms) as the better producer prices thanks to devaluation protected them from the shock of the drought and from the rise in the price of imported agricultural inputs (fertilizer).[6] The year 2003 also seems to have been favorable for them with a 36% increase in average standard of living, and even an ongoing reduction in poverty (from 62% in 1994 to 58% in 1998 and 47% in 2003). Food crop farmers' consumption levels, however, closed the gap more rapidly between 1998 and 2003 (+42%), lessening the positive difference in favor of cotton farmers. In 2003, the difference in poverty rates had fallen to only ten percentage points, compared to thirteen in 1998. This is even manifest in a higher poverty level in cotton-producing areas in 2003 than the average for all other rural areas (57% compared to 47%).

6 The cost of fertilizer is said to have increased by 100% between 1990 and 2000, which considerably reduces cotton farmers' margins (Ouedraogo *et al.*, 2003).

Table 5. Average standard of living and poverty rates, Burkina Faso 1994, 1998, 2003

Average Per Capita Consumption (CFA francs, 1994 Ouagadougou prices)[b]	1994[a]	1998[a]	2003[a]
National	78 772	64 952 (-18%)	85 438 (32%)
Cotton Farmers[c]	58 772	51 243 (-13%)	69 797 (36%)
Other Farmers	56 056	43 411 (-23%)	61 618 (42%)
Other Rurals	100 916	90 422 (-10%)	97 235 (8%)
Urbans	205 989	191 431 (-7%)	197 334 (3%)
Cotton Zones[d]	62 270	54 142 (-13%)	72 835 (35%)
Other Rural Areas	58 895	42 312 (-28%)	63 200 (49%)
Poverty Rate (%)			
National	55.5	61.8	47.2
Cotton Farmers[c]	62.1	58.2	46.8
Other Farmers	64.1	71.6	57.2
Other Rurals	46.9	50.7	35.6
Urbans	8.5	17.7	13.7
Cotton Zones[d]	62.6	62.9	56.7
Other Rural Areas	63.5	63.5	46.6

a. Per capita consumption, 1994 Ouagadougou prices. Poverty line: 53.2 thousand CFA francs per year. The deflators used to calculate real average per capita consumption are specific to each consumption decile in order to take into account differences in consumption baskets. Poverty rates are calculated differently: the poverty line for the years 1998 and 2003 is deflated by a price index that corresponds to the basket of goods consumed by households located near the poverty line. This poverty line is then compared to the nominal aggregates for each year. These two calculation methods explain why, from 1994 to 1998, the poverty rate among cotton farmers did not increase even though average consumption fell.
b. Rate of growth in parentheses.
c. Farmers who say they grow cotton.
d. 1994, 1998 and 2003 cotton-producing areas (Appendix D).
Source: EP1 (1994), EP2 (1998), EP3 (2003); authors' calculations.

Does a per capita measurement of standard of living not skew results?

Cotton-producing households seem to be larger than other households in both Burkina Faso and Mali. The average difference is at least one member, usually two, and can be up to four as was the case in Mali in 1994 (Appendices A and C). When it is particularly marked, this size difference can come in part from an artifact linked to the delimitation of households by surveyors in the large concessions that contain several homes. For instance, we find fewer female-headed households among cotton farmers; in addition, the second wife is housed separately and counted as outside the household even if she lives in the concession. This difference also involves a real

phenomenon linked to a much higher incidence of polygamy among cotton-producing households (Appendix F), the reception of a larger number of related or unrelated members, and/or the necessities of more labor-intensive production. The first two elements can even lead one to assume that cotton farmers' advantageous standard of living allows them to contract second marriages more often, be more fertile, and provide room and board to a larger number of dependents from the extended family. In all cases, a per capita standard of living indicator does not take into account the economies of scale possible in large households (because the indicator assumes that every additional member absorbs the same fraction of the budget), or the differences in needs depending on the age structure within the household. It is therefore likely to skew the comparison between households with different needs, in particular to the detriment of larger households or households that contain more children—which is the case of cotton-producing households.

Appendix E explores how these differences in size and structure can alter comparisons of monetary poverty. To do so, two alternative per capita equivalence scales are used: the "Oxford scale" is used when only food consumption serves to measure standard of living (years 2001 and 2006 in Mali). This first equivalence scale, which considers limited economies but large differences in needs, is probably relatively suited to food consumption. When the monetary aggregate also contains non-food spending (Burkina Faso in 1994, 1998 and 2003, and Mali in 1994), we test the influence of a scale that introduces more economies linked to the size of the household: we have chosen the square root of the Oxford scale to count the number of consumption units in the household. Household consumption is then divided by these two measurements of the number of consumption units (or adult-equivalents) and the shape of the cumulative consumption curves makes it possible to evaluate the influence of this correction.

As expected, taking into account economies of scale related to the size of the household corrects standard of living indicators in cotton farmers' favor. This correction is, however, appreciable only for economies assumed to be large, that is to say, with the second equivalence scale tested and on expenditure (Mali 1994) or total consumption (Burkina Faso). A comparison of the cumulative spending and consumption curves in Graphs 8 and 9 and Figures E.1 and E.2 show this. By comparing dependency rates, one can see in particular that cotton-producing households do not contain more children (under 15 years of age) and elderly people (over 65). These households differ primarily in size rather than in structure. It should be remembered that economic theory does not provide a satisfactory way to extract the "right equivalence scale" from the data. Since our consumption aggregate does not contain durable goods, it is possible that this second equivalence scale amplifies economies of scale; the correction that it provides can probably be seen as the upper bound.

When we recalculate poverty rates setting the poverty line in such a way that the national poverty rate is the same for per capita expenditure and consumption, we redistribute situations of poverty between households (and therefore between the individuals in these households) in function of their size and demographic structure (Tables E.1 and E.2). For instance, in Mali in 1994, the poverty rate in cotton-producing households falls from 94% to 88%, and in cotton-producing areas from 93% to 89% depending on whether one divides total household spending by the size of the household or by the square root of the Oxford scale, whereas this correction increases poverty among other farmers and other rural populations. The same observation holds for Burkina Faso: the incidence of poverty among cotton farmers falls from 62% to 54% in 1994, from 58% to 53% in 1998, and from (only) 47% to 45% in 2003, whereas it remains the same for other farmers.

[7] This scale assumes that children eat half of what adults eat and that the other adults only eat 70% of what the head of household eats.

These considerations help further attenuate the "cotton paradox" already amply commented in regard to Mali. In the case of Burkina Faso, they foster the same presumption that there is less poverty among cotton farmers (or cotton-producing areas) than among other farming households (or other rural areas).

Intermediary conclusion concerning monetary standard of living comparisons

The diagnosis of cotton farmers' situation in Mali before 2006 is considerably muddied by the poor quality of the 1994 EMCES survey. In 2006, it would seem that cotton farmers' standards of living were slightly better than those of other farmers. The differences are, however, relatively small.

In Burkina Faso, it is possible to analyze changes in cotton farmers' relative situation since 1994. One can see that their situation has improved and that they were the principal beneficiaries of the devaluation of the CFA franc. Nevertheless, in 2003 one can see a certain convergence of standards of living, which was partially due to food farmers catching up with respect to periods of poor rainfall and low production (between 1998 and 2001).

Even though the expansion of cotton cropping in the two countries over the last fifteen or so years has helped reduce rural poverty, particularly in cotton-producing areas, it has not enabled cotton farmers' situations to take off. Their standards of living remain relatively low, little different from other farmers', whereas the gap between them and urban populations remains large.

1.3 Ownership of durable goods and farm tools: cotton farmers better equipped

Possession of assets such as means of transportation and communication as well as housing comfort are indicators of standard of living that may be less sensitive to measurement error. Among other things, they are more structural than per capita consumption. We have therefore examined ownership rates for assets such as bicycles, mopeds and radios.

As early as 1994, cotton farmers in Mali were much better equipped than the rest of the rural population (Table 6), with an equipment rate near that of urban households: 35% owned a moped, compared to only 14% of other farmers, and 74% owned a radio, compared to 53% of other farmers. What is more, equipment ownership rates have been increasing over the years for everyone in Mali, with relative differences between categories of households staying the same: cotton farmers therefore still have relatively more durable goods than other farmers. In 2006, 92% of cotton farmers had a bicycle compared to 55% of other farmers, 44% had a moped (compared to 22%), and 57% had a radio (compared to 48%).[8]

In Burkina Faso, the picture is somewhat different (Table 7). Cotton farmers own more assets than other farmers, but the gap is smaller than that in Mali. In 1994, the difference in the share of households that owned a motorcycle was 13 percentage points between cotton farmers and other farmers (compared to 21 percentage points in Mali) and 10 percentage points for ownership of a radio (21 in Mali). In 2003, the cotton farmers' advantage persisted but at a slightly lower level because of rising equipment rates among other farmers, notably for ownership of bicycles and radios.

We also compared levels of farm equipment ownership despite the somewhat summary information in the agricultural techniques surveys. Nevertheless, we are able to see large differences in favor of cotton farmers. In both countries, they are better equipped than other farmers. They own relatively more tools (barrows and carts). In Mali in 1994, 94% of cotton farmers had a barrow, compared to 55% of other farmers. In 2001, all farmers used more barrows than before, but more

[8] It is interesting to note that this durable goods advantage among cotton farmers can be verified even when the comparison is limited to other farmers in the cotton-producing area in 2006, and even when comparing cotton farmers to other farmers living in the same *arrondissement* (Appendix F).

farmers in cotton-producing areas have them (90% compared to 69%). Cotton farmers also seem to own more livestock, although the difference fell between 1994 and 2006. In 1994, cotton farmers owned 7 head of cattle on average, compared to 4 for other farmers. In 2006, the difference fell to 1.5 head on average, with cotton farmers

Table 6. Level of wealth, Mali 1994, 2001, 2006

Asset Ownership (% of individuals whose households own the asset)	1994	2001	2006
Bicycle			
National	49	57	48
Cotton Farmers[a]	89	-	92
Other Farmers	43	-	55
Other Rurals	42	-	47
Urbans	24	38	26
Cotton Zones[b]	80	88	86
Other Rural Areas	38	49	44
Moped			
National	23	26	34
Cotton Farmers[a]	35	-	44
Other Farmers	14	-	22
Other Rurals	20	-	30
Urbans	37	39	42
Cotton Zones[b]	30	27	38
Other Rural Areas	14	18	24
Radio			
National	61	77	57
Cotton Farmers[a]	74	-	57
Other Farmers	53	-	48
Other Rurals	62	-	47
Urbans	73	89	70
Cotton Zones[b]	67	78	49
Other Rural Areas	54	69	50
Farm Equipment[d]			
Barrow, Cart	Barrow	Barrow	Cart
Cotton Farmers[a]	94	-	72
Other Farmers	56	-	54
Cotton Zones[b]	83	90	68
Other Rural Areas	52	69	47
Head of Livestock	Cattle		Large Livestock
Cotton Farmers[a]	7.4		8.5
Other Farmers	4.3		6.9
Cotton Zones[b]	8.3		8
Other Rural Areas	3.1		7.3

a. Farmers who say they grow cotton.
b. CMDT cotton zones in 1994, 2001 and 2006 (Appendix D).
Source: 1994 EMCES, 2001 EMEP, 2006 ELIM; authors' calculations.

owing 8.5 head of large livestock compared to 7 for other farmers.

In Burkina Faso, equipment rates are lower overall but the situation of cotton farmers is also more favorable. For instance, in 1994, 50% of cotton farmers owned a cart, compared to 28% of other farmers. Cotton farmers' advantage persisted throughout the period.

Table 7. Level of wealth, Burkina Faso 1994, 1998, 2003

Asset Ownership (% of individuals whose households own the asset)	1994	1998	2003
Bicycle			
National	94	82	86
Cotton Farmers[a]	93	95	96
Other Farmers	79	84	88
Other Rurals	66	69	81
Urbans	53	62	71
Cotton Zones[b]	85	90	94
Other Rural Areas	79	83	86
Moped			
National	30	29	26
Cotton Farmers[a]	35	33	28
Other Farmers	22	21	17
Other Rurals	36	43	27
Urbans	67	63	64
Cotton Zones[b]	33	21	26
Other Rural Areas	22	32	16
Radio			
National	47	57	71
Cotton Farmers[a]	51	65	77
Other Farmers	40	50	65
Other Rurals	46	64	66
Urbans	81	86	90
Cotton Zones[b]	45	60	76
Autres zones rurales	40	49	63
Farm Equipment			
Cart			
Cotton Farmers[a]	50	51	72
Other Farmers	28	31	45
Cotton Zones[b]	37	44	63
Other Rural Areas	29	31	46

a. Farmers who say they grow cotton.
b.1994, 1998 and 2003 cotton-producing areas (Appendix D).
Source: EP1 (1994), EP2 (1998), EP3 (2003); authors' calculations.

1.4 Education and nutrition

We shall examine non-monetary indicators of living conditions such as education and children's health status. These indicators are less subject to measurement error than per capita consumption. In addition, in both Mali and Burkina Faso, the methods used to gather information on education and health did not change from one survey year to the next, which made it easier to diagnose changes over time

Education

Education level indicators in Mali, notably children's school attendance, show improvement since 1994 (Table 8). The percentage of children between the ages of 12 and 16 who have completed primary schooling thus rose by 7 percentage points nationally from 1994 to 2006 for boys (from 12% to 19%) and by 9 percentage points for girls (from 6% to 15%). While this increase affects all Malian children, the rate improved the most among children of cotton farmers. This is true for both boys and girls.

Table 8. School attendance and literacy, Mali 1994, 2001, 2006

	1994		2001		2006	
12- to 16-year-olds who have completed primary schooling (%)	Boys	Girls	Boys	Girls	Boys	Girls
National	12	6	14	8	19	15
Cotton Farmers[a]	4	2			12	9
Other Farmers	7	2			7	4
Other Rurals	16	6			16	11
Urbans	26	19	32	20	38	27
Cotton Zones[b]	8	4	5	3	13	10
Other Rural Areas	9	3	6	2	10	6
Literacy Rate (%)[c]	Men	Women	Men	Women	Men	Women
National	-	-	33	14	35	18
Cotton Farmers[a]	-	-	-	-	19	8
Other Farmers	-	-	-	-	18	6
Other Rurals	-	-	-	-	36	13
Urbans	-	-	55	33	59	38
Cotton Zones[b]	-	-	26	5	21	10
Other Rural Areas	-	-	17	5	23	8
Average Number of Years of Primary School [c]	Men	Women	Men	Women	Men	Women
National	1.5	0.6	1.3	0.8	1.8	1
Cotton Farmers[a]	0.6	0.1	-	-	0.9	0.4
Other Farmers	1.1	0.3	-	-	0.7	0.3
Other Rurals	1.7	0.6	-	-	1.7	0.7
Urbans	3.2	1.9	2.6	1.8	3.2	2.1
Cotton Zones[b]	0.9	0.3	0.8	0.4	1	0.5
Other Rural Areas	1.2	0.4	0.6	0.3	1	0.4

a. Farmers who say they grow cotton.
b. CMDT cotton zones 1994, 2001 and 2006 (Appendix D).
c. For individuals 15 years old and older.
Source: EMCES 1994, EMEP 2001, ELIM 2006; authors' calculations.

Despite this effort at children's school attendance, overall education levels nevertheless remain very low and the gap between cotton farmers' and other farmers' literacy rates and number of years of primary education is marginal. What is more, cotton farmers' advantage is not longer verifiable in 2006 when one limits the comparison to farmers in the cotton-producing zone or to other farmers in the same *arrondissement*. This suggests that part of the school attendance advantage of the cotton farmers' children can be attributed to greater availability of school infrastructures, slightly higher in cotton-producing areas (Appendix F).

Table 9. School attendance and literacy, Burkina Faso 1994, 1998, 2003

	1994		1998		2003	
12- to 16-year-olds who have completed primary schooling (%)	Boys	Girls	Boys	Girls	Boys	Girls
National	25	17	18	15	22	18
Cotton Farmer[a]	18	8	10	6	15	7
Other Farmers	18	11	13	9	16	11
Other Rurals	39	24	34	26	23	12
Urbans	62	48	57	51	63	57
Cotton Zones[b]	22	14	12	9	15	9
Other Rural Areas	19	10	11	8	14	9
Literacy Rate (%)[c]	Men	Women	Men	Women	Men	Women
National	27	12	25	14	29	15
Cotton Farmers[a]	19	6	19	9	19	6
Other Farmers	19	5	15	8	19	8
Other Rurals	31	17	39	24	28	16
Urbans	68	47	66	50	71	52
Cotton Zones[b]	21	9	20	10	22	8
Other Rural Areas	19	6	15	7	17	7
Average Number of Years in Primary School[c]	Men	Women	Men	Women	Men	Women
National	1.3	0.6	1.2	0.6	1.4	0.8
Cotton Farmers[a]	0.9	0.4	0.6	0.2	0.7	0.3
Other Farmers	0.8	0.3	0.6	0.2	0.8	0.3
Other Rurals	1.5	0.8	1.9	1.3	1.3	0.7
Urbans	3.6	2.7	3.7	2.8	4	3
Cotton Zones[b]	1.1	0.4	0.7	0.3	0.9	0.3
Other Rural Areas	0.8	0.3	0.5	0.2	0.7	0.3

a. Farmers who say they grow cotton.
b. Cotton-producing areas 1994, 1998 and 2003 (Appendix D).
c. For individuals 15 years old and older.
Source: EP1 (1994), EP2 (1998), EP3 (2003); authors' calculations.

