Distortions to Agricultural Incentives in Senegal

William A. Masters

Purdue University
wmasters@purdue.edu

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This chapter provides an overview and measurement of distortions to agricultural incentives in Senegal from 1961 through 2004. Senegalese agriculture is unusually specialized in just three products: groundnuts, rice and millet. Groundnuts have remained Senegal's premier export, rice remains the principle importable food, and millet is the principal food crop. Our data also include cotton, primarily because of its role elsewhere in the region. Several other products are of significance to particular communities within Senegal, but are much less important at the national level. These include both exportables such as fish, import-competing products such as meat or maize, and a range of items with little international trade such as sorghum and cowpeas. Fertilizers also play an important role, including phosphates which are exported as well as nitrogenous compounds which are imported.

Most descriptions of Senegal begin by noting that it was the favored capital of French West Africa, with Dakar as the French center for colonial administration and industry. This status led to an unusual economic structure, with a very large government and service sector relative to the country's size. Adjustment after Independence in 1960 was slow and painful. Real GDP in purchasing-power parity terms fell by over 20 percent during the 1960s and 1970s (Appendix Figure 1). This long decline ended in 1980, when Senegal became the world's first country to enter a World Bank-sponsored structural adjustment program. Incomes rose in the 1980s, fell again from 1988 to 1994, and have risen steadily since then. Policy changes were spread out over more than a decade, but since 1993 the country has enjoyed more than a decade of sustained growth, fueled by an exchange-rate devaluation in 1994 and subsequent aid flows.

A remarkable feature of Senegal's long decline and eventual turnaround is its relative steadiness. There was no growth collapse, and internal conflict was limited to a long but relatively small insurgency in the Casamance region which did not break out until after the decline had ended. For most Senegalese, relative peace and stability prevailed over a period that required wrenching changes in every aspect of Senegalese life, a situation that could easily have involved widespread violence and macroeconomic instability. Instead, the restructuring of Senegal's inefficient and inequitable colonial economic institutions was

spread out over more than 40 years. Many challenges remain and growth reversals may again occur, but the country now has a much more open and competitive economic structure and a more favorable outlook for the future.

The focus of this chapter is on Senegal's own policy choices. Other countries' policies are taken as given, considered to be part of Senegal's market environment. France has been particularly important, of course, through both fiscal transfers and market prices. French decisions set the starting point for Senegalese policy in 1960, and heavily influenced the opportunity costs for any subsequent reforms. Those opportunity costs are measured using Senegal's actual border prices even though these include European trade preferences and other countries' export subsidies, to capture the net effect of all influences on Senegal's market opportunities.

We focus on net effects within Senegal as well, treating each commodity category as a single market. In fact, Senegalese policy involved significant discrimination within markets, using quota allocations, fiscal transfers and cross-subsidies to favor particular groups such as marabout leaders in the groundnut basin. These cross-subsidies do not appear when measuring the aggregate average distortion from world prices. They may have been necessary for political stability, but they were probably costly for economic growth, making the reforms of the 1980s and 1990s even more valuable for future growth than the estimates in our data would imply.

Economic and structural change since 1955

> *The post-1955-56 period… was characterized by a general decline of output in (most) major industrial groups.*
>
> Diawa-Mory Traore (1969, pp. 37-38)

Senegal's economic structure was built by French colonials in the 19th and early 20th century. The country served as the administrative and logistical hub for French West Africa, exporting groundnuts and groundnut oil to metropolitan France while importing low-quality rice from French colonies in Southeast Asia. Revenues from this system were generally repatriated to France rather than reinvested within Senegal, so that even before Independence the country was in serious economic difficulty. And despite the country's large urban population,

agriculture continued to employ the vast majority of workers, so living standards for the poor were determined mainly by the country's farm productivity.

From 1960 through the mid-1980s, Senegal's total food output fluctuated but did not grow at all, while population more than doubled so that food output per capita declined by more than 50 percent. Since the reforms of the 1980s, total agricultural output has doubled, but population has doubled again so per capita production has been about constant. In Sub-Saharan Africa as a whole, total output has grown much faster, producing much less decline in output per capita than has occurred in Senegal (Appendix Figure 2).

The consequences of stagnant farm productivity for Senegal's trade are noteworthy. Exports of groundnut products grew briefly in the 1970s and again in the late 1980s but in each case have fallen back to their 1961 level. An expansion of the local groundnut-oil industry virtually eliminated the export of raw groundnuts in the late 1960s, but the sector as a whole did not grow in nominal US dollars, and so declined in real terms (Figure 1 and Appendix Figure 3). Stagnation of this sector is often attributed to limited demand on world markets, but the lack of aggregate growth despite local value added suggests that supply constraints were also important. At prevailing prices and productivity levels, farmers have been unable to devote more land or labor to any export, and the country as a whole has survived (albeit with high malnutrition rates) only thanks to steadily increasing food imports.

Net imports of all kinds can be a desirable counterpart to aid and capital inflows. In aggregate, they grew very rapidly in the 1970s and again from 1997, but food imports have followed a trend of their own, steadily increasing since the late 1970s. Only a small fraction of this trend is due to increasing imports of rice. Increasing imports of other cereal grains add to the trend, and since 1989 there have been even larger increases in the imports of other foods. In sum, stagnation of local agricultural production has led Senegal to devote a large fraction of available foreign exchange to food imports (Figure 1), with continued poverty allowing very limited improvement in dietary quality.

Table 1 presents the FAO's food balance sheet for Senegal, in their earliest (1961) and latest (2003) available years. The first pair of columns shows self-sufficiency ratios, and the second shows dietary composition. Cereals continue to dominate the diet, providing over 60 percent of calories, of which the share supplied by local production has declined from 0.73 to 0.43. Starchy roots account for a small and falling fraction of the food supply. The most unusual aspect of the Senegalese diet is its extraordinarily high consumption of vegetable oils, with lower-cost soybean oil replacing much of the groundnut oil that had been the focus of colonial development policy.

Most African countries have significantly increased their cropped area since the early 1960s, under pressure of rural population growth, but in Senegal there has been almost no increase (Appendix Figure 4). One reason why Senegalese farmers have not undertaken similar expansion into previously unattractive areas is that they lack profitable technologies with which to do so. That lack of profitable expansion opportunities is due in part to the country's unusual focus on groundnuts and millet. Some combination of a legume such as groundnuts with a cereal crop such as millet is typical of rainfed systems around the world, but Senegal's focus on these particular crops reflects the country's political history as much as its agronomic conditions. Groundnuts were deliberately imposed on farmers by the French in the late 19th and early 20th century, while millet became the dominant food grain by default due to the lack of investment in farmers' alternatives.

Raising incomes without a change of crop species is difficult. Some farmers are turning from groundnuts to cowpeas, and have recently also been turning from millet to maize. These other crops are widely grown in countries whose agronomic conditions are similar to Senegal's, but Senegalese farmers have had only limited access to appropriate new varieties that would stimulate substitution. The only crop with significant yield growth has been rice (Appendix Figure 5), which is grown under irrigation. Rice has benefited from a relatively high level of public research (Fisher, Masters and Sidibe 2000), but total irrigable area is small and limited. The major rainfed crops have a larger area under cultivation and probably more opportunity for expansion if only farmers had access to more-productive technologies.

Fertilizer use is a key contributor to sustainable crop productivity growth. Senegal is a significant exporter of phosphates, but it imports nitrogenous fertilizers. The value of phosphate exports rose suddenly in the mid-1970s, but declined steadily thereafter (Appendix Figure 6). Consumption of fertilizers grew throughout the 1970s, but was not associated with significant crop yield increases and quickly fell back to earlier levels. Since 1990, however, there has been a decade of steadily increasing fertilizer consumption, helping to lay a foundation for sustainable crop yield growth in the more-competitive farming systems.

Government policy in the colonial era

French colonial policies gave Senegal a distinctive social history. One key legacy is Africa's oldest tradition of electoral democracy. In 1848, France gave all Senegalese the right to vote in its national elections. This was the first universal-suffrage vote in Sub-Saharan Africa, and it resulted in the first African representative to a European parliament. Those elections may have had little practical influence on the colonial policies of the day, but could have helped establish the culture of representative government which Senegal has enjoyed since independence. Despite the political stress imposed by low and falling per capita incomes, independent Senegal is one of the very few African countries to have experienced repeated contested elections and only peaceful transfers of power, from Léopold Sédar Senghor to his chosen successor Abdou Diouf in 1981, and then to longtime opposition party leader Abdoulaye Wade in 2000.

A second key legacy of French colonialism is Senegal's unusually high level of urbanization. From 1902, Dakar was developed as the capital for all of French West Africa, with a far larger urban population than the Senegalese economy could efficiently support. At Independence, 32 percent of the population was urbanized, more than twice the average for Sub-Saharan Africa.[1] The city's administrative role left independent Senegal with an extraordinarily large civil service. The national government absorbed almost all of the functionaries who had previously governed French West Africa and then the Mali Federation, doubling the state operating budget during the transition period from 1957 to 1961 (Schumacher 1975, p. 123).

If the city of Dakar had been developed for commercial or industrial reasons one might expect Dakar's size to be a source of economic dynamism, but France's *pacte colonial* severely constrained local growth opportunities. Boone (1992) describes in detail how French trading houses were established and protected by colonial authorities. Their *traite* was a closed circuit of trade between France and its colonies, exporting groundnuts in exchange for high-priced French manufactures and consumer goods, including the lowest-quality broken rice from Southeast Asian colonies. After World War II, some import-substituting industries were established in Dakar, competing with French products but heavily protected against imports from elsewhere, with market shares dictated by negotiation among the trading houses and with the colonial government. The development of these subsidized industries imposed a double burden on the Senegalese economy, first by reducing the savings available for any

[1] By comparison, Ghana's urbanization rate at the time was also above average, but still only 23 percent. Within Sub-Saharan Africa, the next-highest urbanization rate was for Congo-Brazzaville (World Bank 2006). Only three countries in the entire world with similar or lower per capita incomes in PPP terms had higher urbanization rates: Egypt, Syria and Romania.

more efficient investment at that time, and then later by requiring massive adjustment costs when subsidies were removed.