In Burkina Faso, we do not see the same trend—that is, a consequential increase in school attendance rates—on the national level (Table 9). School attendance indicators follow a similar trend to that of the monetary standard of living, with a worsening between 1994 and 1998 followed by improvement from 1998 to 2003. This can be explained by the fact that the demand for school enrollment is affected by income variations and changes in the provision of education,

which grew relatively little because of budgetary restrictions in the second half of the 1990s. Large and persistent differences in school attendance are observed between boys and girls. However, one can see that cotton farmers send their children to school less than other farmers do. Schooling levels and differences are nevertheless very small.

Thus, the situation seems very different in the two countries: in Mali, cotton farmers' children's school attendance has improved, but this is clearly less the case in Burkina Faso.

Nutrition

Children's nutritional status is a good indicator of their state of health. Nutritional status is evaluated by measuring the weight and size of children under the age of 5. Here, we have chosen to look at growth retardation as an indicator. Growth retardation is estimated using the percentage of children whose size compared to their age is more than two standard deviations from the international median (Table 10 for Mali, and Table 11 for Burkina Faso).

Table 10. Nutrition of children less than 5 years old, Mali 1994, 2001

	1994		2001	
Children with Growth Retardation (%)	Boys	Girls	Boys	Girls
National	42	38	45	43
Cotton Farmers[a]	51	44	-	-
Other Farmers	41	38	-	-
Other Rurals	41	37	-	-
Urbans	32	31	45	39
Cotton Zones[b]	46	42	47	47
Other Rural Areas	42	37	43	44

a. Farmers who say they grow cotton.
b. CMDT cotton zones in 1994, 2001 and 2006 (Appendix D).
Range: children from 1 to 59 months of age.
Method: Indicators using the WHO's international standards. The Z-score for growth retardation is equal to the size of the child minus the international median for the child's gender and age group, divided by the group's international standard deviation. The reported indicators correspond to the proportion of children with a Z-score of less than -2, that is to say more than 2 international standard deviations from the group's international median.
Source: 1994 EMCES, 2001 EMEP; authors' calculations.

Children's size was not measured in Mali in 2006. Table 10 therefore only gives information on the percentage of children with growth retardation for 1994 and 2001 (and, for the latter, only by geographic area). We can see that in 1994 the children of cotton farmers were rather poorly nourished compared to the children of other farmers. This negative gap seems to have persisted in 2001. Indeed, the gap also exists between the cotton-producing zone as a whole and other agricultural areas, for boys and girls alike.

In Burkina Faso, the samples of children for each household category in 1994 were too small to provide reliable statistics. In 1998 and 2003, there does not seem to have been any large differences between the children of cotton farmers and others, even if one can note a slight disadvantage for cotton farmers' children. However, when production zones are compared, one can see a slight advantage for cotton-producing areas with respect to other rural areas.

When they exist, nutritional differences between the children of cotton farmers and other children do not necessarily stem from a difference in a standard of living but, potentially, from differences in the composition of the food

basket and the income allocation within households. Other types of farmers, mainly stock farmers, may be able to provide their children with consumption baskets that are more favorable to their growth, notably more meat in their diets (WFP, 2005). Furthermore, since cotton incomes are usually in the hands of fathers, while food crop incomes are more often in the hands of mothers, the latter's greater concern for their children's nutrition may favor children's nutrition in non-cotton households (Kelly *et al.*, 2004).

Table 11. Nutrition of children less than 5 years old, Burkina Faso 1994, 1998, 2003

	1994		1998		2003	
Children with Growth Retardation (%)	Boys	Girls	Boys	Girls	Boys	Girls
National	57	55	49	45	50	46
Cotton Farmers[a]	-	-	53	49	53	50
Other Farmers	-	-	52	47	51	46
Other Rurals	-	-	-	-	58	54
Urbans	-	-	31	28	35	28
Cotton Zones[b]	43	37	49	47	51	48
Other Rural Areas	59	57	54	48	54	49

a. Farmers who say they grow cotton.
b. CMDT cotton zones in 1994, 2001 and 2006 (Appendix D).
Range and method: see Table 10.
Source: EP1 (1994), EP2 (1998), EP3 (2003); authors' calculations.

1.5 Consumption and monetary poverty

The 2006 household survey in Mali contained a module that asked individuals about how they perceived their standard of living.[9] We can, therefore, study poverty from a subjective standpoint. Basing the analysis on the population's perceptions allows one to escape the excessively "normative" nature of the definition of the poverty line. However, insomuch as the reference group to which individuals compare themselves is not specified, it is sometimes difficult to understand why this or that segment of the population says if feels better than another.

Table 12. Subjective well-being, Mali 2006

	% who state they live		
	Well or Fairly Well	Acceptably	With difficulty
National	19.7	57.3	23.1
Cotton Farmers	18.4	60.3	21.2
Other Farmers	13.6	59.3	27.2
Rural Non-Farmers	16	57	27
Urbans	29.5	53.2	17.3
Cotton Zones	19.1	59.5	21.5
Other Rural Areas	12.8	58.9	28.3

Source: 2006 ELIM; authors' calculations.

[9] We would like to thank Emmanuelle Lavallée who produced Tables 12 to 14.

We see that on average 57% of Malians believe that they live acceptably, compared to nearly one quarter who believe their lives are difficult and 20% who feel happy about their situation (Table 12). Compared to other rural households, cotton farmers seem more satisfied with their situation. Thus, 18% of them have the feeling they live well or fairly well, compared to only 14% of other farmers and 16% of rural non-farmers.

This feeling of well-being among cotton farmers goes hand in hand with the fact that proportionately they declare more than other Malians that their standard of living has increased over the past five years: 25% of them saw their standard of living improve, compared to 17% of other farmers, 21% of other rural populations, and 27% of urban populations, or a national average of 22%. Inversely, only 30% of cotton farmers feel that their situation has worsened, compared to 39% of other farmers and 38% of other rural populations (Table 13). However, the drop in the producer price since 2004 gives them a feeling of greater income instability. Indeed, according to the declarations reported in Table 14, 44% of cotton farmers say that their incomes are unstable—a higher percentage than any others because, on average, 34% of people surveyed have the feeling that their incomes are unstable, with 37% of other farmers and 37% of other rural populations.

Table 13. Declared changes in standard of living over the past 5 years, Mali 2006

	% who say that their standard of living is		
	Better	The Same	Worse
National	21.8	45.1	33.1
Cotton Farmers	24.6	45.4	30
Other Farmers	16.6	44.2	39.1
Rural Non-Farmers	20.5	42	37.5
Urbans	26.7	47.9	25.4
Cotton Zones	22.6	49.5	27.8
Other Rural Areas	17.6	40.3	42.1

Source: 2006 ELIM; authors' calculations.

Table 14. Declared income stability, Mali 2006

	% who say that their household incomes are		
	Very Unstable	Almost Stable	Stable
National	34.4	57.6	8
Cotton Farmers	43.7	52.9	3.4
Other Farmers	36.8	57.9	5.3
Rural Non-Farmers	36.6	57.7	5.7
Urbans	25.2	60	14.8
Cotton Zones	41.4	55.3	3,3
Other Rural Areas	36.5	57.6	6

Source: 2006 ELIM; authors' calculations.

2. Additional Diagnoses

Here, we extend our analysis beyond an examination of differences in average standards of living between regions or between cotton farmers and other farmers. We shall attempt to determine *(i)* how the weight of cotton in household incomes affects standard of living; *(ii)* if the benefits of cotton production can be seen in the availability of local public goods; *(iii)* to what extent variations in cotton producer prices contribute to differences in standard of living (via a simple simulation exercise); and *(iv)* whether cotton-producing regions are more attractive than other regions, which would explain the small average differences in standard of living.

2.1 Cotton farmers' production levels and living conditions

The previous analysis was based on an aggregate of cotton farmers irrespective of the weight of cotton in their activities. Yet, this population may be highly heterogeneous—a heterogeneity that would be minimized by the comparative analysis of categorical averages. The distribution of standards of living according to quantity of cotton produced or to the amount of income from cotton will allow us to examine this question in more detail. For Mali, we will rely on the quantities produced in 1994 and the income from cotton in 2006. For Burkina Faso, we will base our examination on the quantities produced in 1994 and 1998.[10]

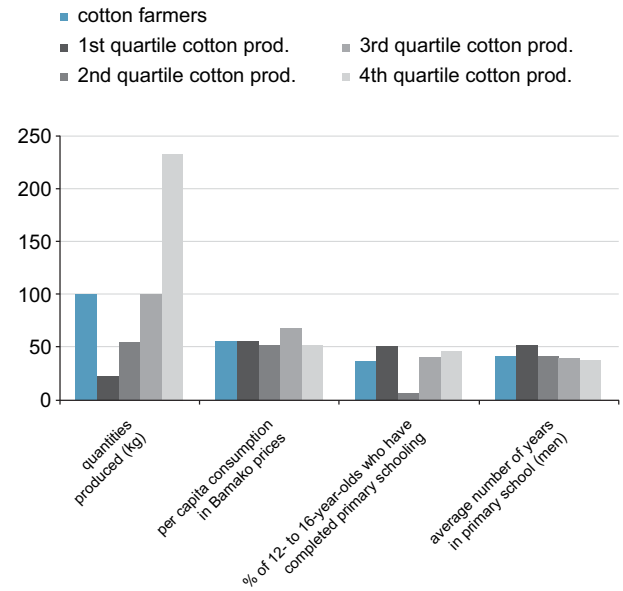
In both countries, the quantities of cotton and, even more, the income from cotton production are highly variable. Thus, in 1994, Malian farmers in the highest production quartile produced ten times more than those in the first quartile. Furthermore, they are mostly small farmers: in 1994 in Mali, more than 50% of them grew less than 2,000 tons per year.

Graphs 10 to 13 connect cotton production indexes to two indicators of standard of living: per capita consumption and school attendance. The national average for each indicator serves as the baseline. What do we see?

In Mali as in Burkina Faso regardless of the year, the quantities of cotton grown do not appear truly decisive in terms of children's school attendance: the children of large cotton farmers do not go to school more than the children of others. However, in Burkina Faso in 1998 and in Mali in 2006, per capita consumption levels increase along with production levels. This increasing relationship does not for all that givecotton producers in the highest production quartile consumption levels above the national average.

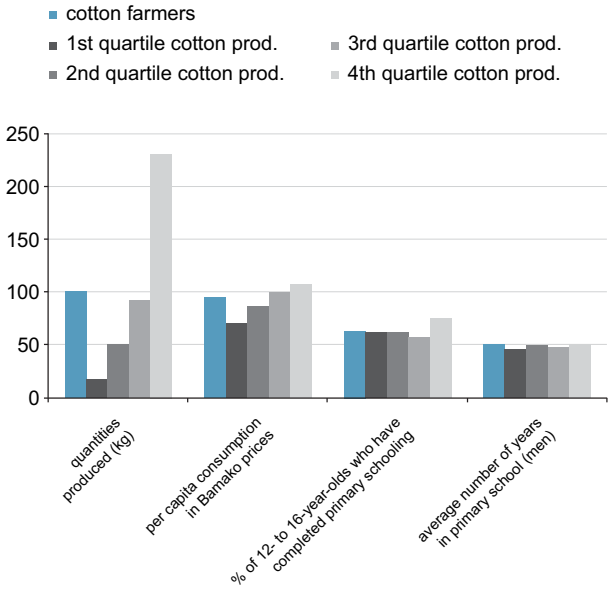
[10] Data on quantities were not gathered in 2003, and not enough information was given on cotton incomes.

Figure 10. Standard of living and school attendance indexes according to quantity of cotton produced, Mali 1994 (base 100 = national average)



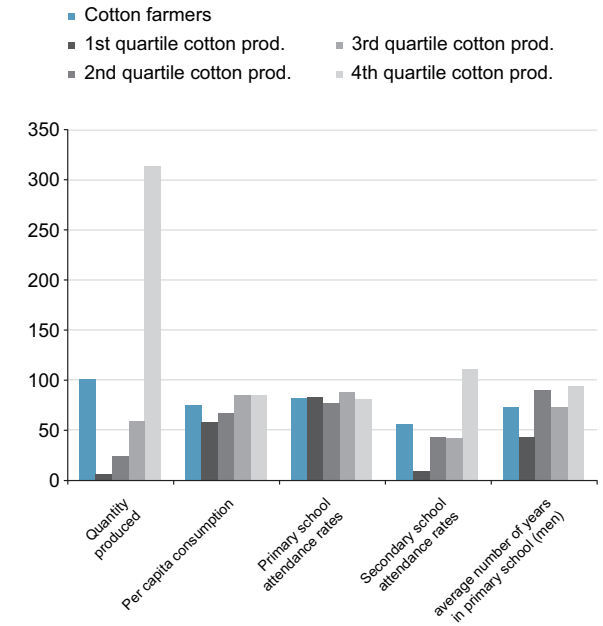
Source: 1994 EMCES; authors' calculations.

Figure 11. Standard of living and school attendance indexes according to cotton income, Mali 2006 (base 100 = national average)



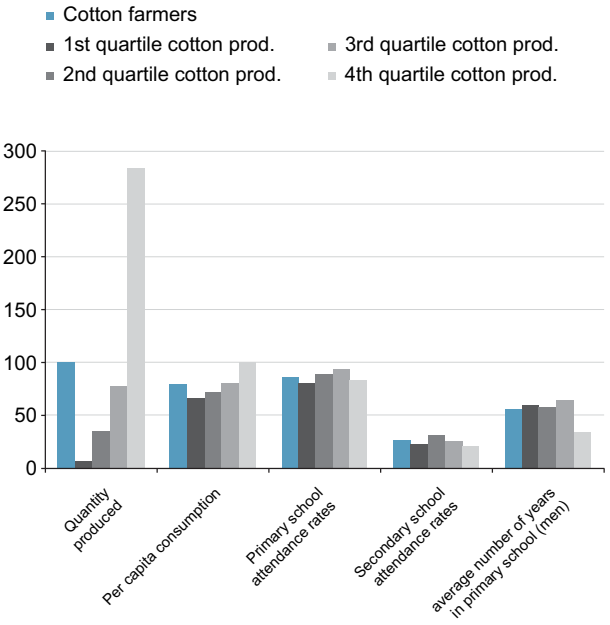
Source: 2006 ELIM; authors' calculations.

Figure 12. Standard of living and school attendance indexes according to quantity of cotton produced, Burkina Faso 1994 (base 100 = national average)



Source: EP1 (1994); authors' calculations.

Figure 13. Standard of living and school attendance indexes according to quantity of cotton produced, Burkina Faso 1998 (base 100 = national average)



Source: EP2 (1998); authors' calculations.

Table 15. Production levels and living conditions, 2006

	2006	
Dependent Variable	Log (per capita food consumption)	Log (per capita food consumption)
	(1)	(2)
Other Farmers	ref.	ref.
Cotton Prod. = 1	9.4%	
Prod. Quartile = 1		-9.9%	ref.
Prod. Quartile = 2		-0.0%	9.4%
Prod. Quartile = 3		10.3%***	20.2%**
Prod. Quartile = 4		11.9%***	21.8%***

Source: 1994 EMCES and 2006 ELIM; authors' calculations.
*Note: *** significant at 1%; ** significant at 5%; * significant at 10%.*

Table 15 shows average food consumption differences according to cotton production quartiles. The largest cotton producers (quartiles 3 and 4) undeniably have monetary standards of living higher than small cotton producers and other farmers. Their food consumption levels are respectively 10% and 12% higher than those of the rest of the agricultural population and 20% to 22% higher than the consumption levels of small cotton producers (quartile 1). This observation is consistent with the fact that in 2006 more of the largest cotton producers were satisfied with their standard of living than other cotton producers (statistics available on demand). On average, the standard of living of cotton farmers as a whole was 9% higher than that of other farmers.

2.2 Local public goods positive external effects

The cotton commodity chain's institutional environment can facilitate the establishment of structures that allow village communities to organize in regard to local investments. Measuring differences in standards of living by solely "private" indicators therefore does not allow one to see the benefits of a more communal nature that cotton could provide.

This possible impact of cotton is first analyzed through the information gathered during household surveys. This information marks a slight advantage in favor of cotton farmers with respect to modes of access to water and electricity. This advantage is clearer in Mali for access to water (Table 16 and Table 17). In 1994, Malian cotton producers obtained 100% of their water from wells or boreholes and not directly from the river—which is less true for other rural populations (around 90%). The observation is the same in Burkina Faso, but one sees a clear improvement in other populations' water access conditions between 1994 and 2003, placing cotton producers "on par" with other rural populations.

Electrification rates are higher among cotton farmers but they are still very low. Only 6% of cotton producers had access to electricity in 2006 in Mali (compared to none of the other farmers) and 1% in Burkina Faso in 2003 (compared to 2% of other farmers).

Table 16. Access to water and electricity, Mali 1994, 2001, 2006

	1994	2001	2006
Access to Non-River Water (% of individuals)			
National	93	98	97
Cotton Farmers[a]	99	-	100
Other Farmers	91	-	94
Other Rurals	89	-	93
Urbans	97	100	100
Cotton Zones[b]	98	100	100
Other Rural Areas	89	95	92
Access to Electricity (% of individuals)			
National	5	9	17
Cotton Farmers[a]	0	-	3
Other Farmers	1	-	0
Other Rurals	3	-	4
Urbans	28	31	50
Cotton Zones[b]	0	1	3
Other Rural Areas	1	0	1

a. Farmers who say they grow cotton.
b. CMDT cotton zones in 1994, 2001 and 2006 (Appendix D).
Source: 1994 EMCES, 2001 EMEP, 2006 ELIM; authors' calculations.