Within agriculture, the country has a long history with groundnuts and millet. There was a long rise in groundnut production from the late 19th century until Independence, when it began to fall and was replaced by millet for own consumption. Now millet itself is being replaced by other foods in the 21st century (Appendix Figure 7).

An important question in Senegalese economic history is why the colonial government chose to focus on groundnuts, and why that focus proved to be so durable. Bonnefond and Couty (1991) suggest a number of contributing factors. One was the late-19th century availability of emancipated slaves, who had been freed in 1848 and could be put to the task under the leadership of local marabouts in what became the groundnut basin. A second was the completion of a railroad from that region to the sea. With abundant labor, an outlet to trade, and few other alternatives at hand, African farmers' groundnut production grew steadily throughout the colonial era, from an average of 31 thousand metric tons per year in 1886-1890 to its eventual peak after Independence. Growth was fastest in the early years, with production expanding by an average of 7.5 percent per year from 1885 until 1930. Growth slowed after 1930, partly due to a slowdown in area expansion, but also because there was no further productivity growth: average yields were 870 mt/ha in the 1930s, and have fluctuated around that level ever since.

France's 19th century investment in transportation and marketing infrastructure, which facilitated agricultural exports, unlocked the potential of inland areas to supply the coasts. Groundnut was an attractive product to export, but without colonial restrictions farmers would probably have been much more diversified, particularly if the alternative included government policies to support other crops. French colonial policy focused on groundnuts, however, and so they remained the only possible source of cash income for most rainfed farmers.

Agricultural policy since independence

After Independence in 1960 Senegal's political leadership used the colonial-era bureaucracy for a sequence of "socialist" and "nationalist" initiatives, to replace French entities with

Senegalese ones. Schumacher (1975) and Boone (1992) describe this process in detail, focusing on agriculture and industry, respectively.

For agriculture, the single most important institutional change was the introduction, in January of 1960, of the Office de Commercialisation Agricole (OCA), a state-owned enterprise created to replace the small group of French trading firms which dominated the circuit of groundnut exports and imports of rice and farm inputs. In particular, the OCA was given a legal monopoly over groundnut marketing, to be exercised by licensing either private buyers or, preferably, one of the state-promoted rural cooperatives. It was also charged with arranging for increased imports of farm inputs, using its legal monopoly over the groundnut trade to recoup operating loans to farmers for the purchase of those inputs. The OCA was also given a monopoly over rice imports, which it allocated to local traders with some limited controls over resale prices. Loans were administered by another new entity, the Banque Sénégalaise de Développement (BSD), in collaboration with the rural development services which were reorganized into a set of Centres Régionaux de l'Assistance pour le Développement (CRADs) and local cooperatives.

The OCA-BSD-CRAD-cooperative system was able to maintain the groundnut circuit in the first few years of independence, avoiding the most likely alternative which would have been a sudden collapse of trade volumes and a period of extreme hardship. Replacing French traders with state-owned enterprises kept trade flowing, but the whole enterprise was almost certainly unsustainable. Margins were shrinking and, within the marketing chain, agents at each stage found opportunities for diversion: individual farmers against their cooperatives, cooperative managers against their lenders, loan officers against the OCA. As detailed by Schumacher (1975), similar problems had plagued colonial administrators. Instead of liberalizing, however, the new government responded by attempting to eliminate private markets entirely, and attempting to use administrative means to control corruption within the bureaucracy.

In 1966-67, the OCA was replaced by an agency with an even broader mandate: the Office Nationale de Cooperation et d'Assistance au Developpement (ONCAD), charged with input distribution and transport as well as groundnut marketing. ONCAD then lasted for about a decade, before being itself dissolved in 1980. The pace of change was dictated in part by France's willingness to support the Senegalese structures it had helped create. But decolonization coincided with European integration, so that France's trade preferences had to be extended to Europe as a whole. These trade preferences, and some fiscal transfers, were governed by a series of agreements among European countries with their former colonies:

first the Yaoundé Convention of 1963, soon followed by the Lomé Convention and now the Cotonou Agreement which took effect in 2002. It is not clear whether these agreements improved or worsened conditions for Senegal, or what the counter-factual might have been. In this study, we take this external environment as given.

By the end of the 1970s, the Senegalese economy was among the most distorted in West Africa. In 1980, Senegal became the first of the region's countries to start a World Bank-sponsored Structural Adjustment Program, but the reform process was slow. In the rice market, for example, a comparison of government interventions across 12 West African countries in 1979 gave Senegal a score of 0.5 on a zero-to-9 scale, where 9 is "generally competitive, with market determined prices" (Randolph 1994, Table 2). The only other country to score below 2 was Mauritania, with a score of 0.7. By 1993, after more than a decade of reform, Senegal had raised its score to 3.9 but it still had the most highly controlled market of the region (Randolph 1994, Table 5). Jammeh (1987) provides a detailed description of the reforms undertaken in the 1980s.

In retrospect, what is most notable is how many of the changes introduced under the "New Industrial Policy" between 1986 and 1988 were subsequently reversed. By 1993, just prior to the region-wide devaluation of the CFA Franc, Senegalese tariff rates were very high (75 percent on consumer goods produced locally, 45 percent on other consumer goods). Government limited competition among domestic firms as well, with *conventions speciales* protecting privately-owned monopolies in sugar, cement and petroleum as well as continued government control of rice imports, groundnut processing and the ports (IMF 1995, p. 29).

Price comparisons and the measurement of distortions

To measure distortions over time in a consistent way, we use the methodology of Anderson et al. (2008). The focus is on government-imposed distortions that create a gap between domestic prices and what they would be under free markets. The method relies on historical observations of prices paid or received in foreign trade, combined with a set of assumptions about the marketing margins that would have applied. Since it is not possible to understand the characteristics of agricultural development with a sectoral view alone, the project's methodology not only estimates the effects of direct agricultural policy measures (including distortions in the foreign exchange market), but it also generates estimates of distortions in

non-agricultural sectors for comparison. We compute the Nominal Rate of Assistance (NRA) for various farm industries, and we also provide an estimate of NRAs for nonagricultural tradables, which is compared with that of agricultural tradables via the calculation of a Relative Rate of Assistance (RRA).

Our analysis does not consider interventions in input prices. For Senegal those are likely to have been very small relative to distortions to prices of outputs, and in any case we have insufficient observations to provide useful estimates. Thus, our results hinge on simple price comparisons in each product market, net of our assumptions about marketing margins and our estimate (again following the project's methodology outlined in Anderson et al. 2008) of exchange rate distortions in each year.

Groundnut prices and marketing margins

Our approach to the groundnut market focuses on the opportunity cost of the raw nuts (in their shells), prior to processing into groundnut oil. This measures the NRA for the production of the groundnuts themselves. We tried to obtain satisfactory data on processing costs and market prices for groundnut oil, so as to measure the nominal protection afforded to the operations of SONACOS, the parastatal groundnut processor. This proved impossible for us to do because of the lack of transparency in SONACOS, which since 2003 has been slowly privatized under intense political scrutiny. In January 2007, SONACOS was renamed Suneor and is majority owned by Advens, a private consortium. Looking back over the history of SONACOS, it is clear from the pricing of raw nuts that its operations have been highly subsidized at the expense of farmers, taxpayers and oil consumers. One estimate for marketing year 2001-02 suggests that, given all of SONACOS's procurement costs, its tradable inputs were subsidized at a rate of about 23 percent, which more than offset the 8.5 percent premiums it paid on nontradable factors such as labor, and was much larger than the 7.7 percent implicit subsidy that SONACOS received from protection on it sales. The net effect was a substantial transfer to SONACOS, amounting to 20 percent of the firm's market revenue (République du Sénégal 2003). In the absence of a time-series for such operational data, however, we cannot determine the full extent of distortions in the processing sector.

Our price comparison method starts with the unit values of Senegal's raw nut exports, obtained from FAO file data, and compares them with estimated farm-gate selling prices reported by a sequence of published sources for various periods of time. The farm-gate prices are from Boone (1992, p. 200) for 1959 and 1966-79, Kelly and Delgado (1991, p. 104) for

1980-89, and the IMF (2005, p.42) for 1997-04, with linear interpolations for the periods between those observations. These published sources report prices from a variety of official publications and official file data. We could find no contemporary publication or file data with a complete time series for the entire 1960-2004 period.

Since the FAO unit values are measured at Dakar whereas the farmgate prices are paid in the groundnut basin, the observed price difference between them includes transport and marketing costs. The price distortion due to trade restrictions is the observed price difference minus our estimate of what those costs would be in the absence of government trade restrictions. Our best estimate of this margin is borrowed from Kite (1993, p.10), who quotes a margin from the Groundnut Basin to Dakar for competitive traders of cereal grains equal to 17 percent of the farmgate price. This is likely to be an upper bound for the cost of groundnut marketing, since at least some of the margin would be a per ton charge for transport, and the groundnuts have a higher value than grains. If the margin was lower, implied rates of taxation would be greater. To proceed conservatively, we apply this same percentage margin to this crop for all years.

In addition, the FAO unit values refer to much higher grade nuts than the national average. An adjustment for quality differences must be made as well as the adjustment for transport costs mentioned above. We could not find an independent estimate for the historical market value of this quality differential, and so we used a conservative calibration approach. We sought the percentage quality differential which, when applied over all years, resulted in the smallest level of taxation, given our observation that there was no period of sustained groundnut-production subsidies. This approach is conservative in the sense that it might understate the absolute value of taxation, if the market value of the quality premium for exported nuts were actually smaller than our calibrated value. The calibration procedure yields an estimated price premium of 35 percent for export-quality as opposed to the national average quality, which we consider plausible. One important aspect of this result is that it includes the policy rent paid by European importers due to trade preferences for Senegalese country of origin, in addition to European consumers' valuation of the product's intrinsic quality. From Senegal's point of view, however, this policy rent can be taken as given, serving as a marginal incentive just like any other type of willingness to pay.