Table 17. Average number of functional local public goods per location for 10,000 inhabitants, cotton zones and non-cotton zones, Mali (excluding Bamako) 1998

	National[a]	Cotton Zones[b]	Other Zones
Number of Locations	10 158	3 509	6 649
School Infrastructures	12.1	17.3	9.4
Primary Schools	2.1	2.2	2
Middle Schools	0.1	0.1	0.1
Secondary Schools	0	0	0
Medersa	1.1	1.1	1.1
Literacy Centers	8.8	13.9	6.2
Health Infrastructures	1.6	1.9	1.3
Dispensaries	0.7	0.8	0.6
Maternity Clinics	0.7	1	0.5
MCH	0	0	0.1
Community Health Centers	0.1	0.1	0.1
Water Supply Infrastructures	30.6	23.3	34.5
Street Fountains	0.8	0.5	0.9
Boreholes	14.8	17.6	13.3
Large Diameter Wells	15.1	5.2	20.3
Other Services			
Village Banks	19.3	24.7	16.4
Cereal Banks	5.4	6.1	5

a. Average for each location for 10,000 inhabitants excluding Bamako.
b. CMDT cotton zones in 2001 (Appendix D), including urban areas.
Source: 1994 EMCES, 2001 EMEP, 2006 ELIM; authors' calculations.

These indicators of access to water and electricity take into account both the availability of public infrastructures and households' financial ability to obtain running water and electricity. They are combined indicators of supply and demand factors.

Table 17 shows "pure" indicators of the public goods supply. They were calculated from an inventory of the infrastructures available in all villages and cities in Mali (with the exception of Bamako) in 1998 during a census of the population. In all, the inventory covered 10,158 locations containing 850 inhabitants each on average. In this table, we have separated the cotton production zone (3,509 locations) from the rest of the territory.

The observation is perhaps clearer: one can see certain positive public external effects from cotton production. Indeed, the inhabitants of cotton-producing areas benefit more than inhabitants of other areas from literacy centers (fourteen for every 10,000 inhabitants compared to six) and village banks (twenty-five for every 10,000 inhabitants compared to sixteen). One can see that cotton farmers receive more professional support than other professions (Table 18): 27% of them are members of a professional association compared to the national average of 21%. Among other things, the majority feel that they can count on this association if needed. No differences are seen, however, when it comes to school and health infrastructures whose availability rates are extremely low. Thus, the positive changes in school attendance among cotton farmers' children in Mali are probably not linked to more abundant available school structures.

Table 18. Membership of a professional association, Mali 2006

	% of households in which a member belongs to a professional association	% of households that say they can count on the help of a professional association if needed
National	20.8	14.4
Cotton Farmers	27.2	20.3
Other Farmers	19.1	12.6
Rural Non-Farmers	18.9	11.5
Urbans	20	14.7
Cotton Zones	24.2	17.3
Other Rural Areas	18.9	12.2

Source: 2006 ELIM; authors' calculations.

In conclusion, it appears that cotton confers certain advantages when it comes to the availability of local public goods, which may partially explain the attractiveness of this crop, at least until now, and its expansion in Mali as in Burkina Faso.

In addition, and even though this argument cannot be verified with the available data, it is possible that the central government in Mali invested in less favored regions to compensate, which would attenuate *ex post* differences in the provision of public goods obtained *ex ante*.

2.3 The Impact of variations in the price of cotton

Cotton farmers' standard of living obviously depends very heavily on the price of cotton. This is a tricky issue: governments want to preserve cotton farmers' standard of living but, if the producer price of cotton is too high, it can endanger the commodity chain's financial viability.

Here, we shall examine the impact of cotton price variations on the prevalence of poverty among cotton farmers by simulating two shocks, in the short and long term:

- a 25% drop in the price of cotton; and
- a 25% increase in the price of cotton.

For Mali, these simulations were run based on data from the 2006 ELIM survey; for Burkina Faso, we used the data from the EP2 survey (1998). The magnitudes chosen for the shocks correspond to relatively realistic variations in market and producer prices.

The calculation method is based on consideration of cotton's share in each household's income. We used the following formulas:

- for the short term: Y1 = Y0 + Y0.shcot0.(?P/P)
- for the long term:
  Y1 = Y0 + Y0.shcot0.(?P/P).(1 + 0.5.?.(?P/P))

where:
Y0 = the well-being indicator for the base year
Y1 = the simulated well-being indicator
shcot0 = cotton's share in base year income
(?P/P) = the price shock
? = the price elasticity of cotton production

The well-being indicator used is per capita consumption. The resulting impacts on the poverty rate are presented in Table 19.

Table 19. Simulated impact of variations in the price of cotton on the poverty rate

	Base	Decrease		Increase	
		-25% short term	-25% long term	+25% short term	+25% long term
Mali 2006					
Cotton Farmers	53.7	57.2	56.4	47.7	46.7
		6.5%	5.0%	-11.2%	-13.0%
National	43.8	44.4	44.3	42.7	42.5
		1.4%	1.1%	-2.5%	-3.0%
Burkina Faso 1998					
Cotton Zones	53.5	57.8	55.7	50.5	49.2
		8.1%	4.0%	-5.6%	-8.0%
Cotton Farmers	58.2	66.1	62.3	53	50.9
		13.5%	6.9%	-9.0%	-12.6%
National	61.8	63.1	62.5	60.9	60.5
		2.2%	1.1%	-1.5%	-2.1%

Source: 2006 ELIM and EP2 (1998); authors' calculations.

The results suggest that a 25% rise in the price of cotton in Mali would result in an 11.2% drop in poverty among cotton farmers in the short term and a 13.0% drop in the long term. Nationally, this would result in a 2.5% drop in poverty in the short term and a 3.0% drop in the long term. Inversely, a 25% drop in the price of cotton would increase the prevalence of poverty by 6.5% among cotton farmers in the short term.

Wodon *et al.* (2006) ran similar simulations based on a 2004 survey of a sample of 400 cotton farmers conducted by the *Cabinet d'Etudes de Documentation de Recherche et de Formation* (CEDREF). According to their results, a 20% drop (or a 30% drop) in the price of cotton would lead to a 2.9% (or 3.3% respectively) rise in poverty among cotton farmers. This is a drop twice less than the one obtained using the 2006 ELIM sample. At least two factors may explain these differences:

• The surveys were conducted two years apart on different samples. How representative the cotton farmer samples are in the two surveys is difficult to determine. For instance, income from cotton accounted for more than 50% of cotton farmers' incomes in the CEDREF sample whereas it accounted for only one third of cotton farmers' incomes in the 2006 ELIM survey.[11]

• Baseline poverty rates are also very different. Wodon *et al*. use the poverty line calculated by the DNSI in 2001 and obtain very high baseline poverty rates among cotton farmers (81.8%). We used the poverty line that the DNSI calculated for 2006, which gave much lower poverty rates (53.7%). The elasticity of the poverty rate to a variation in the underlying aggregate is very sensitive to the baseline poverty level.[12]

In Burkina Faso, the results of the simulations are similar. They suggest that a 25% rise in the price of cotton would result in an 9% drop in poverty among cotton farmers in the short term and a 12.6% drop in the long term. Nationally, this would result in a 1.5% drop in poverty in the short term and a 2.1% drop in the long term.

2.4 Migration

Here, we shall attempt to examine the issue of migration to and from cotton zones. Indeed, cotton farmers' situation could depend on migratory phenomena that are behind a "convergence" of standards of living for households in different regions. For instance, a region that has a natural advantage (e.g. the possibility of growing cotton in Sikasso region) would attract migrants from less favored zones, which would result in a relative reduction in the standard of living in the favored region.

In the case of Sikasso, migration to cotton zones is said to result in the presence of a large number of young and under-equipped farmers that are relatively poor compared to the "old" cotton farmers who are symbols of the "success" of the cotton commodity chain. On aggregate level, this phenomenon is said to explain the lack of significant differences in standard of living between Sikasso and other regions of Mali.

[11] Because cotton's share in the incomes of cotton producers in the CEDREF sample was higher than in the cotton producer sample in the ELIM study, one could expect that variations in the price of cotton would also have a bigger impact on income in the CEDREF sample. However, converting this variation in average income into a variation in the poverty rate depends on the shape of income distribution and the position of the poverty line in relation to this distribution.

[12] To illustrate this, simulations were run using baseline poverty rates equal to those Wodon *et al.* (2006) obtained from the CEDREF survey and the DNSI's poverty line for 2001. A 25% drop in the price of cotton would, in this case, increase the incidence of poverty by 3.2%—a number much closer to the one obtained from the CEDREF survey.

Another phenomenon could have a similar consequence: if the most "successful" cotton farmers (or their most educated descendants) have migrated to cities, one could then think that cotton played a role in improving household living conditions but that this effect can no longer be seen in the regional data.

Unfortunately, the data that we have on Mali and Burkina Faso do not allow us to examine these two questions in detail. We shall limit ourselves to attempting to determine whether or not the migration balance of cotton regions is positive in Mali, and analyzing the characteristics of domestic urban migrants living in Bamako when it comes to well-being.

Unfortunately, the data that we have on Mali and Burkina Faso do not allow us to examine these two questions in detail. We shall limit ourselves to attempting to determine whether or not the migration balance of cotton regions is positive in Mali, and analyzing the characteristics of domestic urban migrants living in Bamako when it comes to well-being.

Inter-regional migration in Mali

This section is based on the migration matrix established by Diarra and Cissé (2003) using data from the 1998 general census of the population and housing.

The numbers in Table 20 indicate that Sikasso is the only region other than Bamako and Kidal (a new cotton-producing region) to have had a positive migration balance in 1998. This result lends credibility to the hypothesis presented above under which cotton's economic success is accompanied by migration flows to the Sikasso region, thereby reducing inter-regional differences in standard of living. However, the net flow appears modest in relation to the region's population.

Table 20. Distribution of the Malian population at the time of the 1998 census (thousand inhabitants)

	Region of residence									
Region of birth	Kayes	Kouli.	Sikasso	Ségou	Mopti	Tomb.	Gao	Kidal	Bko	Total
Kayes	1 311.60	14.1	7.7	6.1	2.1	0.9	1.2	0.1	52.7	1 396.50
Koulikoro	11.4	1 444.60	23.5	21.4	3	0.4	0.8	0.1	91.7	1 596.90
Sikasso	3.4	14.8	1 637.30	20.3	4.2	0.7	0.7	0	49.5	1 731.00
Ségou	13.7	25.1	37.8	1 553.90	15.6	3.6	3	0.8	74.4	1 727.80
Mopti	2.3	10.4	19.8	25.8	1 415.40	3.6	1.2	0.1	38.9	1 517.50
Tombouctou	0.8	4.7	3.5	4.7	16.7	460.7	2.5	0.3	16.5	510.3
Gao	0.6	2.6	2.2	3.9	4.3	2.5	377.5	1.4	9.7	404.9
Kidal	0.1	0.4	0.3	0.3	0.2	0.1	0.4	39	0.8	41.6
Bamako	8.6	33.5	12.2	11.3	4.8	1.8	1.8	0.2	632.8	706.8
Foreign	21.7	20.4	37.9	17.6	12.1	2.5	5.6	0.4	49.2	167.4
Total	1 374.30	1 570.50	1 782.20	1 665.30	1 478.50	476.8	394.6	42.4	1 016.30	
Migration balance	-22.2	-26.4	51.1	-62.6	-39	-33.5	-10.3	0.7	309.5	

Source: Diarra and Cissé (2003).

Characteristics of domestic migration to Bamako

The nationally representative surveys in Mali in 1994, 2001 and 2006 do not provide data on individuals' migration status. We can, however, use the data from the 1-2-3 survey conducted in Bamako in 2001 by the DNSI, in partnership with DIAL and AFRISTAT, to examine the situation of migrants from rural areas living in the capital. More specifically, we shall attempt to answer the following question: do migrants from Sikasso have more favorable living conditions than migrants from other regions?

This analysis is based on the data from phase 1 of the 1-2-3 survey, which was essentially an employment survey but questioned all the members of the households in the sample. Migrants were defined as all individuals who had not always lived in Bamako and who were consequently questioned about their region of origin.

Table 21. Characteristics of domestic migrants living in Bamako

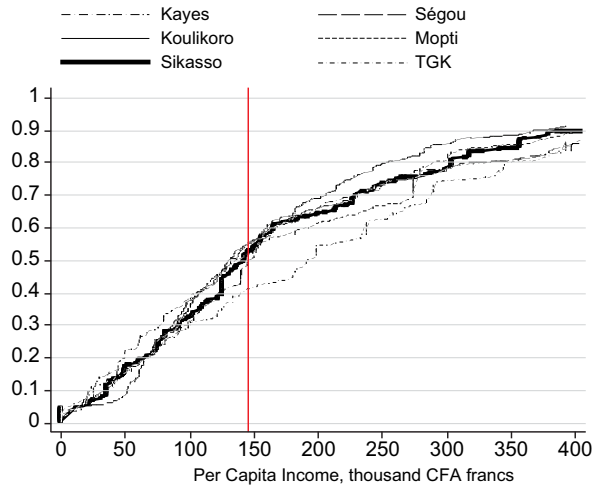
Region of Origin	Sample Size	Structure (weighted)	Rural	Women	Under the Age of 15	Average Age	Number of Years of Schooling*	Employed Workers*
Kayes	651	18.2%	23.5%	48.3%	13.8%	33.6	3.8	55.2%
Koulikoro	992	26.1%	42.5%	53.0%	11.9%	34.3	2.7	65.3%
Sikasso	560	15.7%	31.9%	51.8%	14.9%	32.5	4	65.3%
Ségou	847	23.1%	47.6%	53.8%	14.0%	31.2	3.6	65.0%
Mopti	420	11.0%	34.0%	49.7%	13.2%	30.7	3.3	60.3%
TGK	234	5.8%	24.7%	48.0%	12.3%	31.8	4.5	56.5%
Total	3 704	100.0%	36.6%	51.5%	13.4%	32.6	3.5	62.3%

** for individuals 15 years old and older.*
Source: Phase 1, 1-2-3 survey; authors' calculations.

In Bamako, migrants from Sikasso region account for 15.7% of domestic resident migrants. The numbers in Table 21 show that there is a relative diversity in regional migration flows to the capital, but that it is not possible to show any singularity in migration flows from Sikasso region. From the standpoint of characteristics, these migrants are a little less "rural" than the average domestic migrant. The proportion of women and the average age are close to the average, while the proportion of young people under the age of 15 is higher than the average domestic migrant. Finally, migrants from the Sikasso region appear to be slightly more educated than the average domestic migrant and relatively better integrated in the job market.

Afterwards, we look at whether or not migrants from Sikasso have better living conditions. The indicator chosen for this is the poverty rate measured based on the threshold set by the DNSI and the distribution of household income within the population of Bamako. Our results are presented in the form of cumulative per capita income curves.

Figure 14. Cumulative income curves for domestic migrants by region of origin, Bamako 2001



Source: Phase 1, 1-2-3 survey; authors' calculations.

The curves in Figure 14 do not make it possible to highlight more favorable living conditions for migrants from Sikasso, despite the characteristics of human capital and job market insertion being slightly better than domestic migrants living in Bamako as a whole.

In support of the inter-regional convergence hypothesis, we can therefore retain from these analyses the fact that the migration balance for Sikasso and Kidal regions was positive in 1998, whereas it was negative for all other regions with the exception Bamako.

Summary of Main Conclusions

1. Depending on the country, year and variables considered, the difference between cotton-producing regions and other regions, or between cotton farmers and other farmers varies. Nevertheless, it is positive more often than it is nil or negative. However, whether cotton comes out ahead or behind, the magnitude of this difference is generally modest

2. When it comes to private consumption in particular, this difference is fairly sensitive, in both countries, to cotton prices, volumes produced, and the conditions affecting alternate food crops, notably rainfall. Because of this, the exceptional conditions of the year 2001 in Mali did not fail to influence the comparisons. In a relatively auspicious year (2006 in Mali), cotton farmers' situation appears comparatively more favorable than that of other farmers, mainly for the largest cotton farmers. Over the period analyzed (1994 to 2003), temporary fluctuations were also noteworthy in Burkina Faso, punctuated by the devaluation of the CFA franc and drought followed by recovery, even if they are more modest in scope.

3. Malian cotton farmers appear considerably better equipped in durable goods for transportation and even communication. This advantage is potentially linked to the benefits provided by cotton production over the long term, independently of the specific conditions of individual years. But it is also linked to cotton farmers' preferential access to credit. The cotton-producing regions of Mali appear better equipped with village banks. This advantage in non-agricultural durable goods is much less pronounced in Burkina Faso. Finally, the capital assistance given to the cotton sector also explains the much higher level of farm equipment seen in both cases.

4. When it comes to education, the difference is still in favor of cotton farmers in Mali, whether for children's primary school attendance or for adult literacy rates. The cotton-producing regions of the country appear, what is more, better equipped with literacy centers but not better equipped with schools. This education advantage is nil or insignificant in Burkina Faso. Finally, whether they exist or not, these education differences in any case involve very modest performances. When it comes to nutrition, however, the situation of cotton farmers' children in Mali appears particularly disadvantageous, which is potentially linked to the composition of the food basket and to a poor allocation of cotton farmers' incomes, which are controlled by fathers rather than by mothers. Once again, this nutrition difference is not seen in Burkina Faso.