Rice prices and marketing margins

Our approach to rice is similar to that for groundnuts, in that we compare FAO file data on the unit values of Senegal's rice imports against published estimates of farmgate prices, net of our estimates for the marketing margins and quality premia that would be paid for these transactions in the absence of trade restrictions. We start with import unit values from the FAO, which refer principally to broken rice from Southeast Asia. We then compare these with farmgate prices reported by Randolph (1997, p. 84) for 1961-95, plus IMF (2005, p. 42) for 1997-04. In this case there is only one missing value, for1996, which we interpolate linearly from the 1995 and 1997 observations. As with groundnuts, we could find no publication or data source with a continuous time series.

For transport costs between Dakar and rice farmers, again we use the 17 percent estimate of Kite (1993, p.10), and apply it uniformly to all years. For product quality adjustments, we note that imported rice is usually of a much lower quality than that produced domestically in Senegal. In the absence of an independent estimate for the historical market value of this quality differential, we used a similar calibration approach as with groundnuts. Our goal in this case was to find the uniform percentage quality differential which, when applied over the entire period, is consistent with the policy observation of approximately zero net taxation or subsidies over the decade of the 1960s. This calibration procedure yields an estimated discount for imported rice of 30 percent, which we find consistent with anecdotal evidence.

An important caveat is that this quality discount is calibrated to fit historical prices, and it is possible that quality values have not only fluctuated but also trended over the years. (We would have no such trend error in the groundnuts case, since that calibration was based on observations about policy over the entire period.) But it turns out that the 30 percent quality differential calibrated for the 1960s is also consistent with no non-tariff barriers to rice traders after liberalization in 1995, which gives us some confidence in the stability of this parameter over time.

Millet prices and marketing margins

Millet is included in this study to represent the large fraction of Senegalese agriculture which is produced and consumed primarily within rural areas. This basic food is actively traded across short distances, but its low value-to-weight ratio limits the extent of long-distance transport and international trade. This grain is a necessity for the rural poor, but effective market demand is limited as higher-income consumers prefer foods that require less preparation time or have other attractive characteristics. There is no price distortion due to government intervention. On the other hand, there is also little public investment in new technology or other drivers of productivity growth. We treat this product as nontradable internationally.

Millet is normally much less valuable than rice, but it appears to have become more costly than rice in the past decade (Appendix Figure 8). This switch in national-average farmgate prices is probably due mainly to differences in the location of production, as rice is increasingly abundant in irrigated and urban areas while millet remains in the dryland regions where it is grown for local consumption.

Quantities produced

Quantities produced are used for the computation of aggregate NRAs. Weights are based on FAO estimates of total production valued at undistorted prices. Rice production grew rapidly from 1973 to 1990, when real farmgate prices fluctuated with no trend, and then production stayed constant after 1990 even as real farmgate prices fell sharply. This suggests significant shifts in the rice supply curve, due perhaps to public investment in genetic improvement and infrastructure, especially for irrigation. In contrast, estimated production of both groundnuts and millet has trended down in recent years, despite roughly constant real prices (Appendix Figures 8 and 9).

Exchange rates and macroeconomic distortions

Distortions to the market for foreign exchange have been small in Senegal relative to other African countries. Like most other former French colonies in Africa, Senegal has never had its own monetary policy. After Independence the colonial currency, the *franc des Colonies Françaises d'Afrique* (CFA Franc) was simply renamed the *franc de la Communauté*

Financière de l'Afrique using the same acronym and the same fixed rate of 50 CFAF per French Franc. Convertibility was guaranteed by capital inflows from France, underwriting the balance-of-payments deficit of the CFA region with the rest of the world. Senegal accounted for a very small fraction of these inflows, but the total payment needed to support the currency became increasingly unsustainable and on 12 January 1994 the region's currency was devalued to 100 CFAF per French Franc. It has remained convertible at that valuation ever since, switching its peg to the Euro in January 1999.

The real exchange rate consequences for Senegal of the CFAF's fixed nominal rate are illustrated in Figure 2(a). The Real Effective Exchange Rate (REER) shown there is the IMF's measure of differential inflation between Senegal and its trading partners, after conversion between currencies at official exchange rates. What is most noticeable is the relative stability of Senegal's real exchange rate. The country did have faster inflation than its trading partners during the 1981-86 period, resulting in an appreciation of its REER totaling about 24 percent over five years, but then it had slower inflation and a depreciation until 1994 that returned the REER back to its 1981 level. There was only one year of appreciation after the devaluation of 1994, followed by another five years of low inflation and REER depreciation, before a slight upturn in the REER in 2001-2003.

Clearly, Senegal has not experienced the same inflation-induced overvaluation as many other countries – including many of its neighbors in the CFA zone. Indeed, relative to other countries, Senegal's macroeconomic policies caused the country's price level at official exchange rates to gain only about 30 percent in value in the decade before the 50 percent devaluation imposed by France. This limited degree of overvaluation is shown in Figure 2(a) by the difference between the IMF's REER and the estimated Equilibrium Real Exchange Rate (EqRER), which is the econometric result of an exercise conducted by Elbadawi (2006), using a worldwide panel of REERs and their determinants to estimate what each country's REER would be without the influence of short-term fluctuations in unsustainable fiscal and monetary policies. The difference between the REER and the EqRER is an estimate of RER misalignment (RERmis), with an increase in RERmis reflecting an increasingly overvalued currency. The 1994 devaluation much more than compensated for any of Senegal's own macroeconomic imbalances, although the overshooting was quickly eroded and by 2004 the RERmis index was back to where it started in 1980.

For a consistent measure of policy-induced distortions in agriculture, instead of RER misalignment we will use the information implied by the Easterly (2006) data on black market premiums paid for the CFAF in parallel markets. These data, reported in Figure 2(b),

show that despite the French effort to support the CFAF, a small degree of excess demand for foreign currency prevailed from 1960 through 1970, and again in most years from 1978 through 1993, and also in 2002-2004. The project's approach (Anderson et al. 2008) is to compute an undistorted marginal value of foreign exchange earned or saved as a blended average between the black market premium and the official exchange rate. This is shown in Figure 2(b) as the dashed line, roughly half-way between the other two. Since the black market premium is small, this kind of distortion is of little consequence for our estimates.

NRA estimates

The net effect of government policies on agricultural incentives are summarized by the prices in Figure 3 and the NRAs in Figure 4 and Table 2. During the early 1960s, groundnut production was moderately taxed (and groundnut processors thereby helped), while rice production was slightly subsidized (and rice consumers thereby harmed). This pattern of protection, restricting both exports and imports, imposed a moderate level of anti-trade bias, which widened considerably over the 1970s. For groundnuts and cotton, export prices rose much faster than the farmgate price in the 1970s, then fell in the 1980s before rising again after 1995. Domestic prices followed the trend, but with much greater stability. A similar story applies to rice. In both cases, domestic prices were institutionally fixed, and year-to-year changes in distortions were driven by changes in foreign prices. During the brief period of high import prices in 1974-75, rice producers were slightly taxed to the benefit of consumers in contrast to the twenty years thereafter when lower international prices resulted in a very high level of protection for rice producers. Both of these were largely eliminated after 1995, although we estimate that there remained moderate taxation of groundnut and cotton producers. There has been very little short-term correlation between domestic and foreign prices until the experience with groundnuts after 2000 (Figure 3).

When combined with the zero distortion to the price of nontradable millet (whose share of the value of farm production has been in the range of 15-30 percent), the overall NRA for the four covered products has fluctuated from less than 15 percent taxation in the 1960s to more than 30 percent taxation in the 1970s and early 1980s, before turning to slightly positive support in the latter 1980s when international national prices were extremely low and then settling at around 10 percent taxation in the past decade or so.

For other farm products (roughly one-third of overall farm production), in the absence of commodity-specific data we guesstimate that 30 percent is import-competing with an

average NRA of 20 percent from import restrictions, another 30 percent is exportable with an average NRA of -10 percent from export restrictions, and 40 percent is nontradable with no distortions. That yields an average NRA for non-covered farm products of around 3 percent when the distortions to exchange rates also are taken into account, and hence a slightly less negative NRA average for the entire sector than for just covered products (upper half of Table 3).

The lower half of Table 3 compares the NRAs for the tradable part of the agricultural sector with our guesstimate of the NRA facing producers of tradable nonagricultural goods. For the latter we assume that two-thirds of the value of production of those goods are import-competing with an average NRA of 20 percent from import restrictions and one-third is exportable with an average NRA of -10 percent from export restrictions. That yields an average NRA for nonagricultural tradables of around 7 percent when the distortions to exchange rates also are taken into account, and hence a more negative RRA than NRA for agricultural tradables (lower half of Table 3). That is, this guesstimate for assistance to nonfarm producers worsens our estimate of the anti-agricultural bias in Senegal. As can be seen from the annual data in Figure 5, that bias was present for all but 3 years in the period from independence to 2004.

Finally, the bottom three rows of Table 3 show what some the key indicators would have been if exchange rate distortions had not been included. The NRAs and RRA change little, suggesting that policy measure was not a significant part of the distortions to agricultural incentives in Senegal.

Conclusions

Senegal's groundnut and rice trade policies have maintained relatively stable domestic prices for these two products. This has had the effect of providing an anti-trade bias within the agricultural sector. It also meant an increase during the 1970s and a decrease in the latter 1980s in the country's anti-agricultural bias. More recently, the completion of agricultural market reforms, towards liberalized rice trade in the late 1990s and the privatization of groundnut processing in the current decade, have led to a somewhat smaller level of distortion now that prior to the mid-1980s.

The unwinding of Senegal's colonial institutions has been among the slowest in Africa, extending over more than 40 years. Senegalese incomes fell significantly over the first half of that period, but there was no sudden growth collapse and no country-wide civil strife. A continuous practice of electoral democracy has been maintained, with peaceful transfers of political power. This remarkable political achievement, together with the establishment of new institutions for competitive markets in agriculture and throughout the economy, provides a potentially very strong foundation for sustained economic growth in the future. It will take decades for the country to overcome the legacy of widespread malnutrition and low agricultural productivity, but with open trade policies and macroeconomic stability, there is now the opportunity for new investments in both the private and public sectors that could have a dramatic payoff in terms of poverty reduction and economic growth.

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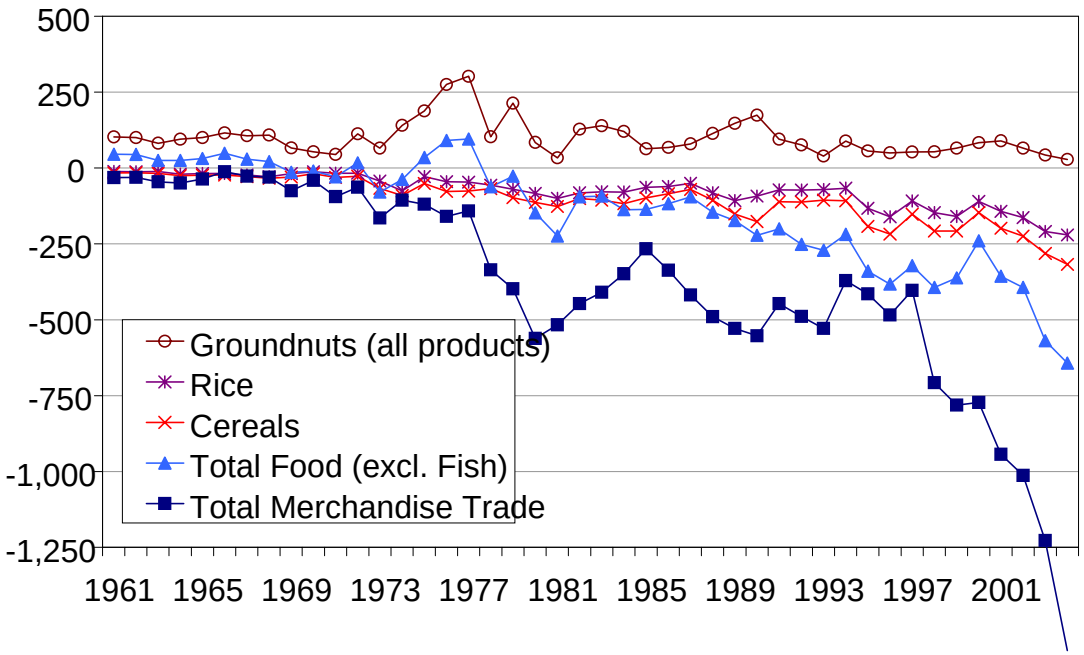
Figure 1: Net merchandise trade, Senegal, 1961 to 2004

(exports minus imports, US$ millions)

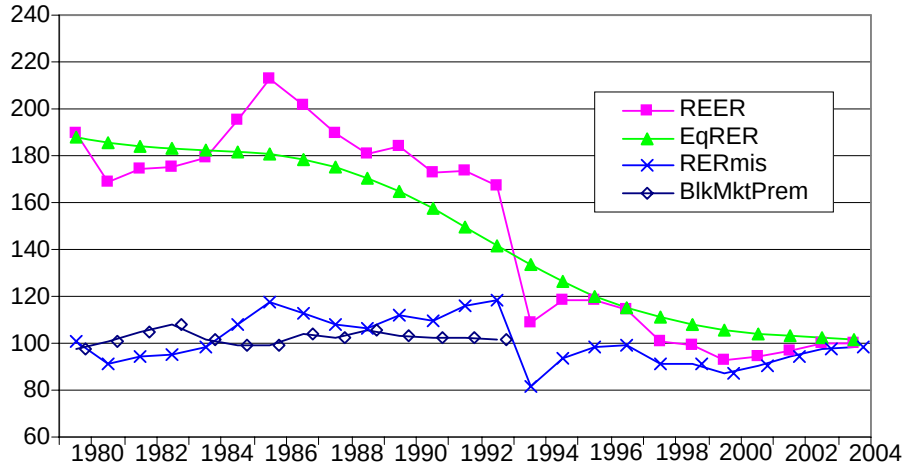


Note: Value for total merchandise trade in 2004 was -US$1,590 m. (not shown).

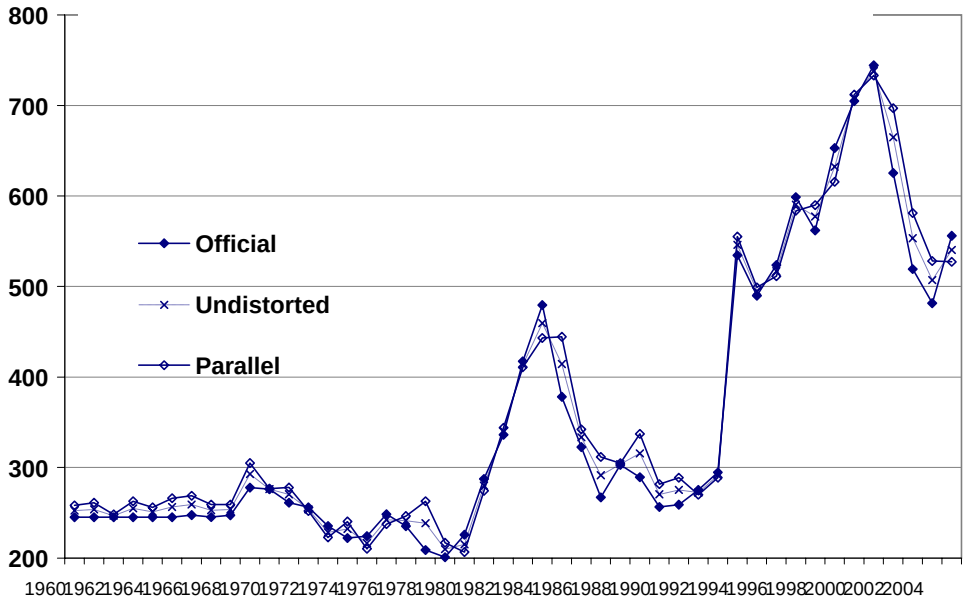
Source: Author's calculations from FAO (2006) data.

Figure 2: Foreign exchange rates, Senegal, 1960 to 2005

(a) Real exchange rates, 1980 to 2004 (2004 = 100)

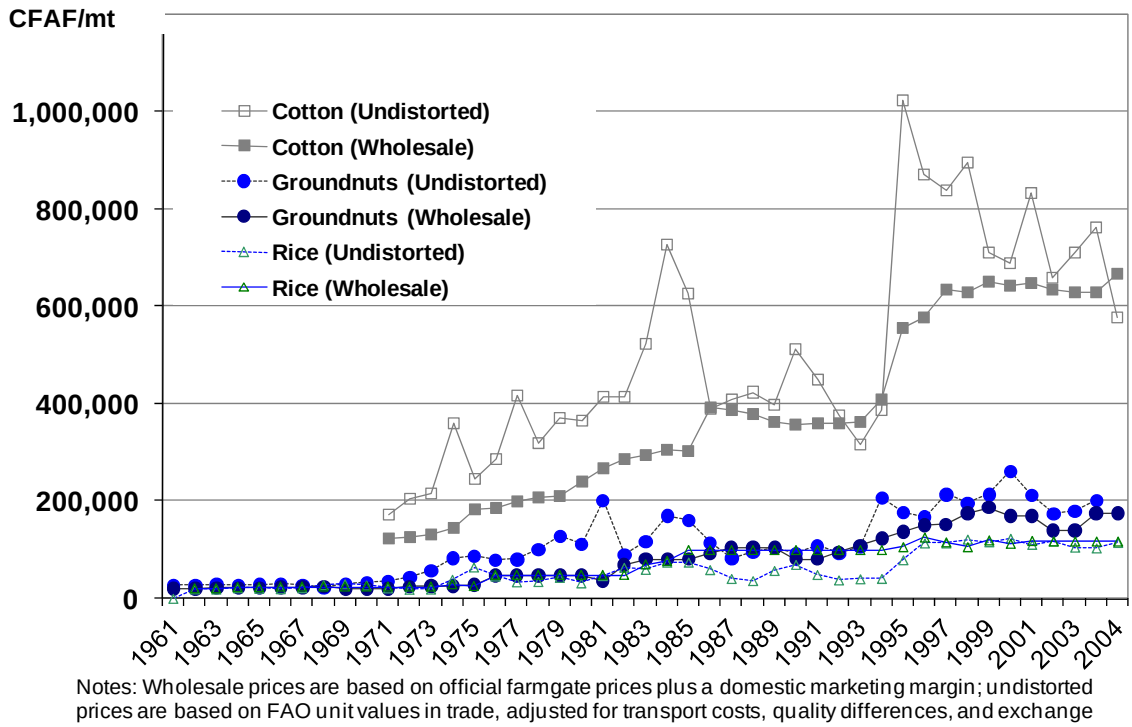


(b) Nominal exchange rates, 1960 to 2005 (CFA per US$)



Note: Author's estimate of the undistorted rate is based on the methodology of Anderson et al. (2008).
Sources: Official exchange rates from IFS (2006), black market/parallel rates from Easterly (2006), RER indexes from Elbadawi (2006)

Figure 3: Wholesale and undistorted prices, Senegal, 1961 to 2004
(real CFAF/mt)