5. In Mali, the Sikasso region is, along with the capital, Bamako, the only region to have a positive (if modest) migration balance. It is therefore a relatively attractive region. These migration flows may attenuate cotton's apparent positive impact, making the region a "victim of its own success". However, emigrants from the Sikasso region living in the capital do not appear to have been richer than other migrants in 2001. The mitigation effect tied to migration could also be strengthened by a compensatory policy of investing in cotton-producing regions by the Malian state, a possibility that remains to be explored with adequate budget data.

6. The descriptive statistical analysis that we have undertaken therefore allows us to presume that cotton cropping provides a slightly positive aggregate outcome for the farmers or zones concerned. This benefit is, however, far from over-whelming and quite obviously depends on the past and future remuneration conditions for this crop. Finally, a complete economic evaluation implies comparing this benefit to the cost of the investments made and the explicit and implicit aid and subsidies received by the commodity chain compared to other commodity chains (from the positive standpoint) and in comparison to alternative uses of the funds (from a normative standpoint). Such an evaluation is, however, beyond the scope of this study.

APPENDICES

Appendix A. Presentation of the 1994 EMCES, 2001 EMEP, and 2006 ELIM Surveys in Mali

The Malian survey of economic and social conditions (*Enquête malienne de conjoncture économique et sociale* or EMCES) was produced by the *Direction Nationale de la Statistique et de l'Information* (DNSI) in 1994. The Malian survey to assess poverty (*Enquête malienne sur l'évaluation de la pauvreté* or EMEP) dates back to 2000-2001, and the integrated light household survey (*Enquête légère intégrée auprès des ménages* or ELIM) dates from 2006. These three surveys are nationally and regionally representative and consist of large samples (Table A.1). Tables A.2 to A.4 give the demographic characteristics of the Malian population in 1994, 2001 and 2006. One should note the differences in household size between regions and depending on the activity of the head of household in 1994 and 2006.

Table A.5 shows a breakdown of the population according to the head of household's employment (public sector employee, private sector employee, informal sector, cotton farmer, food crop farmer, and unemployed). It should be noted that this piece of information was poorly reported in 2001 (an abnormally high unemployment rate). Furthermore, there is a sharp rise in urbanization between 1994 and 2006. Because of this, the share of cotton farmers in the total population rose less than the share of cotton farmers in the agricultural population.

Table A.1 Characteristics of the 1994 EMCES, 2001 EMEP, and 2006 ELIM surveys

	1994 (EMCES)	2001 (EMEP)	2006 (ELIM)
No. of households	9 516	7 365	4 494
No. of individuals	83 102	86 086	40 810
No. of strata	8	9	9
No. of clusters	475	729	749
Survey period	April-May 1994	January-December 2001 (4 visits)	June-December 2006

Table A.5 Socioeconomic groups, 1994 EMCES, 2001 EMEP and 2006 ELIM surveys

	1994				2001*				2006
Socioeconomic Group	National	Cotton Area	Other Rural Areas	Urban Areas	National	Cotton Area	Other Rural Areas	Urban Areas	National
Public	5.2	0.4	3.5	18.5	1.4	0.5	0.3	5.1	6.1
Formal Private	2.2	0.1	0.5	11.6	2.1	0.2	0.8	7.3	2
Informal	10.8	1.3	6	43.2	11.2	2.4	6.5	32.2	24.3
Cotton Farmers	20	63	9.2	0.4					17.3
Other Farmers	54.9	32	73.7	14.8	53.6	87.5	55.2	11.7	36.8
Unemployed	6.9	3.2	7	11.6	31.7	9.4	37.2	43.8	13.4

Range: % of individuals living in households whose head has the SPC mentioned.

** In 2001, cotton farmers were not identified.*

Source: 1994 EMCES, 2001 EMEP, 2006 ELIM; authors' calculations.

Table A.2 Demographic Characteristics, 1994 EMCES

	Sample	Population Breakdown	Household Structure		
	No. of households	(% of total pop.)	Size	Dependence Ratio *	Female Head of Household (%)
National	9 516	100	8.9	1.1	8
Kayes	961	13	5.6	1	7
Koulikoro	900	16	10.8	1.2	4
Sikasso	1 361	19	12.7	1.2	3
Ségou	1 380	22	11	1.2	6
Mopti	1 281	16	8.2	1.1	13
Tombouctou Gao Kidal	739	6	6.1	0.8	15
Bamako	2 894	9	7.9	0.9	12
Urban Areas	5 497	16	7.5	1	14
Rural Areas	4 019	84	9.2	1.1	7
Kayes	580	12	5.5	1	7
Koulikoro	660	15	11	1.2	2
Sikasso	700	17	13.6	1,2	1
Ségou	840	20	11.4	1.2	5
Mopti	900	15	8.3	1.1	13
Tombouctou Gao Kidal	338	5	6.1	0.8	14
Cotton Farmers	731	20	14.2	1.2	1
Other Farmers	2 659	51	8.2	1.1	5
Other Rurals	645	13	8.6	1	19
Zone CMDT 1994	1 300	31	12.2	1.2	2
Other Rural Areas	2 719	53	8	1	8

** No. of children between 0 and 14 years old + adults 65 years old and older / No. of adults (15 to 64 years old).*
Source: 1994 EMCES; authors' calculations.

Table A.3 Demographic Characteristics, 2001 EMEP

	Sample	Population Breakdown	Household Structure		
	No. of households	(% of total pop.)	Size	Dependence Ratio *	Female Head of Household (%)
National	7 365	100	10.5	1.1	8
Kayes	988	15	12.3	1.2	7
Koulikoro	1 566	16	12.6	1.2	5
Sikasso	1 037	19	10.8	1.2	6
Ségou	1 460	17	10.6	1,2	7
Mopti	748	13	9.5	1.2	12
Tombouctou Gao Kidal	904	6	6.9	1.1	18
Bamako	662	14	9.9	0.9	8
Urban Areas	2 652	28	9.4	0.9	12
Rural Areas	4 713	72	11	1.2	7
Kayes	708	12	12.6	1.3	7
Koulikoro	1 227	14	12.9	1.2	3
Sikasso	730	16	11.1	1.3	6
Ségou	1 028	14	11.1	1.2	5
Mopti	498	11	9.7	1.2	10
Tombouctou Gao Kidal	522	4	6.9	1.1	12
Cotton Farmers	Nd	Nd	Nd	Nd	Nd
Other Farmers	Nd	Nd	Nd	Nd	Nd
Other Rurals	Nd	Nd	Nd	Nd	Nd
CMDT Zones 1994	1 449	25	11.5	1.3	6
Other Rural Areas	3 264	47	10.8	1.2	7
CMDT Zones 2001	1 719	28	11.8	1.3	5
Other Rural Areas	2 994	44	10.6	1.2	7

** No. of children between 0 and 14 years old + adults 65 years old and older / No. of adults (15 to 64 years old).*
Source: 1994 EMCES; authors' calculations.

Table A.4 Demographic Characteristics, 2006 ELIM

	Sample	Population Breakdown	Household Structure		
	No. of households	(% of total pop.)	Size	Dependence Ratio *	Female Head of Household (%)
National	4 494	100	8.5	1.2	8
Kayes	594	13	9.1	1.2	9
Koulikoro	966	15	9	1.2	6
Sikasso	624	19	10.6	1.2	5
Ségou	894	16	8.1	1.2	8
Mopti	450	19	9.4	1.2	9
Tombouctou Gao Kidal	564	8	5.9	1.3	8
Bamako	402	10	7.2	0.8	16
Urban Areas	1 550	32	7.1	1	14
Rural Areas	2 910	68	9.3	1.3	5
Kayes	426	10	9.5	1.3	6
Koulikoro	756	12	9.5	1.3	3
Sikasso	438	14	12.3	1.3	2
Ségou	630	12	8.4	1.2	6
Mopti	300	17	9.9	1.2	6
Tombouctou Gao Kidal	360	4	5.9	1.4	7
Cotton Farmers	692	17	11.8	1.3	2
Other Farmers	1 397	33	8.9	1.2	4
Other Rurals	855	19	8.6	1.3	10
Zone CMDT 1994	894	20	10.8	1.3	2
Other Rural Areas	2 016	47	8.8	1.3	6
Zone CMDT 2006	1 266	28	10.6	1.3	3
Other Rural Areas	1 644	40	8,6	1.2	6

** No. of children from 0 to 14 years old + adults 65 years old and over / No. of adults (15 to 64 years old).*
Source: 2006 ELIM; authors' calculations.

Cotton Farmers in the 1994 EMCES, 2001 EMEP, and 2006 ELIM Surveys

Here, the aim is to provide some information on the samples in the 1994 EMCES, 2001 EMEP, and 2006 ELIM surveys in regard to cotton-producing households and/or households in a CMDT zone.

Table A.6 Sample of Cotton-Producing Households and/or Households Living in CMDT Zones

	1994	2001		2006
Survey	EMCES	EMEP[a]		ELIM
Sample	9 516	7 364	4 912	4 494
Households[b]	*908 774*	*991 293*	*1 081 492*	*1 442 910*
Population[b]	*8 071 547*	*10 258 995*	*10 264 226*	*12 317 562*
Average Size	*8.9*	*10.3*	*9.5*	*8.5*
Households in CMDT Zones	1 300	1 719	1 124	1 266
Households[b]	*203 060*	*245 865*	*289 558*	*325 960*
Population[b]	*2 486 824*	*2 887 118*	*2 769 703*	*3 469 520*
Average Size	*12.2*	*11.7*	*9.6*	*10.6*
Cotton Farmers[c]	731	na	na	688
Households[b]	*110 888*	*na*	*na*	*180 668*
Population[b]	*1 578 740*	*na*	*na*	*2 119 122*
Average Size	*14.2*	*na*	*na*	*11.7*
Households in CMDT Zones	697	na	na	653
Households[b]	*106 298*	*na*	*na*	*166 651*
Population[b]	*1 524 989*	*na*	*na*	*1 962 022*
Average Size	*14.3*	*na*	*na*	*11.8*

a. The second column corresponds to the sub-sample of 4,912 households from which food consumption data were collected.
b. Values extrapolated from the statistical weight given in the surveys.
c. Cotton farmers are households that say they produce cotton. This information was not collected in the EMEP 2001 survey.
Source: 1994 EMCES, 2001 EMEP, 2006 ELIM; authors' calculations.

The cotton household sample sizes are fairly close in the EMCES and ELIM surveys because they range from 731households in 1994 to 688 households in 2006. However, these two samples correspond to very different extrapolated household counts because the data indicate that the number of cotton-producing households increased by more than 60% from 1994 to 2006, rising from 110,888 to 180,668. If one looks at cotton-producing households residing in CMDT zones, their number increased from 106,298 to 166,651. As a reference point, the CMDT says that it oversaw 165,204 farms during the 2003-2004 crop year. While these numbers are not fully comparable due to differences in subject (households *vs.* farms) and date, one can nevertheless see that the approximate magnitudes are very similar. This makes the representativeness of the 2006 sample relatively credible, at least as regards the number of cotton-producing households in CMDT zones.

The 1994 and 2006 surveys also made it possible to gather information on cotton production and/or income from cotton production. The numbers in Table A.7 show that production doubled between the two years—a much larger increase than the increase in the number of cotton farmers. This can be explained by the fact that per household production increased by 22.1% from 1994 to 2006. The observation is similar for cotton farmers in CMDT zones. Their number increased by nearly 57%, and per household production increased by only 11%, from 2,080 to 2,320 kg.

Table A.7 Cotton Production, 1994, 2006

	1994	2006	Variation
Survey	EMCES	ELIM	(%)
Number of Cotton-Producing Households	110 888	180 668	62.9
Production (tonnes)[a]	223 432	444 314	98.9
Average Per Household Production (kg)	2 015	2 459	22.1
Number of CMDT Cotton-Producing Households	106 298	166 651	56.8
CMDT Production Zones (tonnes)	221 177	386 659	74.8
Average Per CMDT Household Production (kg)	2 081	2 320	11.5

a. Production estimated from the income declared by producer households and an assumed cotton price of 160 CFA francs per kilogram in 2006.

Source: 1994 EMCES, 2001 EMEP, 2006 ELIM; authors' calculations.

According to the ELIM survey data, 386 tonnes of cotton were produced in the CMDT zones in 2006. This figure is much lower than the amount the CMDT declared for the 2003-2004 crop year, estimated at 578 tonnes (or 50% more). In the same way, the CMDT's estimates of per farm production are much higher than the estimates obtained from the 2006 ELIM survey data for producer households. For the 2003-2004 crop year, the CMDT estimated production of 3,500 kg per farm. Several things can explain this difference. The first is linked to the different dates of these two estimates. Other sources on cotton seed production nevertheless seem to indicate that it did not vary considerably over the 2003-2006 period (Figure 6 - p. 17). A second explanation comes from the price assumption on which the estimate of production from the incomes declared by households in the ELIM 2006 survey is based. The assumed price (160 CFA francs/kg) does however match the official price declared by the CMDT for this crop year.

In conclusion, the representativeness of the cotton-producing household samples in the EMCES and ELIM surveys seems to be relatively satisfactory as concerns the number of producer households. Production per household, however, appears under-estimated compared to the CMDT's figures.

Appendix B. Construction of Household Consumption Aggregates from the 1994 EMCES, 2001 EMEP, and 2006 ELIM Surveys in Mali

Here, we discuss in detail how the 1994 spending aggregates and the 2001 and 2006 food consumption aggregates were elaborated, and how the poverty lines were calculated.

1. Construction of Consumption Aggregates

Construction of the spending aggregate based on the 1994 EMCES survey data

The daily spending aggregate utilized only takes into account products intended to meet households' daily needs and not their exceptional needs. It is made up of three items.

A. Food expenditure
B. Housing-related expenditure
- tenants' gross rents, fictitious imputed rents for owners and people housed for free
- home maintenance and common repairs
- consumption of water, electricity, gas and other fuels

C. Other expenditure (including education spending)

The aggregate does not include ceremony spending or health spending, which is too infrequent. The purchase (and repair) of durable goods such as furniture, household appliances, radios, televisions, paintings and vehicles, which are investments more than consumption, was not taken into account. The aggregate also does not include non-cash gifts received, gifts given, transfers and taxes paid.

A fictitious rent was imputed to homeowner households. It was calculated by estimating a rent equation using tenants,[1] with the following explicative variables: housing location, type of housing, type of lighting or connection to the electric grid, type of fuel used, type of access to water.

The calculation of the consumption aggregate for the 1994 EMCES survey consisted of annualizing declared expenditure by multiplying data gathered on fifteen days of food spending by 26 (that is to say, 52 weeks/2). Each spending line used was then deflated to make up the total aggregate of regional price differences, before aggregating them. Through lack of other information, household consumption in Koulikoro region was deflated by the prices in the Kayes region, and Kidal and Tombouctou consumption by Gao regional prices. We took into account inter-household differences in baskets of goods by deflating each consumption group for each household (food, clothing, housing, transport, etc.) by the corresponding deflator.

[1] In the strict sense, that is to say households paying rent. This excludes "people lodged for free" and households accessing ownership and paying rent.

Table B.1 gives average per capita consumption spending for each region and milieu, before deflation by regional price differences. These same aggregates can be found in Table B.2 at Bamako prices.

Table B.1 Average Value of Per Capita Consumption in Current CFA Francs, 1994 EMCES

	Urban	Rural	Total
Kayes	142 509	79 330	84 796
Koulikoro	149 598	42 187	47 731
Sikasso	81 451	25 845	31 214
Ségou	90 550	33 198	37 660
Mopti	137 999	46 661	51 959
Tombouctou Gao Kidal	129 984	59 655	71 247
Bamako	148 349		148 349
Total	132 489	43 713	57 896

Source: 1994 EMCES; authors' calculations.

Table B.2 Average Value of Per Capita Consumption in Constant CFA Francs (Bamako Prices), 1994 EMCES

	Urban	Rural	Total
Kayes	151 989	82 687	88 683
Koulikoro	168 512	45 506	51 856
Sikasso	127 141	38 783	47 315
Ségou	128 566	42 895	49 560
Mopti	159 270	52 243	58 451
Tombouctou Gao Kidal	208 944	91 616	110 955
Bamako	148 349		148 349
Total	149 242	52 544	67 993

Source: 1994 EMCES; authors' calculations.

Construction of a food spending aggregate based on 2001 EMEP survey data

Constructing a food expenditure aggregate based on the 2001 EMEP survey data raises a certain number of issues. Indeed, it would be useful to know the quantities consumed so as to value them in a single price system. The survey recorded quantities consumed at two levels:[2]

A. the data from weighing food purchases corresponding to each meal (four visits, seven days per visit, three meals per day).

B. the data from weighing the food used to prepare meals (four visits, seven days per visit, three meals per day).

[2] Purchased provisions are also recorded in the budget questionnaire (without being weighed). We have assumed that these volumes were a type B weighing and should not therefore be recorded a second time.

In theory, the type B data should have included not only the food weighed on purchase (type A record) but also self-consumption. In addition, since each visit was the subject of daily records for seven days, the annualization rule should have simply been to multiply the quantities in the source files by thirteen, that is to say the number of weeks in a quarter.

In reality, two different annualization rules were used. For type-A records (purchases), the interviewers were to record the number of days covered by the purchase. Based on this information, the DNSI adopted the following annualization rule to construct the food consumption aggregate in the "depense.dta" file:

spending = (365/nbconsd/4)*value
where spending = annual spending
value = value of the household food purchase
nbconsd = number of consumption days

However, for type-B records (consumption), the quantities were multiplied by thirteen ("consomm.dta" file).