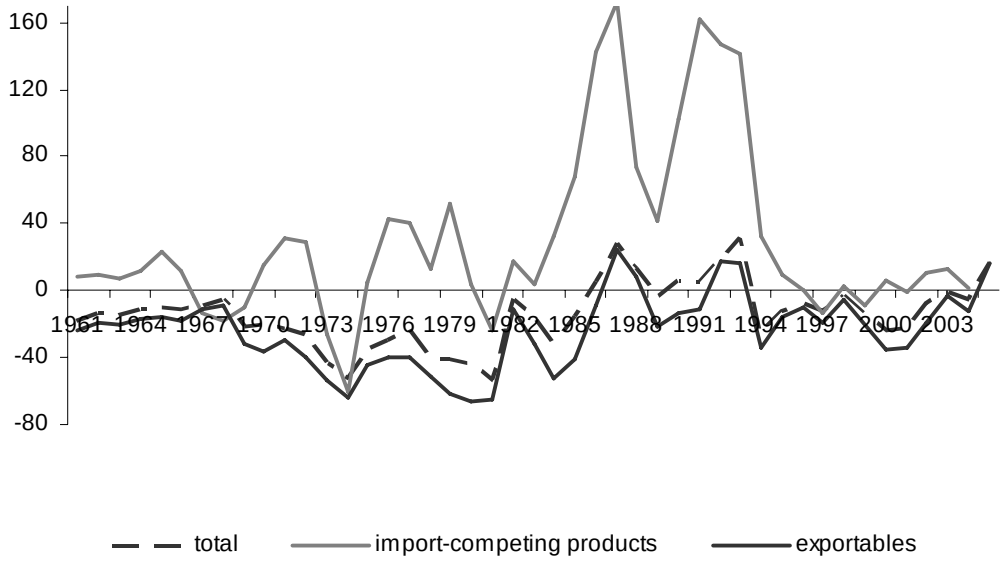


Notes: Wholesale prices are based on official farmgate prices plus a domestic marketing margin; undistorted prices are based on FAO unit values in trade, adjusted for transport costs, quality differences, and exchange

Note: Data shown are in real CFAF at 2004 prices, deflated by CPI from IMF *International Financial Statistics.*
Source: Author's spreadsheet

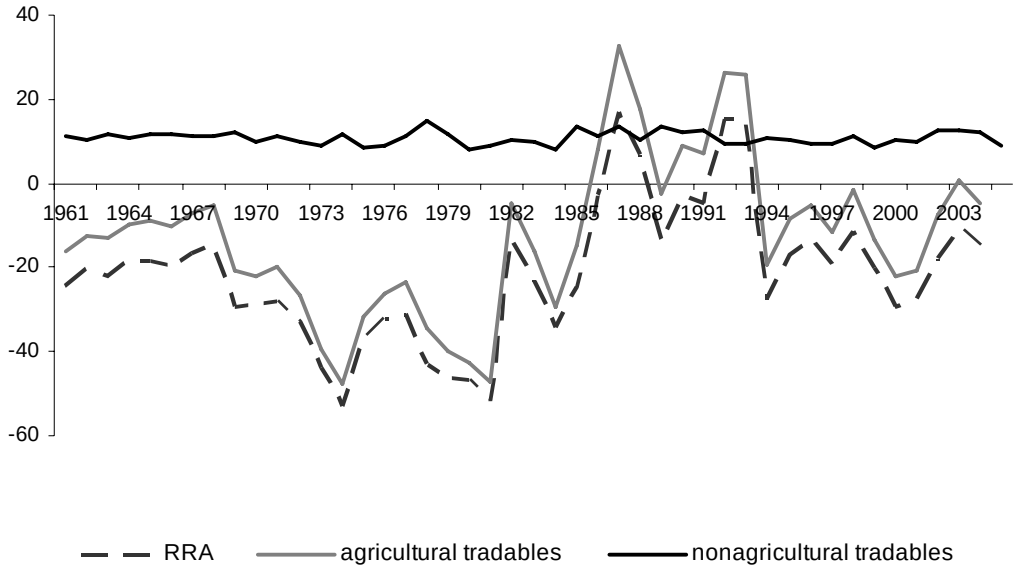
Figure 4: Nominal rates of assistance to exportables, import-competing and all[a] agricultural products, Senegal, 1961 to 2005

(percent)



Source: Author's spreadsheet
a. The total NRA can be above or below the exportable and import-competing averages because assistance to nontradables and non-product specific assistance is also included.

Figure 5: Nominal rates of assistance to all nonagricultural tradables, all agricultural tradable industries, and relative rates of assistance[a], Senegal, 1961 to 2005
(percent)



Source: Author's spreadsheet
a. The RRA is defined as $100*[(100+NRAag^t)/(100+NRAnonag^t)-1]$, where $NRAag^t$ and $NRAnonag^t$ are the percentage NRAs for the tradables parts of the agricultural and nonagricultural sectors, respectively.

Table 1: Food balance sheet data, Senegal, 1961 and 2003

	Self-sufficiency ratio (Production/Utilization)		**Dietary composition** (Percent of calories)	
	1961	2003	1961	2003
Total number of calories			2,290	2,374
Cereals - excluding beer	0.73	0.43	60.6	60.4
Wheat			5.2	9.2
Rice (milled equivalent)	0.34	0.15	20.4	32.0
Maize	0.59	0.66	4.6	4.5
Millet	1.00	1.00	23.1	9.6
Sorghum	0.95	1.00	6.8	5.1
Starchy roots	0.94	0.83	5.7	2.3
Cassava	1.00	0.99	5.0	1.9
Sugar and sweeteners	0.00	0.61	8.5	6.0
Pulses	0.98	0.96	1.4	1.2
Groundnuts (shelled equiv.)	1.62	1.00	3.4	2.1
Vegetable oils	4.15	0.50	8.3	15.1
Groundnut oil	5.03	1.56	6.9	5.0
Soyabean oil				7.7
Palm oil	0.55	0.17	1.2	1.3
Vegetables	0.55	0.88	0.7	1.6
Tomatoes	0.12	0.55	0.3	0.1
Onions	0.43	0.62	0.2	0.6
Vegetables, Other	0.97	0.98	0.2	1.0
Fruits	0.70	0.83	0.6	0.7
Bananas	0.91	0.36	0.0	0.1
Meat	0.99	0.92	2.8	3.2
Bovine	0.98	0.97	1.8	1.0
Poultry	0.97	0.84	0.1	1.1
Milk (excluding butter)	0.78	0.48	2.4	2.2
Eggs	0.88	0.99	0.1	0.4
Fish, seafood	na	na	1.5	2.3

Source: Author's calculations from FAOSTAT (2006) Food Balance Sheet data.
Note: Self-sufficiency ratio is computed as production plus stock change, divided by total utilization (labeled as "domestic supply" by the FAO).

Table 2: Nominal rates of assistance to covered farm products, Senegal, 1961 to 2004

(percent)

	1961-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04
Exportables [a, b]	**-19.9**	**-17.3**	**-44.6**	**-47.8**	**-45.4**	**-7.7**	**-5.2**	**-14.2**	**-20.8**
Groundnuts	-19.9	-17.3	-44.4	-47.7	-44.7	-7.4	-5.0	-13.7	-21.1
Cotton	n.a.	n.a.	-47.9	-50.6	-55.7	-15.0	-11.1	-26.5	-10.0
Import-competing products [a, b]	**9.5**	**-1.4**	**-2.3**	**30.5**	**6.6**	**99.4**	**117.1**	**-2.1**	**5.9**
Rice	9.5	-1.4	-2.3	30.5	6.6	99.4	117.1	-2.1	5.9
Nontradable [a]	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Millet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total of covered products [a]	**-14.6**	**-11.7**	**-33.2**	**-33.7**	**-30.3**	**5.2**	**6.7**	**-9.9**	**-12.1**
Dispersion of covered products [c]	20.3	16.1	33.5	44.5	38.2	58.8	67.1	14.3	18.6
% coverage (at undistorted prices)	70	70	70	70	70	70	70	70	70

Source: Author's spreadsheet

a. Weighted averages, with weights based on the unassisted value of production.

b. Mixed trade status products included in exportable or import-competing groups depending upon their trade status in the particular year.

c. Dispersion is a simple 5-year average of the annual standard deviation around the weighted mean of NRAs of covered products.

Table 3: Nominal rates of assistance to agricultural relative to nonagricultural industries, Senegal, 1961 to 2004
(percent)

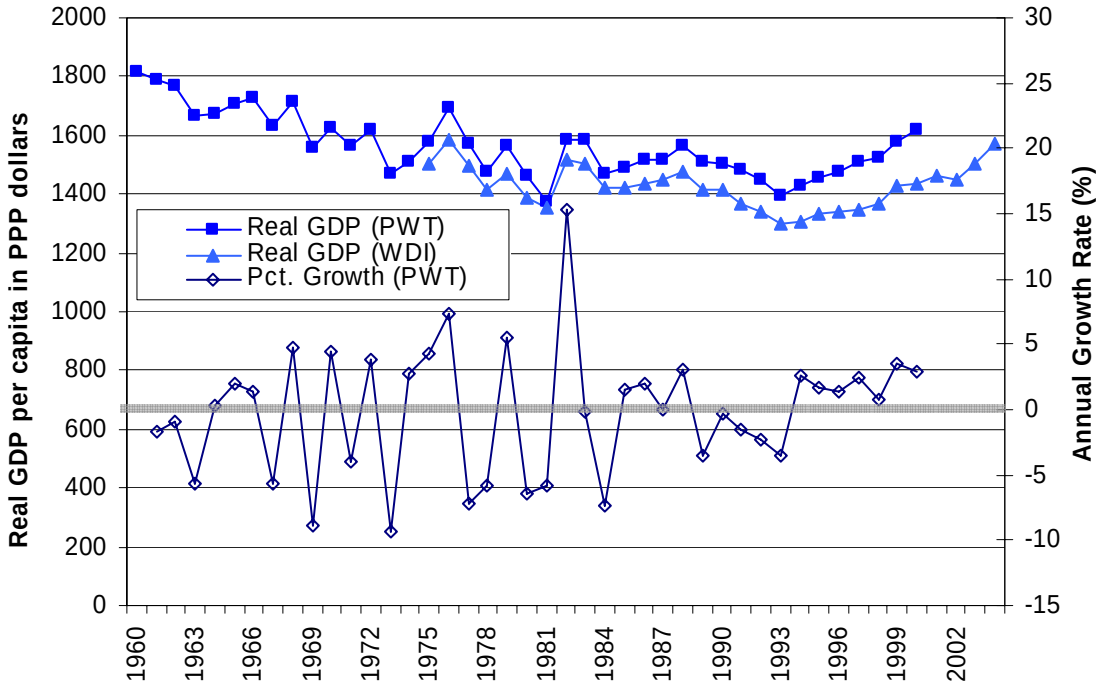
	1961-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04
Covered products	-14.6	-11.7	-33.2	-33.7	-30.3	5.2	6.7	-9.9	-12.1
Non-covered products	3.2	3.3	3.1	3.2	2.8	3.4	3.2	3.0	3.2
All agricultural products	-9.3	-7.2	-22.4	-22.7	-20.5	4.7	5.6	-6.1	-7.5
Trade bias index[a]	-0.32	-0.27	-0.47	-0.53	-0.47	-0.42	-0.42	-0.20	-0.30
Assistance to just tradables:									
All agricultural tradables	-12.7	-10.5	-30.9	-31.1	-28.0	8.2	9.7	-8.1	-10.9
All non-agricultural tradables	11.1	11.6	10.3	11.1	9.1	12.4	10.9	9.8	11.4
Relative rate of assistance, RRA[b]	**-21.4**	**-19.8**	**-37.4**	**-37.9**	**-34.1**	**-3.6**	**-1.0**	**-16.3**	**-20.1**
MEMO, ignoring exchange rate distortions:									
NRA, all agric. products	-8.2	-5.8	-22.2	-22.0	-21.0	6.6	6.2	-6.2	-6.6
Trade bias index[a]	-0.29	-0.22	-0.47	-0.51	-0.49	-0.36	-0.40	-0.21	-0.25
RRA (relative rate of assistance)[b]	-19.3	-16.8	-36.9	-36.5	-35.0	1.2	0.7	-16.6	-17.7

Source: Author's spreadsheet

a. Trade bias index is TBI = $(1+NRAag_x/100)/(1+NRAag_m/100) - 1$, where $NRAag_m$ and $NRAag_x$ are the average percentage NRAs for the import-competing and exportable parts of the agricultural sector.

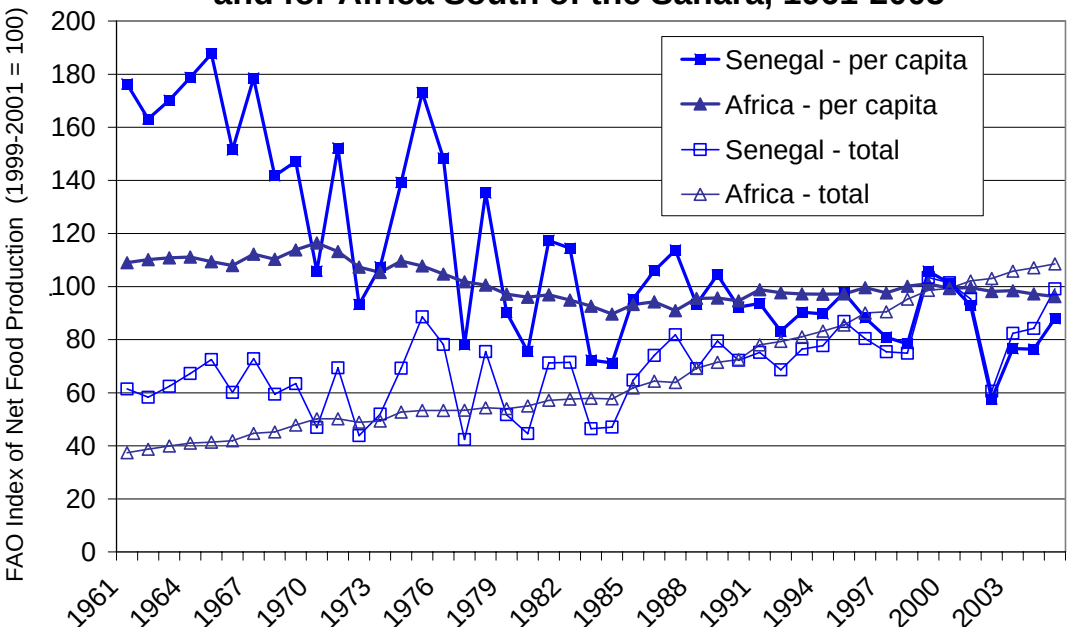
b. The RRA is defined as $100*[(100+NRAag^t)/(100+NRAnonag^t)-1]$, where $NRAag^t$ and $NRAnonag^t$ are the percentage NRAs for the tradables parts of the agricultural and non-agricultural sectors, respectively.

Appendix Figure 1:
Per-capita real GDP and growth in Senegal, 1960-2004

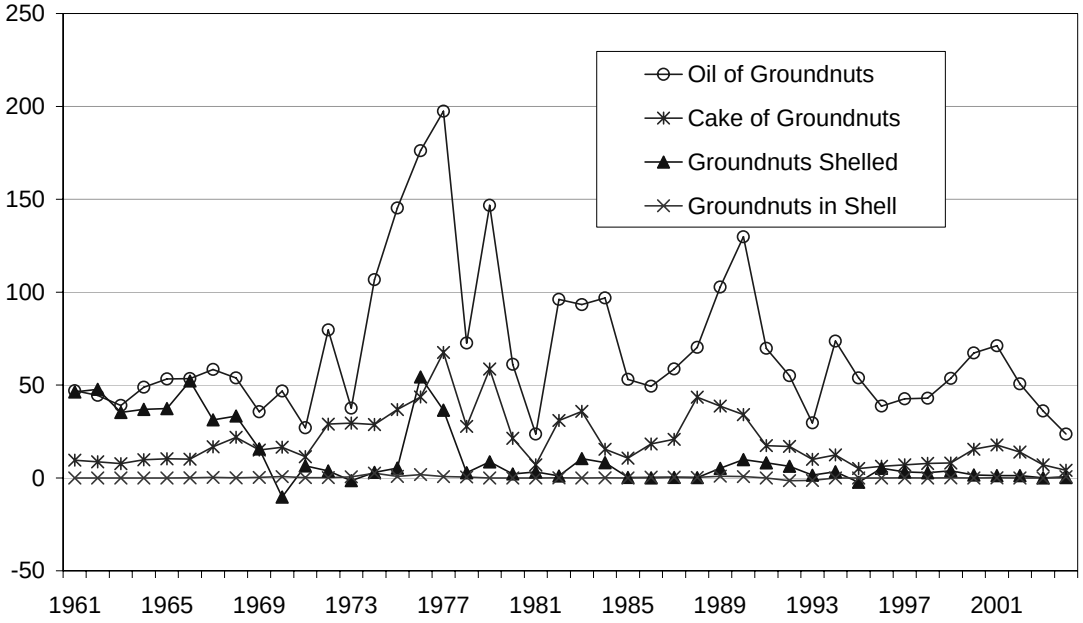


Sources: PWT data (1960-2000) are RGDPCH from Penn World Tables 6.1 (2002);
WDI data (1975-2004) are GDP.PCAP.PP.KD from World Development Indicators (2006).

Appendix Figure 2:
FAO Food Production Indexes for Senegal and for Africa South of the Sahara, 1961-2005

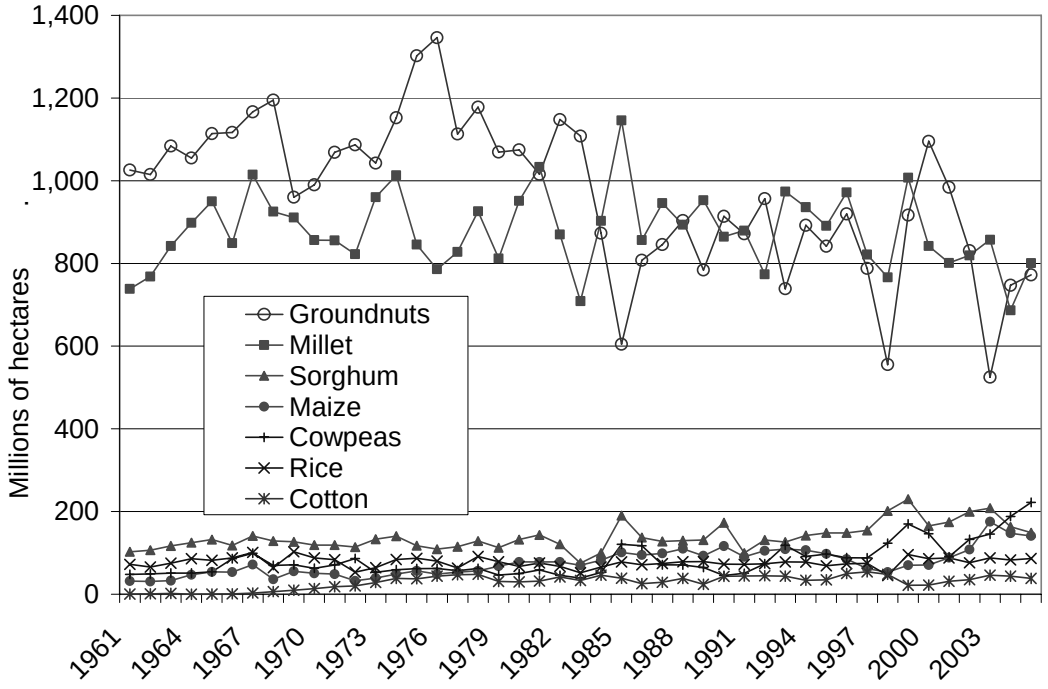


Appendix Figure 3:
Net Groundnut Exports, 1961-2004 (US$ millions)