The result is an inconsistency between the two files. To construct the food aggregate utilized, we therefore decided to correct the data in the "consomm.dta" file so as to obtain an aggregate that was as close as possible to the aggregate used by the DNSI.

In regard to food self-consumption, we decided to not take into account self-consumption of livestock (poultry, mutton, etc.), which is sometimes difficult to value. This decision may be questionable but it does not impact the results obtained, notably in terms of average standard of living rankings for regions or between cotton farmers and others.

Construction of a food spending aggregate based on the 2006 ELIM survey data

The 2006 ELIM survey data on consumption are based solely on retrospective questions asked of the people surveyed in the households. Insomuch as the information collected was relatively detailed, the aggregate obtained is of much better quality than the 1994 aggregate because there is information on self-consumption, months of consumption for each product, and unit prices. However, biases due to inaccurate memories are probably large.

Consumption annualization took into account annual consumption frequency for each product. Before aggregating the various consumption items, we followed a procedure to allow us to value all spending using the same price system—average Bamako prices. This procedure is nearly the same as the procedure followed for food consumption in the 2001 EMEP survey.

We built a reference price system—average prices in the district of Bamako—based on recorded unit prices for each product and each unit of measurement in the "daily spending" module. There were 21,069 records for 160 products and nine units of measurement. For each of these products, an average Bamako price weighted by the quantities purchased was calculated. For products for which we do not have a purchase price per unit of measurement given in Bamako, we used a national average (3,563 records only). We valued self-consumed products for which purchase prices were not available in the "daily spending" module using average Bamako prices declared in the "self-consumption" module. These products were cassava, avocadoes, grapefruit, shea butter, hides and leather, tamarind, jujube, zaban and other gathered products. The prices of the principal products are given in Table B.3.

Table B.3 Average Prices of Some Products in Bamako District

Products	Number of Records	Price (CFA francs/kg)
Rice	2 636	303
Maize	519	252
Sorghum	780	183
Millet	1 461	203
Fonio	404	450
Groundnut Oil (liter)	1 546	521
Local Fresh Milk (liter)	1 109	338
Beans	1 252	322
Groundnuts	568	369
Sweet Bananas	346	301
Dates	360	84
Onions	701	334
Sweet Potatoes	427	153
Yams	159	469
Potatoes	1 059	396
Beef	1 086	1 068
Mutton	292	1 454
Fresh Fish	617	1 350
Smoked Fish	564	1 456
Salt Fish	275	711
Salt	863	115
Sugar	3 490	388
Lamp Oil (liter)	1 981	420
Lubricant Fuel (liter)	1 622	624

Source: 2006 ELIM survey and products for which we have more than 150 records.

Merging correctly valued self-consumption and daily spending files allows one to construct the total food consumption aggregate. Average per capita values by region and milieu are given in Table B.4.

Tableau B.4 Average Value of Per Capita Food Consumption in Constant CFA Francs (Bamako Prices), 2006 ELIM

	Urban	Rural	Total
Kayes	145 960	102 745	114 069
Koulikoro	148 786	127 757	132 039
Sikasso	149 255	118 080	126 959
Ségou	157 061	118 039	126 848
Mopti	147 473	147 806	147 753
Tombouctou Gao Kidal	143 404	155 891	151 206
Bamako	175 502		175 502
Total	157 492	126 759	136 534

Source: ELIM 2006; authors' calculations.

Identification and Correction of Outliers

A procedure to audit consumption aggregates was followed for all the surveys. Households for which the food consumption aggregate logarithm differed by plus or minus five or more standard deviations from the average logarithm were eliminated. The same auditing principle was applied to total expenditure. This amounted to eliminating less than 1% of the samples when calculating consumption levels, corresponding essentially to households with zero food consumption.

2. Construction of Poverty Lines

We used the official poverty line calculated by the DNSI as the poverty line for 1994, specifically 77,204 CFA francs per capita per year.

The construction of the food poverty line from the 2001 EMEP survey data relied on a fairly standard methodology based on the concept of calorie needs (Ravallion, 1994). It was calculated based on the cost of one calorie in a nationally representative food basket and daily calorie needs.

The caloric values for foods whose consumption is recorded in the survey are available in the “consomm.dta” file elaborated by the DNSI (corrected based on the annualization rule used to construct the “depense.dta” spending file; see above). The average cost of a calorie can therefore be easily calculated given the structure of national food consumption. This calculation was done at Bamako prices to ensure consistency with the consumption spending calculation in Appendix A.

According to our calculations, this cost is 0.10 CFA francs/kcal. Consequently, the cost of a daily calorie ration of 2,450 kcal (the DNSI standard) is 247.60 CFA francs per day and the food poverty line is 90,387 CFA francs (365 days * 247.60 CFA francs).

For the 2006 ELIM survey, the food poverty line was calculated based on the 2001 poverty line corrected for inflation in the Bamako food price index, or 95,800 CFA francs per capita per year.

Appendix C. Description of the Burkina Faso Household Surveys (EP1, EP2, EP3) and Discussion of Adjustments Made

Description of the EP1, EP2 and EP3 household surveys

The main features of the three household surveys—which were undertaken in Burkina Faso by the *Institut National de la Statistique et de la Démographie* (INSD) with financial and technical assistance of the World Bank within the last 10 years in 1994 (EP1), 1998 (EP2) and 2003 (EP3) and which provided the expenditure data used to compute pro-poor growth, poverty and inequality estimates in the three reported years—are summarized in Table C.1. Furthermore, Tables C.2 to C.4 provide a brief description of the socio-economic population structure of all three samples.

Table C.1 EP1, EP2 and EP3 Survey Design

	EP1 (1994)	EP2 (1998)	EP3 (2003)
No. Households	8 642	8 478	8 500
No. Individuals	65 014	63 509	54 034
No. Strata	7	10	13
No. Provinces	436	425	425
No. Clusters	Oct.-Jan. 94	May-Aug. 98	April-July 2003

Source: EP1 (1994), EP2 (1998), EP3 (2003); authors' calculations.

Table C.2 Demographic Characteristics, EPI 1994

	Sample	Geographic distribution of the population	Household structure		
	No. of households	(% of the whole population)	Household size	Dependence ratio ***	Household head as female (%)
National	8613	100%	11.9	1.3	4.5%
Hauts Bassins**	757	8.8%	12.5	1.2	6.4%
Mouhoun**	794	9.2%	10.0	1.4	7.9%
Sahel	1323	15.4%	9.9	1.2	3.9%
East	600	7.0%	10.2	1.4	2.4%
South-West**	278	3.2%	10.3	1.4	5.3%
Center-North	760	8.8%	12.6	1.3	3.2%
Center-West*	533	6.2%	13.7	1.4	3.1%
Plateau	258	3.0%	11.4	1.5	2.7%
North	819	9.5%	16.0	1.4	2.4%
Center-East	399	4.6%	11.6	1.3	3.1%
Center	1516	17.6%	9.1	1.0	7.4%
Cascades**	238	2.8%	15.7	1.3	2.8%
Center-South*	338	3.9%	9.8	1.4	4.9%
Urban areas	2710	31.5%	9.7	1.1	10.3%
Rural areas	5903	68.5%	12.3	1.4	3.3%
Hauts Bassins**	300	3.5%	13.9	1.3	2.1%
Mouhoun**	696	8.1%	10.0	1.4	7.5%
Sahel	1283	14.9%	10.0	1.2	3.7%
East	560	6.5%	10.2	1.5	2.2%
South-West**	258	3.0%	10.5	1.4	4.6%
Center-North	699	8.1%	12.5	1.3	2.9%
Center-West*	374	4.3%	14.0	1.4	2.3%
Plateau	258	3.0%	11.4	1.5	2.7%
North	680	7.9%	16.0	1.5	2.1%
Center-East	339	3.9%	11.4	1.3	2.3%
Center	19	0.2%	9.7	1.3	1.4%
Cascades**	139	1.6%	16.5	1.3	2.0%
Center-South*	298	3.5%	9.8	1.4	5.0%
Cotton farmers*	476	5.5%	14.5	1.4	0.4%
Other farmers	5153	59.8%	12.0	1.4	2.7%
Other rurals	815	9.5%	11.6	1.4	11.5%
Cotton Area	574	6.7%	14.3	1.4	3.1%
Other rural areas	5329	61.9%	11.9	1.4	3.4%

*Note: */** more than 20%/40% of the population living in these regions are dependent on cotton production.*
**** (No. of children 0 to 14 year-old + No. of adults 65 year-old and more)/ No. of adults 15 to 64 year-old.*
Source: EP1 (1994); computations by the authors.

Table C.3 Demographic Characteristics, EP2 1998

	Sample	Geographic distribution of the population	Household structure		
	No. of households	(% of the whole population)	Household size	Dependence ratio ***	Household head as female (%)
National	8477	100%	11.1	1.3	4.3%
Hauts Bassins**	957	11.3%	12.7	1.2	4.1%
Mouhoun**	878	10.4%	12.9	1.4	3.5%
Sahel	599	7.1%	10.0	1.2	1.8%
East	620	7.3%	9.9	1.4	3.1%
South-West**	518	6.1%	8.9	1.3	5.5%
Center-North	620	7.3%	10.8	1.3	4.6%
Center-West*	638	7.5%	12.5	1.2	2.3%
Plateau	380	4.5%	9.2	1.4	2.3%
North	654	7.7%	15.0	1.4	3.3%
Center-East	621	7.3%	8.9	1.3	8.2%
Center	1374	16.2%	7.9	1.0	9.7%
Cascades**	298	3.5%	11.4	1.1	2.2%
Center-South*	320	3.8%	10.6	1.3	2.8%
Urban areas	2593	30.6%	8.4	0.9	11.0%
Rural areas	5884	69.4%	11.6	1.3	2.9%
Hauts Bassins**	438	5.2%	14.5	1.2	1.1%
Mouhoun**	758	8.9%	13.3	1.4	2.7%
Sahel	559	6.6%	10.1	1.2	1.6%
East	560	6.6%	9.9	1.4	3.0%
South-West**	498	5.9%	9.0	1.3	5.4%
Center-North	540	6.4%	10.9	1.3	4.6%
Center-West*	478	5.6%	12.8	1.3	1.3%
Plateau	380	4.5%	9.2	1.4	2.3%
North	535	6.3%	15.3	1.4	2.3%
Center-East	501	5.9%	9.0	1.3	7.2%
Center	120	1.4%	10.5	1.4	3.0%
Cascades**	197	2.3%	11.9	1.1	0.4%
Center-South*	320	3.8%	10.6	1.3	2.8%
Cotton farmers*	1038	12.2 %	13.7	1.3	0.5%
Other farmers	4892	57.7 %	11.1	1.3	3.4%
Other rurals	491	5.8 %	10.9	1.3	8.1%
Cotton area	1794	21.2 %	12.8	1.3	1.9%
Other rural areas	4090	48.2 %	11.1	1.3	3.4%

*Note: */** more than 20%/40% of the population living in these regions are dependent on cotton production.*
**** (No. of children 0 to 14 year-old + No. of adults 65 year-old and more)/ No. of adults 15 to 64 year-old.*
Source: EP2 (1998); computations by the authors.

Table C.4 Demographic Characteristics, EP3 2003

	Sample	Geographic distribution of the population	Household structure		
	No. of households	(% of the whole population)	Household size	Dependence ratio ***	Household head as female (%)
National	8488	100%	9.0	1.2	5.2%
Hauts Bassins**	999	11.8%	8.5	1.1	7.3%
Mouhoun**	880	10.4%	11.1	1.3	2.7%
Sahel	599	7.1%	6.5	1.3	2.7%
East	620	7.3%	8.4	1.4	2.0%
South-West**	520	6.1%	8.8	1.4	6.8%
Center-North	620	7.3%	9.2	1.3	3.3%
Center-West*	636	7.5%	9.5	1.3	8.0%
Plateau	380	4.5%	10.1	1.2	4.7%
North	655	7.7%	8.6	1.4	5.5%
Center-East	620	7.3%	8.7	1.3	6.2%
Center	1380	16.3%	8.6	0.9	10.2%
Cascades**	259	3.1%	8.3	1.1	0.9%
Center-South*	320	3.8%	8.1	1.2	4.2%
Urban areas	2598	30.6%	8.1	0.8	11.9%
Rural areas	5890	69.4%	9.2	1.3	3.8%
Hauts Bassins**	479	5.6%	8.5	1.2	2.7%
Mouhoun**	760	9.0%	11.4	1.3	2.5%
Sahel	559	6.6%	6.5	1.3	2.4%
East	560	6.6%	8.4	1.4	1.6%
South-West**	500	5.9%	8.8	1.4	6.1%
Center-North	540	6.4%	9.3	1.3	2.2%
Center-West*	476	5.6%	9.7	1.3	6.3%
Plateau	380	4.5%	10.1	1.2	4.7%
North	536	6.3%	9.0	1.5	4.4%
Center-East	500	5.9%	9.0	1.3	6.1%
Center	120	1.4%	9.4	1.3	8.2%
Cascades**	160	1.9%	8.4	1.1	0.3%
Center-South*	320	3.8%	8.1	1.2	4.2%
Cotton farmers*	1129	13.3%	10.4	1.2	0.8%
Other farmers	4504	53.1%	8.9	1.3	4.7%
Other rurals	763	9.0%	8.2	1.3	6.2%
Cotton area	1919	22.6%	9.8	1.2	3.0%
Other rural areas	3971	46.8%	8.8	1.4	4.2%

*Note: */** more than 20%/40% of the population living in these regions are dependent on cotton production.*
**** (No. of children 0 to 14 year-old + No. of adults 65 year-old and more)/ No. of adults 15 to 64 year-old.*
Source: EP3 (2003); computations by the authors.

Table C.5 Data Description EP1, EP2, EP3 (in percentages)

	1994 (EP1)	1998 (EP2)	2003 (EP3)
Urban			
Urban	16.2	16.7	18.2
Rural	83.8	83.3	81.8
Gender			
Female	4.5	4.3	5.3
Male	95.5	95.7	94.7
Socio-economic groups			
Public	4.0	4.0	3.6
Private	2.3	2.7	2.1
Informal	6.5	5.7	8.3
Agr. Subsistence	68.3	66.1	58.3
Agr. Cotton	10.3	16.7	18.2
Inactive	8.6	4.7	9.5
Education			
None	85.4	87.5	84.4
Primary	9.5	6.8	8.7
Secondary	2.7	3.2	4.4
Higher Level	2.4	2.5	2.5
Economic region			
Hauts Bassins	11.9	10.8	10.8
Mouhoun	10.2	10.6	12.2
Sahel	5.5	6.4	5.8
East	6.9	8.6	8.5
South-West	5.3	4.2	4.9
Center-North	8.1	8.9	8.3
Center-West	10.5	10.7	8.6
Plateau	5.5	5.6	6.0
North	9.8	9.6	8.6
Center-East	7.0	8.0	8.3
Center	8.3	9.3	10.2
Cascades	4.6	3.0	3.6
Center-South	6.3	4.4	4.3

Notes: Measured as a percentage of total population according to characteristics of the household head.
Source: EP1 (1994), EP2 (1998), EP3 (2003) and computations by the authors.

Consumption aggregate and poverty line definitions

To construct and analyze the expenditure aggregates used for our assessments, the following (not exhaustive) adjustments and assumptions were made:

- Durables. Equipment such as television, radio and refrigerator, mobile devices such as motorcycles, bicycles, and cars and investments in housing, land and livestock were not included into the aggregate expenditure variables.

- Transfers. Transfers were included into the aggregate household expenditure variables.

- Housing rents. For approximately 30% of urban and 2% of rural households rents were declared. For most other households an imputed rent was computed by the INSD with a hedonic regression, but is still missing for 22%, 16% and 6% of households in 1994, 1998 and 2003 respectively. To approximate those missing rents, regional and urban/rural averages were taken from the declared and imputed rents, since it was not possible to estimate a valid regression between housing features and declared rents, especially in rural areas.

- Outliers. Households with no declared expenditure for purchased or auto-consumed food, as well as households with unreasonable high expenditure in the 'subsistence farmer' socio-economic group were dropped from the data set.

- Large household size. 10.7%, 8.5% and 3.2% of all interviewed individuals in 1994, 1998 and 2003 respectively lived in households with over 20 members. However, no adjustment was made to account for possible measurement errors in this variable.

- Recall periods. To obtain annual values, we multiplied expenditures with a 30-day recall period by 12 and those with a 15-day recall period by 24.

- Per capita expenditure. Per capita expenditure was estimated by dividing our total household expenditure aggregate by household size. For reasons of comparison with other studies, we did not use any equivalence scale; i.e. no adjustment was made for economies of scale in consumption within households and different needs by age.

- Regional deflators. Since no official regional deflators could be found, we used for 1994 and 1998 the regional deflators approximated by Koné and Telsiuc (2004). For 2003, regional deflators were estimated comparing nominal and real aggregate household expenditures computed by the INSD. These regional deflators were then used to account for regional differences in the cost of living (see Table C.6).

- Inter-year price variations. To compare expenditure aggregates over time, these have to be adjusted by price variations. As emphasized in our main text, the CPI is in this respect not an appropriate deflator to use, because the budget shares it uses do not reflect the consumption habits of the majority of the population and especially not those of the poor, i.e. the food and in particular the cereal share is largely underestimated in the CPI. So, unless otherwise indicated, we use as decile and urban/rural specific price deflators (see also Section C.3).