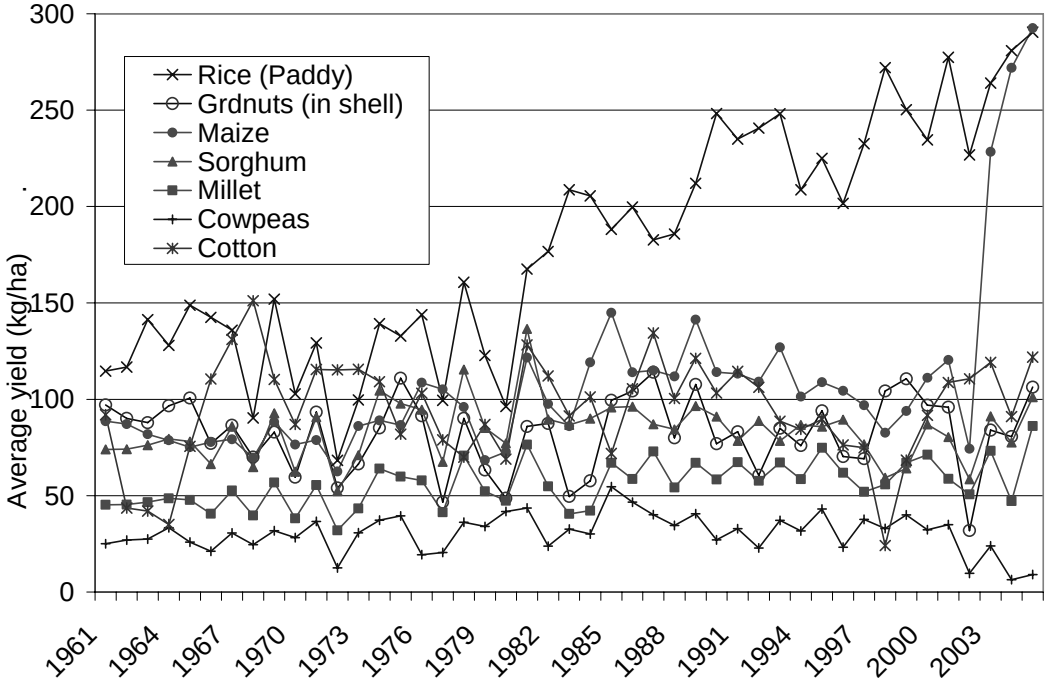


Source: Authors' calculations from FAO (2006) data.

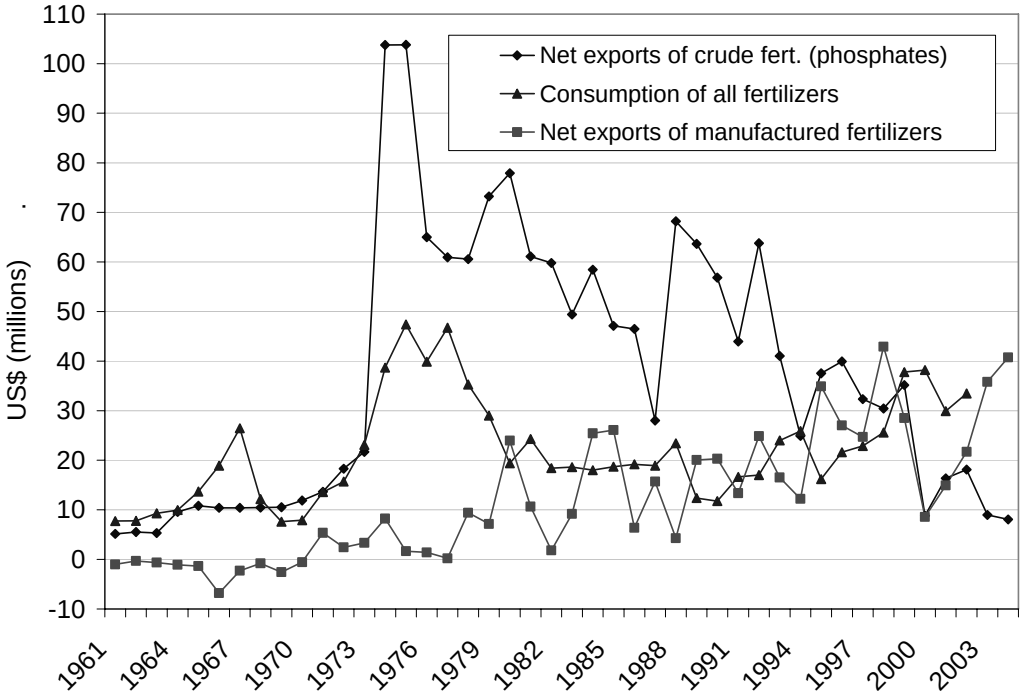
Appendix Figure 4:
FAO Estimate of Crop Area Harvested, 1961-2005



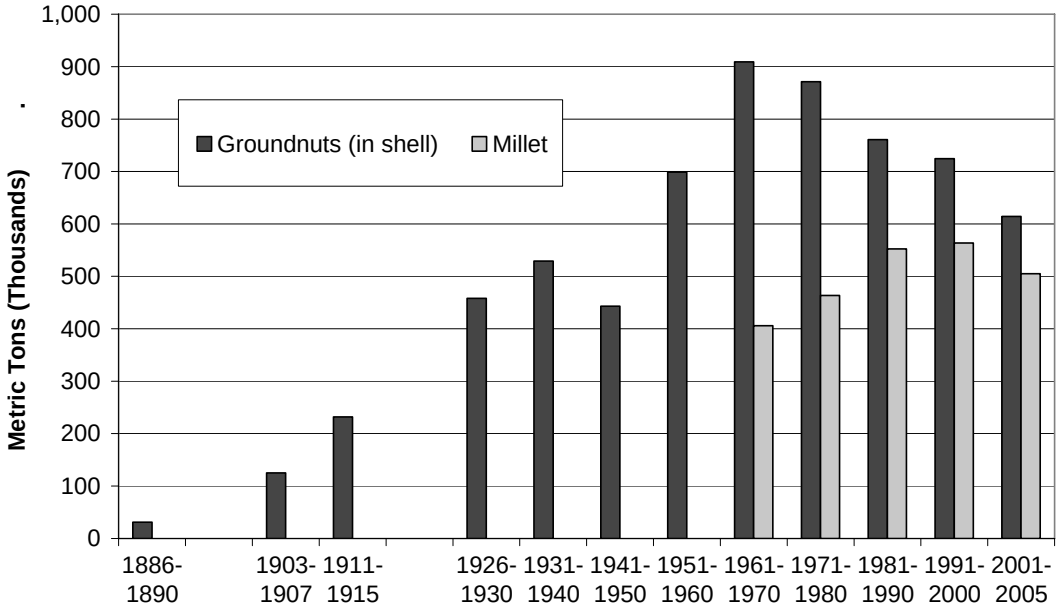
Appendix Figure 5:
FAO Estimate of Average Crop Yields, 1961-2005



Appendix Figure 6:
Net trade and domestic consumption of fertilizers, 1961-2004

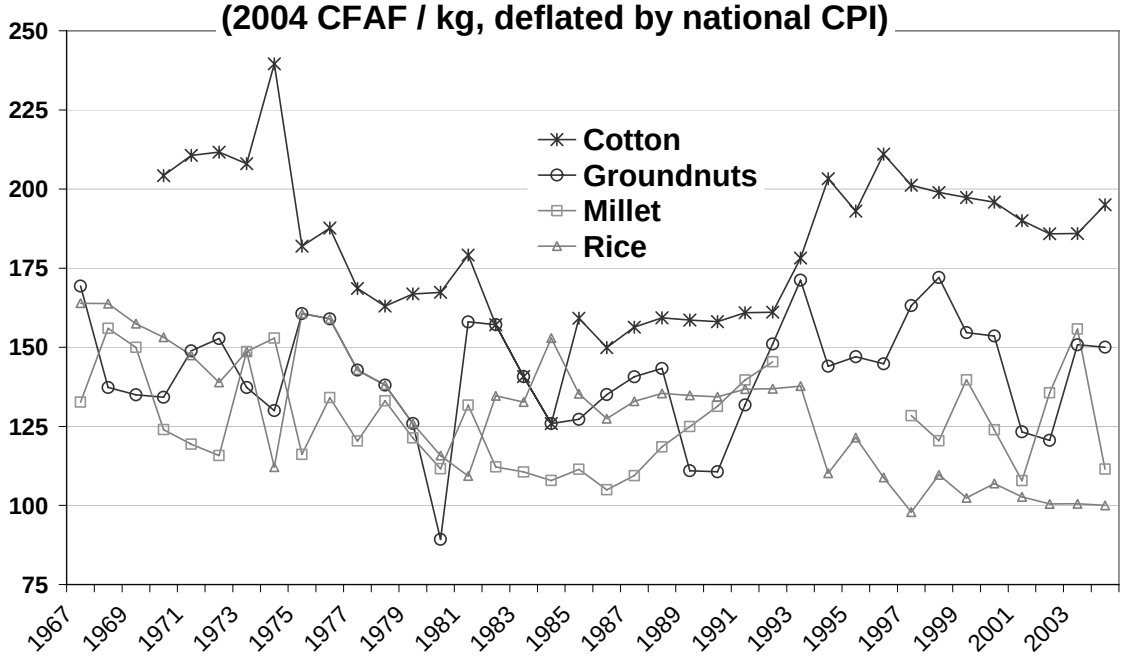


Appendix Figure 7:
Average Production of Groundnuts and Millet in Senegal, 1886-2005