- Socio-economic groups. For the disaggregation of households into the various socio-economic groups, wage earners in the public sector and wage earners in the private formal sector were identified as those who declared that they worked in the public or private sector (and had a labor contract and/or social security) respectively. Subsistence

farmers were identified as those who declared that they generated their income from some form of agriculture. Those individuals working in agriculture, but who were in addition somehow involved in cotton production, were specified as cotton farmers. Individuals who had not worked during the last 7 days were specified as inactive. The residual was treated as people working in the informal sector.

- Economic regions. Since the number of strata used differed in each survey (see Table C.1) the strata used in 1994 and 1998 were converted into the 2003 strata to evaluate regional poverty changes. This was done via the 45 provinces which were declared for all households for 1994 and 1998. The conversion could be undertaken perfectly for 1998, since no province fell into two strata, but might not be fully correct for 1994, because before 1996 Burkina Faso was only partitioned into 30 provinces and 2 provinces slightly cross two strata in the 2003 divide. However, this should have only a marginal impact on regional poverty estimates.

Table C.6 Deflators Used to Correct for Regional Consumption Price Differences

EP1 (1994)		EP2 (1998)		EP3 (2003)	
West	0.863	Hauts Bassins	0.934	Hauts Bassins	0.960
South	0.863	Cascades	0.934	Cascades	0.960
Center-North	0.888	North-West	0.843	North-West	0.860
Center-South	0.863	Sahel	0.983	Sahel	1.010
North	0.976	East	0.887	East	0.710
Other Cities	0.970	South-West	0.776	South-West	0.840
Ouaga & Bobo	1.000	Center-North	0.953	Center-North	0.800
		Center-West	0.832	Center-West	0.820
		Center	1.000	Center	1.000
		Plateau Central	1.000	Plateau Central	0.970
		Center-South	1.000	Center-South	0.890
		North	0.876	North	0.910
		Center-East	0.627	Center-East	0.840

Notes: Regional deflators for 1994 are only available for a divide in seven economic regions, which do not correspond to the economic regions of 1998 and 2003. Hence a direct comparison of regional deflators between 1994 and 1998/2003 is not possible.
Source: 1994 and 1998: World Bank. 2003: INSD.

Many of these adjustments have not been made in previous studies by other authors, which explains, besides a different poverty line used (see Section C.3), the divergence between their results and ours. In the computations made by the INSD for instance we found the following problems (these problems are also summarized in Section C.3).

- Since most households do not pay any housing rent (90%), rent for most households was estimated by the INSD using a hedonic regression in 1994, 1998 and in 2003, but is however non-systematically missing for 22%, 16% and 6% of households in 1994, 1998 and 2003 respectively.

- Durables (equipment such as television, radio and refrigerator, mobile devices such as motorcycles, bicycles, and cars and investments in housing, land and

livestock) were included by the INSD in the total household expenditure in 1998 and 2003. Although this fact does not have a large effect on poverty headcounts, it does considerably increase inequality measures as the Gini-index.

- Comparing the raw data (adjusted for regional deflation) with the official INSD processed data, we found that to all aggregate expenditure categories an additional 12.4% 'expenditure margin' was added across all households in 1998, which might be justified by the extremely 'bad' year in 1998 or the fact that the survey was conducted in the pre-harvest season. However this 12.4% surplus margin was not applied in 2003 when the household survey was also conducted in the pre-harvest season and therefore introduced a major bias into poverty comparisons over time.

Comparability of the household surveys and the construction of a new poverty line and consistent consumption price deflators

When evaluating pro-poor growth, the measurement of poverty and thus the household data used and the chosen poverty line are of crucial importance. In fact, because the household surveys undertaken in Burkina Faso in 1994, 1998 and 2003 were first of all aimed at providing current 'snap-shot' poverty estimates and less for being used for a comparison across time, the 'Burkinabè growth-poverty puzzle' can be explained *(i)* partly by unusual and inconsistent assumptions made by the INSD and other previous studies when computing household expenditure aggregates, *(ii)* partly by changes in the survey design, and finally *(iii)* to a large extent by changes in the real poverty line and the use of inappropriate price deflators over time. The first issue was already discussed in Section C.2. The second and the third issues, also being the most important, will be discussed in what follows.

Comparability of the three household surveys

The changes in survey design of the Burkinabè household surveys between 1994 and 1998/2003 are indeed crucial and not using the EP1 (1994), as suggested by some, might be an option to prevent possible misinterpretations. We are fully aware of the differences in survey design and will therefore discuss them in detail. However, given the purpose and objective of this study, we think that the EP1 should be used to draw on all of the available information to determine what happened during the last ten years in Burkina Faso. Focusing only on the surveys of 1998 and 2003 would tell us very little about longer-term dynamics between growth and poverty. It would also prevent us from examining the impact of the 1994 CFAF devaluation, a key event for Burkina Faso. In addition, Burkina Faso experienced, as recurrently mentioned, a severe drought in 1997/98, which tends to make 1998 a rather 'poor' and not very representative year. Therefore, we think it is important to take into account all three data points: 1994, 1998 and 2003. In what follows, we discuss again briefly the differences in survey design between the EP1 on the one hand and the EP2 and the EP3 on the other hand. We show that the potential biases tend to partly offset each other. Even making the most pessimistic assumptions on the resulting net effect, our poverty assessment between 1994 and 1998 would hold.

The survey design of the EP1, the EP2 and the EP3 differs in three points.

1. Whereas the EP1 was undertaken in the post-harvest period (October-January), the EP2 and the EP3 were undertaken in the pre-harvest period (April-August).

2. Whereas the EP1 has a recall period for food items of 30 days the EP2 and the EP3 have a recall period for food items of 15 days.

3. The disaggregation of expenditures was continuously increased from 1994 to 1998 to 2003.

According to empirical evidence of other countries, the first bias will result in lower expenditures in 1998 and 2003, compared to 1994. The shorter recall period in 1998 and 2003 will however result in rather higher declared expenditures in 1998 and 2003 compared to 1994, thus generating a bias in the opposite direction. Finally the higher disaggregation will most likely also lead to higher expenditure in 1998 and 2003 with respect to 1994. It follows that the 'potential errors' go in both directions and will therefore partly offset each other. Below we will try to give a rough evaluation of the magnitude of each of these 'errors'. It is important to note that the first bias reflects a real change in consumption, whereas the biases two and three are due to pure measurement error.

a) Post-harvest/pre-harvest bias

Of course, it is hard to quantify accurately the seasonal effect on the expenditure declarations. This is especially true in our case, because the seasonal effect is mixed with the effects from the drought which Burkina Faso knew in 1997/98. Using panel data of 1,450 rural Ethiopian households, Dercon and Krishan (2000) examined differences in labor supply and food consumption before and after the harvest. They show that for less wealthy households a 10% increase in food prices would result in an 8% reduction in consumption. In the Ethiopian sample, poverty head count measures vary by up to 15% per year due to seasonal fluctuations. Reardon and Matlon (see Sahn, 1989) have shown for the case of Burkina Faso, that fluctuations in real food consumption vary only by roughly 13% over seasons for poor households, since most of seasonal production fluctuation is compensated with purchased food. Whereas during the post-harvest season only around 10% of calories consumed by poor households is purchased, during the lean season in fact 60%-70% are purchased (Sahn, 1989) Taking this and the fact that average food prices vary by approximately 20% over season in Burkina Faso, we may adopt 13-16% as an estimation of seasonal variations in real consumption. To make the three surveys compatible, one could hypothetically thus either lower consumption by 13-16% in 1994, or increase it in the two later years.

b) Recall bias

Empirical studies tend to show that longer recall periods lead to less declared expenditures. Scott and Amenuvegbe (1990) show using the Ghanaian LSMS that for 13 frequently asked purchased items, reported expenditures fell at an average of 2.9% for every day added. Deaton (2003) reports an experiment with different recall periods in India where shortening the recall period for food items from 30 to 7 days resulted in 30% higher consumption (or 1.1% for every day). In the case of Burkina Faso, where the share of total food expenditures for poor household amounts to roughly 60-70%, the recall bias might be responsible for 12-15% lower declared consumption in 1994 compared to 1998 and 2003 (1.1% over 15 days times 0.7).

c) Disaggregation of expenditure items

In 1994 the poverty-relevant consumption items (excluding durables) were disaggregated into 50 items, whereas they have been disaggregated into 70 items in 1998 and 80 items in 2003. For instance 'expenditures for diverse schooling expenditures' in the EP94 were asked in the EP98 separately as 'schooling fees' and 'other schooling expenditures'. Expenditures for 'Millet and Sorghum' in the EP94 were separated into 'Millet' and 'Sorghum' in the EP98. Again it is difficult to quantify exactly the resulting bias of such changes in the survey design. Concentrating on those expenditures that were asked for in exactly the same degree of disaggregation

might be one solution, but it might also introduce a new bias if the true weights shifted between different consumption items; i.e. when, relatively to total consumption, much more was spent on millet and sorghum in 1998 than in 1994 or vice versa. Therefore, we chose not to delete any items to prevent a further enhancement of measurement mistakes, since most of the 'additional' items were only a disaggregation of the former.

It can be seen that the above biases partly offset each other, but that it is even likely that the latter two are in total even a little higher in magnitude than the first one. This implies that, despite the fact that the EPI was conducted in the post-harvest season, poverty estimated using the EPI might even be overestimated with respect to 1998 and 2003. Or, put differently, if we assume that the net impact of the three biases is uniform over the whole population, we would need a more than 12.4% reduction in per capita consumption in 1994 (i.e. the pre-/post-harvest bias would have to offset the two later biases by more than 12.4%), in order to obtain a poverty headcount for 1994 that is higher than the one observed in 1998.

Construction of a new poverty line

Another concern was of course the appropriate poverty line to use. We think it is widely recognized that this line has to have a major basic food component, much higher than the one taken to construct the national CPI (with a cereal component of only 10%). The official poverty line fulfils this requirement (with a ~ 50% basic food component). Therefore we argued that a fixed poverty line which is simply updated over time using the CPI would not be appropriate in the case of Burkina Faso. More precisely the official poverty line in all three reference years was based on the price of a 2,283-calorie food component, based on millet, sorghum, maize and rice prices, which are the main components of nutrition intake for poor people in Burkina Faso. Again, whereas the CPI only increased by 22.7% between 1994 and 1998, the prices for cereals more than doubled during the same time (see Figure C7). Conversely, between 1998 and 2003 the CPI further increased whereas cereal food prices decreased again.

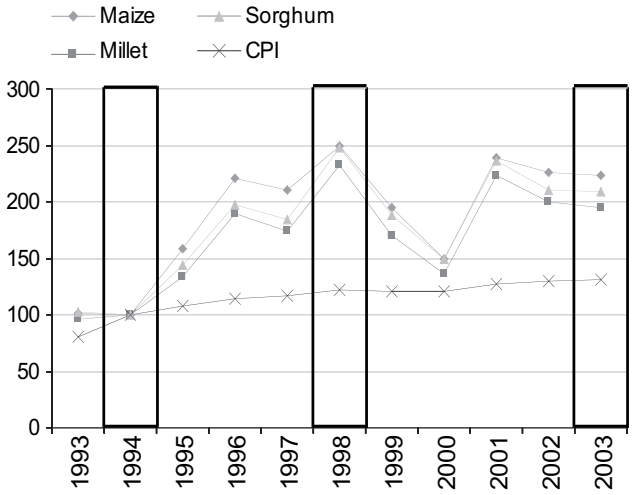
Hence, given these large changes in relative prices and the high share of food or cereal consumption of the Burkinabè population, a key issue is the weight given to food and especially cereals (and the use of their respective price changes) to compute the poverty line. However, whereas the real food component was appropriately inflated with the respective price index, an important drawback of the official poverty line is the fact that the non-food component was not inflated by an appropriate price index but was only calculated as a share of the nominal food component. In addition this ratio of non-food to food was even increased over time: only slightly between 1994 and 1998, but much more strongly between 1998 and 2003. Therefore the price index implicit in the poverty line does not correspond not to a true Laspayres-Index. Here, we suggest the use of a new poverty line using constant and appropriate real weights of food and non-food items over the period 1994-2003.

The poverty line was computed as follows. We took the nominal value of the official poverty line for 2003, and the cereal food, other-food and non-food budget shares as they are observed in the lower part of the expenditure distribution (1st and 2nd quintiles) via the household survey. The cereal food component (accounting for ~40% of per capita household expenditure) was then deflated to 1998 and to 1994 using the observed price changes for the corresponding cereals. Figure C7 shows that prices for these cereals in the post-harvest season are considerably lower than in the pre-harvest season. The remaining food and non-food component was deflated using the non-food monthly CPI. Of course one could also use the official poverty line and the food and non-food weights of 1994 or 1998 as a point of departure. We did this to check the robustness of our results and found the same poverty trends, but on a lower level.

Construction of consistent consumption price deflators

To express household expenditures at various points in time in real terms, we need a price deflator. As emphasized, the CPI would be completely inappropriate in this case, given that the underlying consumption basket is not at all representative for the majority of the population in Burkina Faso. Therefore, to be consistent with observed consumption patterns and in order to reflect correctly the relevant purchasing power of households, for urban and rural areas, we compute separately decile specific consumption price deflators. More precisely, for each decile in the distribution of household expenditures per capita, we measure the mean food and mean non-food share in total expenditure and use these shares as weights for the price changes of food and non-food items. This procedure provides us with decile specific price changes between the different survey years for each household, which can be then used to convert nominal expenditures into real expenditures with 1994 being the base year. As described, we do the same to deflate the poverty line over time and, as a result, obtain a consistent deflator for both household expenditure per capita and the poverty line.

Figure C.7 Annual Cereal Price Variations

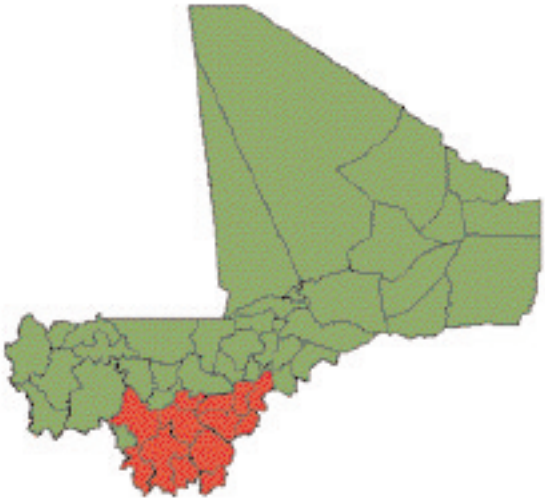


Note: Annual average cereal consumer prices. 1994=100. CPI: national consumer price index.
Source: CPI: IAP (2004). Cereal Prices: Grain Market Price Surveillance System, Burkina Faso, Ministry of Commerce (2003).

Appendix D. Definition of Cotton-Producing Zones in Mali and Burkina Faso

For Mali, cotton-producing zones were defined as the rural *arrondissements* in the CMDT's areas of intervention (Figures D.1, D.2 and D.3). This territorial division was made using maps provided by the CMDT that showed its areas of intervention. Table D.1 lists the *arrondissements* in which household surveys were conducted. There were 1,300 households in 1994, 1,719 households in 2001, and 1,266 households in 2006 (Appendix A).

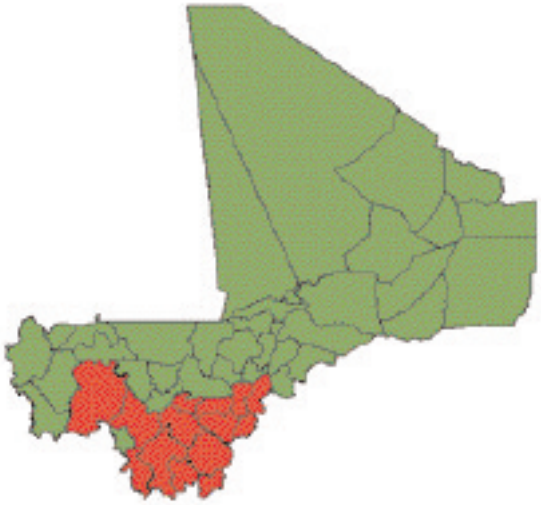
Figure D.1 Cotton Zone, Mali, 1994



Circle Names: Bla (43), Baraoueli (42), Bougouni (32), Diolila (23), Kadiolo (33), Kati (25), Kolondieba (34), Koutiala (35), San (46), Sikasso (31), Tominian (47), Yanfolila (36), Yorosso (37).

Source: authors.

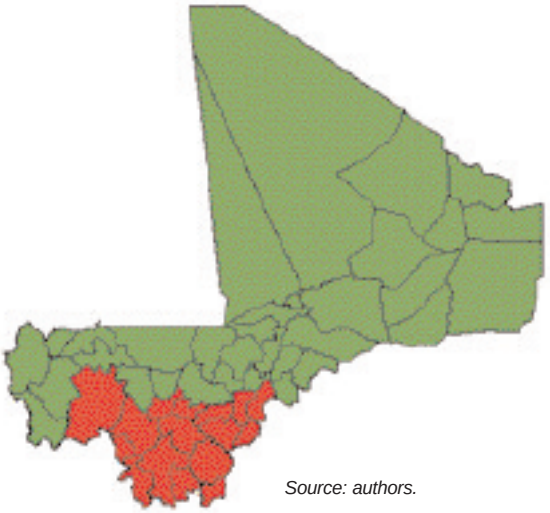
Figure D.2 Cotton Zone, Mali, 2001



Circle Names: Bla (43), Baraoueli (42), Bougouni (32), Diolila (23), Kadiolo (33), Kati (25), Kita (15), Kolondieba (34), Koutiala (35), San (46), Sikasso (31), Tominian (47), Yanfolila (36), Yorosso (37).

Source: authors.

Figure D.3 Cotton Zone, Mali, 2006



Source: authors.

Circle Names: Baraoueli (42), Bla (43), Bougouni (32), Diolila (23), Kadiolo (33), Kati (25), Kangaba (24), Kita (15), Kolondieba (34), Koulikoro (21), Koutiala (35), San (46), Sikasso (31), Tominian (47), Yanfolila (36), Yorosso (37).

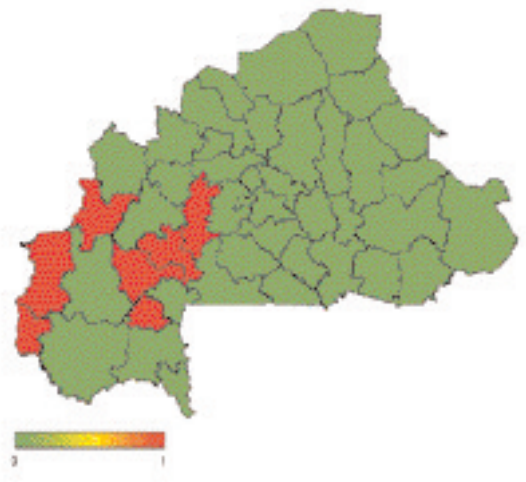
Table D.1 Rural Arrondissements Surveyed in Cotton Zones, 1994, 2001, 2006

Year	Arrondissement Number
1994	2301, 2315, 2329, 2343, 2357, 2371, 2513, 2561, 3101, 3110, 3128, 3146, 3164, 3201, 3219, 3228, 3246, 3264, 3301, 3367, 3401, 3418, 3435, 3501, 3529, 3543, 3557, 3571, 3667, 3701, 3723, 3745, 4201, 4223, 4267, 4301, 4369, 4601, 4613, 4625, 4673, 4701, 4715, 4743, 4757, 4771
2001	1501, 1512, 1523, 1545, 1556, 1567, 1578, 2301, 2315, 2329, 2343, 2357, 2371, 2513, 2561, 3101, 3110, 3119, 3128, 3137, 3146, 3164, 3173, 3201, 3210, 3219, 3228, 3246, 3255, 3264, 3273, 3323, 3401, 3418, 3452, 3515, 3543, 3557, 3601, 3612, 3656, 3667, 3701, 3745, 4201, 4245, 4267, 4301, 4318, 4335, 4352, 4369, 4601, 4613, 4625, 4649, 4661, 4701, 4715, 4729, 4743, 4771
2006	1501, 1512, 1523, 1545, 1556, 1567, 1578, 2101, 2125, 2137, 2149, 2173, 2301, 2315, 2329, 2343, 2357, 2371, 2401, 2445, 2501, 2513, 2525, 2531, 2537, 2549, 2561, 2573, 3101, 3110, 3119, 3128, 3137, 3146, 3164, 3173, 3201, 3210, 3219, 3228, 3246, 3255, 3264, 3273, 3323, 3401, 3418, 3435, 3452, 3515, 3543, 3557, 3601, 3612, 3656, 3667, 3701, 3745, 4201, 4245, 4267, 4301, 4318, 4335, 4352, 4369, 4601, 4613, 4625, 4637, 4649, 4661, 4701, 4715, 4729, 4743, 4771

Source: 1994 EMCES, 2001 EMEP, and 2006 ELIM.

For Burkina Faso, cotton-producing zones were defined as provinces in which more than 20% of the population depended on cotton production (Figures D.4, D.5 and D.6). Only rural zones in these provinces are included in the "cotton zone" category for statistical calculations.

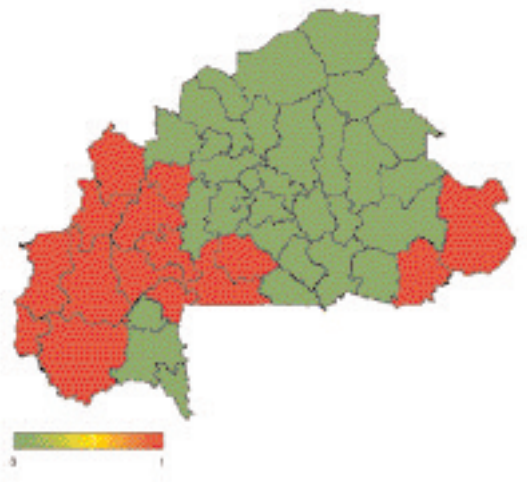
Figure D.4 Cotton-Producing Provinces, Burkina Faso, 1994



Province Names: Bougouriba (03), Kenedougou (12), Sanguie (22), Bale (31), Banwa (32), Leraba (38), Tuy (42).

Source: authors.

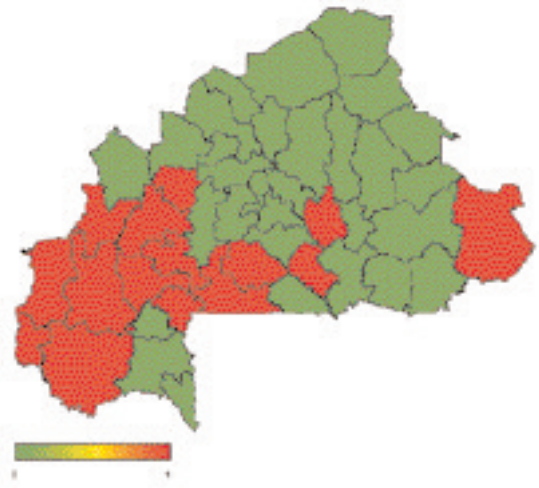
Figure D.5 Cotton-Producing Provinces, Burkina Faso, 1998



Province Names: Comoe (06), Houet (10), Kenedougou (12), Kossi (13), Mouhoun (15), Sissili (25), Tapoa (28), Bale (31), Banwa (32), Ioba (33), Kompienga (35), Leraba (38), Nayala (40), Tuy (42), Ziro (44).

Source: authors.

Figure D.6 Cotton-Producing Provinces, Burkina Faso, 2003

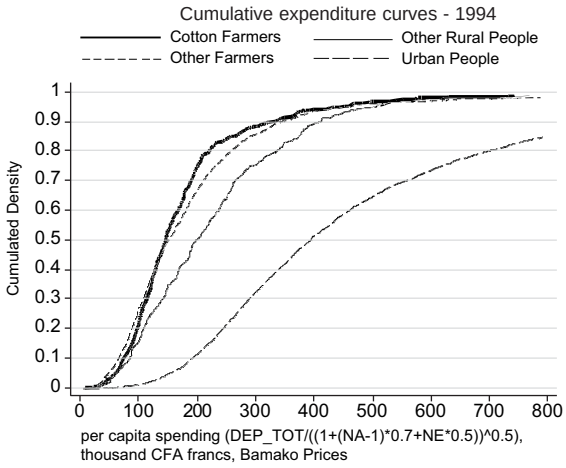


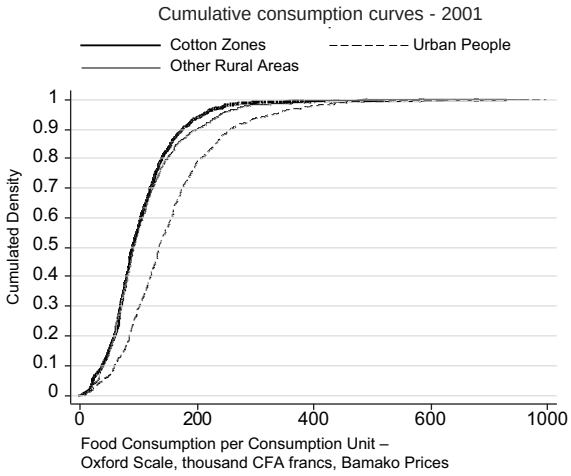
Province Names: Comoe (06), Gangourou (07), Houet (10), Kenedougou (12), Mouhoun (15), Sissili (25), Tapoa (28), Zounweogo (30), Bale (31), Banwa (32), Ioba (33), Leraba (38), Nayala (40), Tuy (42), Ziro (44).

Source: authors.

Appendix E: Consumption Levels, Poverty, and Equivalence Scale, Mali 1994, 2001, 2003 and Burkina Faso 1994, 1998, 2006

Figure E.1 Cumulative Consumption Curves with Equivalence Scale, Mali, 1994, 2001, 2006





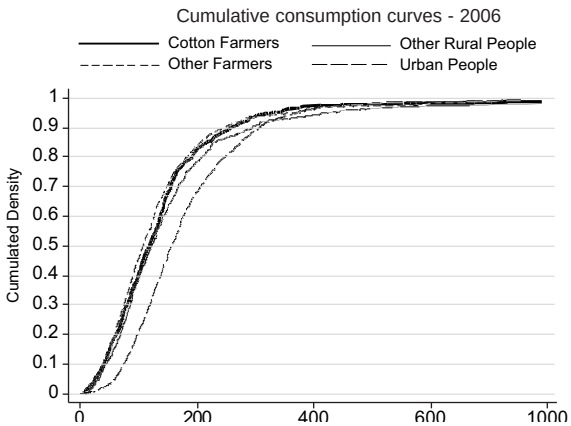
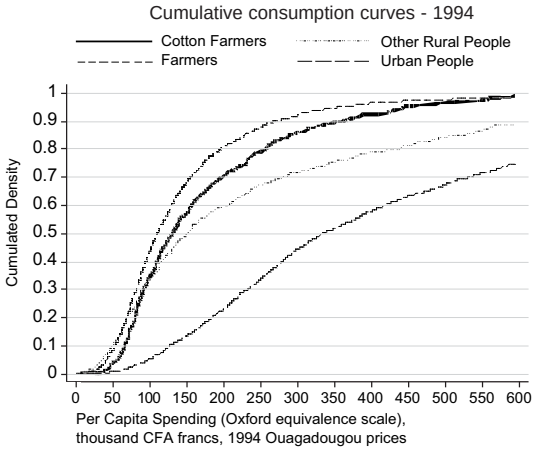
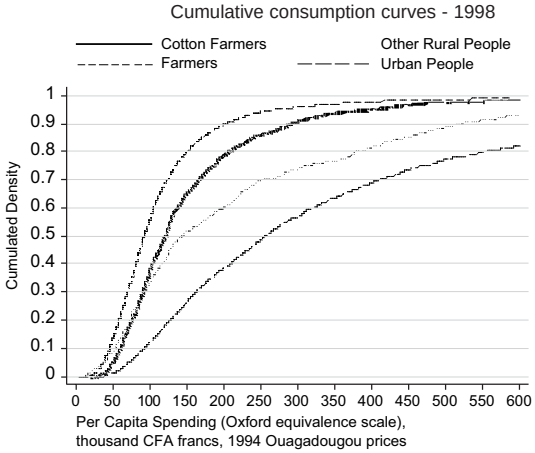
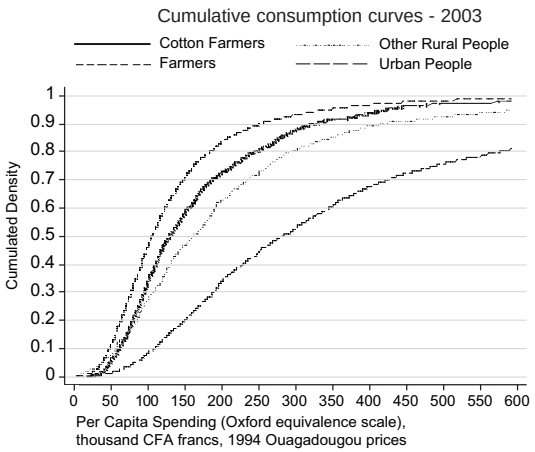


Figure E.2 Cumulative Expenditure Curves with Equivalence Scale, Burkina Faso, 1994, 1998, 2003







Source: EMCES (1994), EMEP (2001), ELIM (2006), EP1 (1994), EP2 (1998), EP3 (2003); authors' calculations.

Table E.1 Poverty Rate, Mali 1994, 2001, 2006

	1994[a]	1994[a]	2001[b]	2001[b]	2006[c]	2006[c]
	Total Expenditure Per Capita	Total Expenditure Per Consumption Unit[d]	Food Consumption Per capita	Food Consumption Per Consumption Unit[d]	Food Consumption Per Capita	Food Consumption Per Consumption Unit[d]
National[e]	75	75	55.2	55.2	44.5	44.5
Cotton Farmers[f]	94.5	87.7			51.2	49.6
Other Farmers	82.5	85.3			55.6	54.8
Other Rurals	70.2	72.3			46	47.4
Urbans	29.7	29.7	34.0	27.2	27.8	29
Cotton Zones[g]	92.6	88.8	63.8	63.1	52.2	50.8
Other Rural Areas	78.3	80.9	61.8	65.8	51.9	52.2

a. Total per capita spending, Bamako prices, 1994. Poverty line: 77.2 thousand CFA francs per year.
b. Per capita food consumption, Bamako prices, 2001. Food poverty line: 90.3 thousand CFA francs per year.
c. Per capita food consumption, Bamako prices, 2006. Food poverty line: 95.8 thousand CFA francs per year.
d. Square root of the Oxford equivalence scale: (1 adult + 0.7 other adults + 0.5 children 0-14 years old) 1/2 in 1994 and Oxford equivalence scale in 2001 and 2006.
e. When the Oxford scale was used, the poverty line was adjusted so that national poverty rates remain equal to those calculated based on the per capita aggregate.
f. Farmers who say they grow cotton.
g. CMDT cotton zones 1994, 2001 and 2006 (Appendix D).
Source: 1994 EMCES, 2001 EMEP, 2006 ELIM; authors' calculations.

Table E.2 Poverty Rate, Burkina Faso, 1994, 1998, 2003

	1994[a]	1994[a]	1998[a]	1998[a]	2003[a]	2003[a]
	Total Consumption Per Capita	Total Consumption Per Consumption Unit[b]	Total Consumption Per Capita	Total Consumption Per Consumption Unit[b]	Total Consumption Per Capita	Total Consumption Per Consumption Unit[b]
National[e]	55.5	55.5	61.8	61.8	47.2	47.2
Cotton Farmers[c]	62.1	53.5	58.2	53	46.8	45.2
Other Farmers	64.1	64.3	71.6	71	57.2	56.9
Other Rural	46.9	49.4	50.7	52.8	35.6	37.1
People	8.5	12.3	17.7	27.8	13.7	16.1
Cotton Zones[d]	63.5	57.7	73.3	54.8	56.7	46.2
Other Rural Areas	62.6	63.7	58.2	72.6	46.6	56.2

a. Per capita consumption, 1994 Ouagadougou prices. Poverty line in current prices: 53.2 thousand CFA francs per year.
b. Square root of the Oxford equivalence scale: (1 adult + 0.7 other adults + 0.5 children 0-14 years old) 1/2.
c. Farmers who say they grow cotton.
d. 1994, 1998 and 2003 cotton production zones.
e. When the Oxford scale was used, the poverty line was adjusted so that national poverty rates remain equal to those calculated based on the per capita aggregate.
Source: EP1 (1994), EP2 (1998), EP3 (2003); authors' calculations.

Appendix F. Cotton Households (988) Compared to Other Farmers (654) in Cotton Zones, Mali 2006

Demographic Characteristics	Mean gap[a]	Mean gap in each *arrondissement* of the area[b]
Household Size	+2,2***	2,0***
Polygamy in the Household (2 or more wives)	+16,8***	+14,1***
Number of Adults	N/S	N/S
Consumption (%)		
Per Capita Food Consumption	N/S	N/S
Asset Ownership		
Bicycle	+9,9%***	+6,9%***
Moped	+17,7%***	+13,8%***
Radio	N/S	+10,8%***
No. of Head of Cattle	N/S	-13,3***
Cart	+11,1%**	+9,7%***
Education		
% of 12- to 16-year-olds who have completed primary schooling		
Boys	N/S	N/S
Girls	N/S	N/S
Average Number of Years in Primary School		
Men	N/S	+0,2*
Women	N/S	+0,1*
Literacy Rate		
Men	N/S	+5,0%**
Women	N/S	+2,2 %*

N/S: difference not significant.
a. The significance of differences was calculated taking into account the self-correlation of residents within the arrondissements.
b. Differences are given by "within" estimates for each arrondissement (regressions with set effects – 77 arrondissements within the cotton zone).
**** Significant at 1%.*
*** Significant at 5%*
** Significant at 10%*
Source: 2006 ELIM; authors' calculations.

Appendix G. Note on the Report *Tendances et déterminants de la pauvreté au Mali* (2001-2006) by the DNSI, September 2007 Preliminary Version

The "contradiction" that emerged in Mali between a fairly widely shared perception of cotton-producing regions' relative prosperity and the results of quantitative poverty studies is often evoked under the name of the "Sikasso paradox", so called after the country's main cotton-producing region (Güther *et al.*, 2006). This term entered the public debate following the DNSI's June 2004 publication of the report on the results of the 2001 EMEP survey. Indeed, according to this report, the Sikasso region was one of the poorest in the country.

In September 2007, the publication of the results of the 2006 ELIM survey led to the presentation of a new report (DNSI, 2007) that repeated the 2004 diagnosis on household living conditions in cotton-producing areas. More specifically, the authors of the report noted: "The poorest group of households is made up of households headed by farmers and notably cotton farmers in Sikasso region."

This diagnosis differs from the diagnosis established by DIAL and presented in a report produced for the AFD on the living conditions of cotton farmers in Mali and Burkina Faso (Mesplé-Somps *et al.*, 2007). In fact, it concluded that while cotton farmers' relatively poor situation in 2001 could be attributed to the disadvantageous price and production conditions that prevailed that year, "in a relatively more auspicious year such as 2006 in Mali, the cotton farmers' situation appears comparatively more favorable than that of other farmers, notably for the largest cotton farmers."

As it happens, these two diagnoses are not totally incompatible insomuch as they cover slightly different fields: the DNSI's diagnosis is based on an analysis of inter-regional differences, whereas the DIAL report attempts, rather, to compare cotton farmers' situation to that of other farmers.

Here, we shall attempt to:

(i) compare the different approaches taken to analyze poverty and the evolution of inter-regional differences between 2001 and 2006, with an emphasis on the most relevant differences; and

(ii) emphasize the difficulties involved in establishing a definitive diagnosis using the available data.

Comparison of the Approaches Used in 2001

In 2001, the approaches taken by the DNSI and by DIAL to analyze poverty using the EMEP data differed in their choice of consumption aggregate and how their poverty lines were constructed. Indeed, the DIAL report relied solely on a real food consumption aggregate whereas the DNSI analysis was based on a total consumption aggregate at current prices. DIAL's decision can be explained by the fact that only the food component of consumption can be properly valued using a single price system (Bamako prices) to allow inter-regional comparisons that take into account inter-regional price differences.[3]

[3] Indeed, the price indexes possibly available to deflate non-food spending are not satisfactory insomuch as they are prior to 1994 and only concern the regional capitals. Using them would therefore imply making two strong assumptions: (1) inter-regional price gaps have not changed since 1993; and (2) prices are the same in urban and rural areas. These two assumptions do not appear to be confirmed by available price data. See Mesplé-Somps et al. (2007) for more details.

Furthermore, the methods differ for the construction of poverty lines in the items covered, level of aggregation, and valued prices (Table G.1).

Table G.1 Description of Methods – 2001

2001	DNSI Method 1	DNSI Method 2	DIAL
Consumption Aggregate - coverage - valuation	total consumption current prices	total consumption + rent current prices	food consumption Bamako prices
Poverty Line(s) - coverage - disaggregation - valuation	overall national current prices	overall by region and by environment current prices	food national Bamako prices

Source: authors.

Table G.2 lists the DNSI's results for 2001 with two calculation methods and DIAL's results. Nationally, the DNSI's two methods lead to very different results but still place the Sikasso region behind the Kayes-Koulikoro group (and, *a fortiori*, behind all the other regions) with a very high incidence of poverty. Indeed, the poverty rate is more than 80% in the cotton-producing region.

Table G.2 Poverty Rate – 2001

2001	DNSI Method 1	DNSI Method 2	DIAL
National	68.3	55.6	55.2
Residential Environment			
Urban	37.4	24.1	34.0
Rural	79.2	66.8	62.9
Region Groups			
Kayes-Koulikoro	76.2	65.1	69.2
Sikasso	81.8	80.1	63.0
Mopti-Ségou	71.4	51.9	48.0
Tombouctou-Gao-Kidal	51.3	30.8	33.6
Bamako	27.5	17.6	41.6

Source: DNSI (2007); authors' calculations from the 2001 EMEP survey data.

In addition, the second method strongly emphasizes differences in poverty between the Sikasso region and the other regions of Mali. In order to better grasp this effect, the poverty rates were compared to the corresponding national rates (Table G.3). In this way, one can see that Sikasso's relative rate is 120 with method 1 and 144 with method 2. The method utilized by DIAL places Sikasso at a relative rate of 114, ahead of the Kayes and Koulikoro regions.

Table G.3 Relative Poverty Rates (baseline = national), 2001

2001	DNSI Method 1	DNSI Method 2	DIAL
National	100	100	100
Residential Environment			
Urban	55	43	62
Rural	116	120	114
Region Groups			
Kayes-Koulikoro	112	117	125
Sikasso	120	144	114
Mopti-Ségou	105	93	87
Tombouctou-Gao-Kidal	75	55	61
Bamako	40	32	75

Source: Authors' calculations from DNSI (2007) and 2001 EMEP survey data.

With the **DNSI's method 1**, which is based on a current consumption aggregate and the use of an overall poverty line calculated on national level, Sikasso's relative poverty rate may be overestimated if the prices of consumer goods were low in 2001 compared to prices in other regions. Calculating the cost of a calorie shows that one costs 0.097 CFA francs in Sikasso region, compared to the national average of 0.101 CFA francs—a relatively small difference of approximately 4%.[4] For non-food goods, the diagnosis cannot be established because adequate data are lacking.

A second risk of over-estimation is linked to the national estimate of the non-food segment of the poverty line. Indeed, the result is that the relative poverty rate is overestimated in regions where the average share of food consumption is lower than the national average. Inversely, it will be underestimated in regions where the average share of food consumption is higher than the national average. Based on the DNSI aggregate, it appears that the non-food budget share is approximately 30.2% in Sikasso compared to 29.8% nationally—which leads one rather to fear a (small) underestimate bias. The two bias risks analyzed are therefore fairly small and in opposite directions. Hence, we have reason to believe that Sikasso's relative rate calculated with method 1 is relatively little biased.

The DNSI's method 2 is based on environment-specific poverty lines calculated for each region, which should resolve the two bias risks mentioned above. Consequently, it is surprising to note that the difference between the poverty rate in Sikasso and the national rate increases with this method, as the relative rate increases from 120 to 144. When one examines the poverty lines estimated by the DNSI and listed in Table G.4, the explanation is obvious: the calculated overall poverty line for Sikasso is the highest of all regions both in rural and urban areas.

[4] The average cost of a calorie is calculated based on a basket of food goods whose caloric value is known, valued at average local prices. This calculation allows one to construct the food poverty line

Table G.4 Poverty Lines by Environment and by Region, 2001

2001	Food		Overall	
	Urban	Rural	Urban	Rural
Kayes	108 551	98 842	149 011	122 483
Koulikoro	91 615	83 439	129 314	97 361
Sikasso	90 703	82 600	149 419	142 678
Ségou	80 921	73 694	133 647	100 835
Mopti	84 133	76 614	127 201	100 169
Tombouctou	90 082	82 052	112 899	104 825
Gao	90 082	82 052	130 638	95 317
Kidal	90 082	-	133 572	-
Bamako	91 615	-	135 920	-

Source: authors' calculations based on DNSI (2007).

In addition, it appears that the high level of the overall poverty line in Sikasso is not linked to the value of the food poverty line but the result of the very large size of the non-food component for this region. Indeed, in monetary terms, this component amounts to more than 60,000 CFA francs per person per year (rural Sikasso) compared to 23,000 CFA francs and 14,000 CFA francs respectively in Koulikoro and Kayes. This means that the non-food share accounts for 42.1% of the overall line whereas it is only respectively 14.3% and 19.3% in Koulikoro and Kayes.

Table G.5 Non-Food Budget Shares, 2001

2001 (en %)	DNSI Poverty Lines		DNSI Current Consumption	
	Urban	Rural	Urban	Rural
Kayes	27.2	19.3	24.9	19.9
Koulikoro	29.2	14.3	31.3	30.2
Sikasso	39.3	42.1	35	28.3
Ségou	39.5	26.9	34	29.4
Mopti	33.9	23.5	29.7	23.9
Tombouctou	20.2	21.7	26.8	26.8
Gao	31	13.9	32.4	20
Kidal	32.6		31.6	.
Bamako	32.6		37.9	.

Source: authors' calculations from DNSI (2007) and 2001 EMEP survey data..

How can one explain the very high level of the non-food component in the estimated poverty line for Sikasso? There are two possible explanations.

The first is based on inter-regional price differences. If the prices of non-food consumption goods are particularly high in Sikasso compared to other regions, then the same real level of non-food consumption results in a higher current

non-food consumption level. This explanation is not convincing for two reasons. First, the estimated levels suggest that non-food goods are nearly three time more expensive in Sikasso than in Koulikoro, something that is improbable. Second, these inter-regional differences should also be seen in the average non-food budget shares for each region, which is not the case. In fact, these shares are very close (28.3% in rural Sikasso, compared to 30.2% in Koulikoro).

The second explanation is that the large size of the non-food component is the result of a statistical artifact. Indeed, it is calculated based on an estimate of non-food needs of a sample of households close to the poverty line. More specifically, the method chosen by the DNSI is described as follows: "The non-food threshold was calculated as the non-food spending of households whose food spending is close to the food poverty threshold (household in the range of plus or minus 5% of the food threshold). The sum of the two thresholds gives the total poverty threshold." This relatively standard method can nevertheless raise difficulties when the household sample in the plus or minus 5% of the food threshold range is too small in size. An examination of the available data suggests that this is indeed the case because the non-food component was estimated from a sample of 29 households in Sikasso compared to respectively 44 and 61 households in Kayes and Koulikoro.

Comparison of the Approaches Used in 2006

In 2006, differences in approach were nearly identical to those in 2001. The DIAL report's consumption aggregate limited itself to food consumption whereas the DNSI's contained non-food spending. The DNSI decided to value quantities by declared prices by replacing abnormally high prices[5] with the regional median. On the contrary, in the DIAL report, all food spending was valued using a single price system, specifically the prices declared in Bamako for which the DNSI's corrections of abnormally high prices were applied.[6] Concerning the poverty line calculation, the approaches are, however, identical. The decision was made to update the 2001 poverty line by the estimated inflation rate in Bamako from 2001 to 2006. Nevertheless, let us specify that this decision was more appropriate in the case of DIAL's approach because all of the quantities consumed were valued at 2006 Bamako prices. In the case of the DNSI's methods, this mode of actualizing the poverty line would have been valid only if the inflation rates for each region and each type of environment had followed the same trends as Bamako.

Table G.6 compares the poverty rates obtained by the DNSI in 2006 with those in DIAL's report. The national poverty level obtained through the DNSI's method 1 is approximately 20 points higher than those obtained by the DNSI's method 2 and by DIAL. In regard to Sikasso region's relative ranking (Table G), the DNSI's method 2 produces the results most different from the DIAL report results. Indeed, the DNSI's method 2 calculations show this region as having an incidence of poverty 70% higher than the national average, or the poverty level in Sikasso staying at around 80%, whereas poverty levels are said to have improved in nearly all other regions.

[5] That is to say, prices higher than the regional median plus three times the inter-quartile interval.

[6] For the products for which a purchase price per measurement unit in Bamako was not available, a national average was calculated (this concerns 16% of the recordings).

Table G.6 Poverty Rates, 2006

2006	DNSI Method 1	DNSI Method 2	DIAL
National	64.4	47.4	44,5
Residential Environment			
Urban	31.8	25.5	27,8
Rural	79.5	57.6	51,9
Region Groups			
Kayes-Koulikoro	61.5	44.7	49,6
Sikasso	81.7	80.8	51,8
Mopti-Ségou	75.2	48.7	47,9
Tombouctou-Gao-Kidal	57.9	29	28,9
Bamako	11	7.9	18,5

Source: Authors' calculations from DNSI (2007) and 2006 ELIM survey data.

Table G.7 Relative Poverty Rates (baseline = national), 2006

2006	DNSI Method 1	DNSI Method 2	DIAL
National	100	100	100
Residential Environment			
Urban	49	54	63
Rural	123	122	117
Grouped Regions			
Kayes-Koulikoro	95	94	115
Sikasso	**127**	**170**	**116**
Mopti-Ségou	117	103	108
Tombouctou-Gao-Kidal	90	61	65
Bamako	17	17	42

Source: Authors' calculations from DNSI (2007) and 2006 ELIM survey data.

The diagnosis in regard to inter-regional poverty differences in 2006 based on the DNSI's approaches suffers from the same pitfalls as in 2001. The relative poverty measurement from the DNSI's method 1 is likely to be biased as it was in 2001 by inter-regional price differences and differences in food budget shares. The data available in 2006 nevertheless suggests that these biases are probably relatively small. The 2006 intensification of Sikasso's relative position obtained through the DNSI's method 2 could be explained by a higher gap in 2006 between the estimated share of non-food spending in the Sikasso poverty line (42%) and the one seen in rural Sikasso (23% compared to 28% in 2001).

By Way of a Conclusion

The diagnosis in the DNSI's report on the worsening of the relative poverty of households in Sikasso between 2001 and 2006 does not seem solid. It is notably based on methodological decisions that probably over-estimate the poverty line in this region.

Furthermore, this diagnosis seems to be invalidated by two other elements:

- Even though agricultural production conditions in 2006 were relatively less favorable than in 2003, notably because of a drop in the producer price of cotton and a rise in the price of agricultural inputs (linked to the rise in the price of oil), these conditions were clearly more favorable than in 2001—which notably reflects the doubling of the volume of cotton produced.

- The living condition indicator elaborated by the DNSI as a summary indicator of the aspects of housing comfort and equipment, and access to hygiene, sanitation and electricity shows that the non-monetary poverty rate fell by eighteen points between 2001 and 2006 in Sikasso, compared to five points nationwide.

In regard specifically to cotton farmers' situation, the analyses in the DIAL report show that their situation is very similar to that of other farmers. Regionally speaking, our analyses reveal above all the difficulty establishing a definitive ranking of the three regions, Sikasso, Kayes and Koulikoro, when it comes to monetary poverty.

References

- AFD (2002), “Perspectives économiques et financières des pays de la zone Franc”, *Jumbo Report*, September, Agence Française de Développement, Paris.

- AFD (2006), “Rapport de conjoncture et prévisions des pays de la zone franc : études pays”, *Jumbo Report*, April, Agence Française de Développement, Paris.

- DIARRA, S. and P. CISSE (2003), “Migrations et pauvreté au Mali”, in HERTRICH, V. and S. KEÏTA (eds.), *Questions de population au Mali*, Le Figuier/UNFPA Bamako.

- DNSI (2004), *Enquête malienne sur l’évaluation de la pauvreté (EMEP) 2001 : principaux résultats*, ronéo, Direction Nationale de la Statistique et de l’Information, Bamako.

- DNSI (2007), *Tendances et déterminants de la pauvreté au Mali (2001-2006)*, Direction Nationale de la Statistique et de l’Information, report produced with the World Bank and the contribution of the Belgium Partnership for Poverty Alleviation, Bamako.

- GOREUX, L. and J. MACRAE (2003), *Réformes des filières cotonnières en Afrique subsaharienne*, World Bank, and Ministry of Foreign Affairs, MAE, Paris.

- GRIMM, M. and I. GÜNTHER (2004), “How to achieve pro-poor growth in a poor economy. The case of Burkina Faso”, document prepared for the “Operationalizing Pro-Poor-Growth” project, GTZ, Eschborn.

- GRIMM, M. and I. GÜNTHER (2007b), “Pro-Poor Growth in Burkina Faso. The role of price shocks”, in GRIMM, M., A. MCKAY and S. KLASEN (eds), *Determinants of Pro-Poor Growth: Analytical Issues and Findings from Country Cases*, Palgrave-Macmillan, London.

- GRIMM, M. and I. GÜNTHER (2007a), “Growth and Poverty in Burkina Faso. A Reassessment of the Paradox”, *Journal of African Economies*, 16: 70-101.

- GÜNTHER, I., M.-A. MAROUANI and M. RAFFINOT (2006), *La croissance est-elle propauvres au Mali ?*, Working Document, DT/2006/15, DIAL, Paris.

• KELLY, V. J. TEFFT, J. OEHMKE and J. STAATZ (2004), "Identifying Policy Relevant Variables for Reducing Childhood Malnutrition in Rural Mali", *Staff Paper No. 2004-28*, Department of Agricultural Economics, Michigan State University, December.

• LAGANDRE, D. (2005), "Le secteur cotonnier en zone franc, entre succès et dépendance", *Jumbo Thematic Repor*t, No. 7, Agence Française de Développement, Paris.

• MESPLE-SOMPS, S., A.-S. ROBILLIARD, J. GRÄB, D. COGNEAU and M. GRIMM (2007), *Impact de la culture du coton sur les conditions de vie des ménages : étude sur le Mali et le Burkina Faso*, ronéo, Agence Française de Développement, Paris.

• OUEDRAOGO, N., A. SANOU and C. SISSAO (2003), "Étude de l'impact des variations du prix du coton sur la pauvreté rurale au Burkina Faso", report prepared with the support of GTZ, Ministry of the Economy and Finances, Ouagadougou.

• RAVALLION, M. (1994), "Poverty Comparisons", *Fundamentals of Pure and Applied Economics*, Vol. 56, Harwood Academic Press, Chur.

• WFP (2005), *Mali – Analyse de la sécurité alimentaire et de la vulnérabilité (CFSVA), données de décembre 2005*, Strengthening Emergency Needs Assessment Capacity (SENAC), World Food Programme, Bamako.

• WODON, Q., BRIAND, V., LABASTE KOFI NOUVE, P. and SANGHO, Y. (2006), "Cotton and Poverty in Mali", Draft World Bank Working Paper, Washington, DC.

• WORLD BANK (2005), *Pro-Poor Growth in the 1990s: Lessons and Insights from 14 Countries*, World Bank, Washington, D.C.