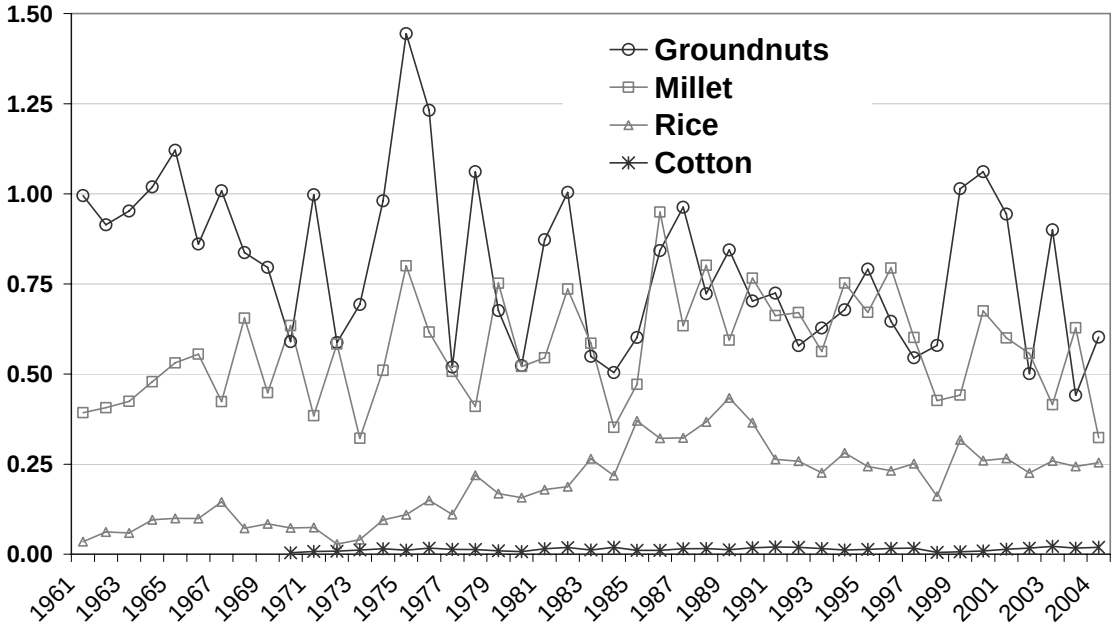


Sources: For 1885/86-1929/30, from Bonnefond and Couty (1991) who cite Vanhaeverbeke (1970). For 1930-60, from Gersovitz and Waterbury (1987) citing various official sources. For 1961-2005, authors' calculations from FAO (2005) data.

Appendix Figure 8:
Real Farmgate Prices, 1967-2004
(2004 CFAF / kg, deflated by national CPI)



Appendix Figure 9:
Estimated Total Production by Crop, 1961-2004



Appendix Table 1: Chronology of changes in tax and agricultural policies, Senegal, 1979 to 2006

1979	Introduction of VAT Abolition of export taxes except on groundnut products and phosphates Reform of entry duties to a three-tier structure: customs duty, tax duty and VAT, with four rates of tax duty.
1980 (Sept.)	Increase in customs duty from 5 to 10 percent (March) and then 15 percent
1986-88	*Nouvelle Politique Industrielle* (NPI), adjustment of import taxes
1990-91	Generalization of VAT, return to *ad valorem* import taxes
1992	Reform of the general tax code
1994	Devaluation of the FCFA (12 January) West Africa Monetary Union (WAMU) becomes West Africa Economic and Monetary Union (WAEMU), adding regional trade integration component. Rice market reform begins (June), with sale of SAED/URIC rice mills and end of CPSP handling of local rice.
1995	CPSP closes interior rice warehouses, ending subsidies on transport to them (June) Private sector authorized to import broken rice; sourcing from India and elsewhere cause Dakar prices to decline by year-end (September) CPSP is dissolved (December).
2002	Adoption of the WAEMU Common External Tariff

Sources: Barthelemy, Seck and Vourc'h (1996, pp. 122-23), Wilcock et al. (1997, p. 5) and WTO (2003).

Appendix Table 2: Annual distortion estimates, Senegal, 1961 to 2004

(a) Nominal rates of assistance to covered products

(percent)

	Cotton	Groundnut	Millet	Rice	All covered
1961	na	-24	0	8	-18
1962	na	-19	0	10	-14
1963	na	-20	0	8	-15
1964	na	-16	0	12	-11
1965	na	-16	0	23	-11
1966	na	-18	0	12	-11
1967	na	-11	0	-13	-9
1968	na	-9	0	-18	-6
1969	na	-32	0	-10	-22
1970	-39	-36	0	15	-21
1971	-49	-29	0	31	-23
1972	-49	-39	0	29	-26
1973	-69	-53	0	-26	-43
1974	-34	-64	0	-60	-53
1975	-45	-45	0	5	-35
1976	-62	-39	0	42	-29
1977	-45	-40	0	40	-23
1978	-55	-52	0	12	-40
1979	-45	-62	0	52	-40
1980	-46	-67	0	4	-43
1981	-41	-65	0	-24	-54
1982	-56	-9	0	17	-6
1983	-70	-30	0	3	-17
1984	-65	-52	0	33	-32
1985	0	-42	0	68	-16
1986	-8	-9	0	142	5
1987	-15	26	0	172	28
1988	-12	9	0	73	13
1989	-39	-21	0	42	-4
1990	-27	-13	0	102	6
1991	-6	-12	0	162	4
1992	22	17	0	147	18
1993	10	16	0	142	31
1994	-54	-34	0	32	-26
1995	-42	-15	0	10	-12
1996	-31	-9	0	1	-8
1997	-38	-18	0	-14	-12
1998	-12	-5	0	2	-3
1999	-10	-21	0	-9	-15
2000	-30	-35	0	6	-24
2001	-5	-34	0	-1	-22
2002	-16	-20	0	11	-8
2003	-23	-2	0	13	-1
2004	24	-14	0	1	-5

Appendix Table 2 (continued): Annual distortion estimates, Senegal, 1961 to 2004 (b) Nominal and relative rates of assistance to all[a] agricultural products, to exportable and import-competing agricultural industries, and relative[b] to non-agricultural industries (percent)

	Total ag NRA				Ag tradables NRA				
	Covered products		Non-covered products	All products (incl NPS)	Export-ables	Import-competing	All	Non-ag tradables NRA	RRA
	Inputs	Outputs							
1961	0	-18	3	-12	-22	22	-16	11	-25
1962	0	-14	3	-9	-18	18	-12	10	-20
1963	0	-15	3	-10	-19	20	-13	12	-22
1964	0	-11	3	-7	-16	20	-10	11	-19
1965	0	-11	3	-6	-16	24	-9	12	-19
1966	0	-11	3	-7	-18	21	-10	12	-20
1967	0	-9	3	-5	-11	7	-7	11	-17
1968	0	-6	3	-3	-9	10	-5	11	-15
1969	0	-22	3	-14	-29	14	-21	12	-29
1970	0	-21	3	-14	-32	19	-22	10	-29
1971	0	-23	3	-15	-27	25	-20	11	-28
1972	0	-26	3	-18	-35	20	-27	10	-33
1973	0	-43	3	-30	-47	9	-39	9	-44
1974	0	-53	3	-36	-57	-2	-47	12	-53
1975	0	-35	3	-24	-40	14	-32	9	-37
1976	0	-29	3	-20	-35	23	-26	9	-32
1977	0	-23	3	-16	-36	28	-23	11	-31
1978	0	-40	4	-27	-47	25	-35	15	-43
1979	0	-40	3	-27	-55	31	-40	12	-46
1980	0	-43	3	-30	-57	11	-43	8	-47
1981	0	-54	3	-37	-57	5	-47	9	-52
1982	0	-6	3	-3	-11	20	-5	11	-14
1983	0	-17	3	-11	-28	10	-16	10	-24
1984	0	-32	3	-22	-46	24	-29	8	-35
1985	0	-16	4	-10	-37	49	-15	14	-25
1986	0	5	3	5	-9	65	8	11	-3
1987	0	28	4	21	17	84	33	13	17
1988	0	13	3	10	4	47	17	10	7
1989	0	-4	4	-2	-20	36	-2	13	-14
1990	0	6	3	5	-13	61	9	12	-3
1991	0	4	3	4	-12	71	7	12	-5
1992	0	18	3	14	11	67	26	10	15
1993	0	31	3	23	13	79	26	10	15
1994	0	-26	3	-17	-32	27	-20	11	-27
1995	0	-12	3	-7	-15	15	-8	10	-17
1996	0	-8	3	-5	-10	8	-5	9	-13
1997	0	-12	3	-7	-17	2	-12	9	-19
1998	0	-3	3	-1	-6	14	-2	11	-12
1999	0	-15	3	-10	-19	4	-13	9	-20
2000	0	-24	3	-16	-31	15	-22	10	-29
2001	0	-22	3	-15	-30	10	-21	10	-28
2002	0	-8	3	-4	-19	19	-8	12	-18
2003	0	-1	3	1	-5	20	1	13	-10
2004	0	-5	3	-3	-13	13	-5	12	-15

Appendix Table 2 (continued): Annual distortion estimates, Senegal, 1961 to 2004: (c) Value shares of primary production of covered[c] and non-covered products, (percent)

	Cotton	Groundnut	Millet	Rice	Non-covered
1961	na	55	14	1	30
1962	na	52	16	2	30
1963	na	53	14	2	30
1964	na	50	17	3	30
1965	na	50	17	3	30
1966	na	46	20	4	30
1967	na	49	14	7	30
1968	na	36	29	4	30
1969	na	46	19	4	30
1970	0	41	26	3	30
1971	1	56	12	2	29
1972	1	47	21	1	30
1973	2	54	13	2	29
1974	1	54	12	4	30
1975	0	55	12	2	30
1976	1	53	14	3	30
1977	1	44	21	4	30
1978	1	55	10	5	30
1979	1	48	19	3	30
1980	1	45	19	6	30
1981	1	56	10	4	30
1982	2	43	20	5	30
1983	2	36	21	11	29
1984	2	46	13	9	29
1985	1	43	17	10	30
1986	1	36	29	5	30
1987	1	39	25	6	30
1988	1	30	30	9	30
1989	1	35	22	12	30
1990	1	29	32	8	30
1991	1	35	30	4	30
1992	1	28	36	5	30
1993	2	60	0	8	30
1994	2	59	0	9	29
1995	2	57	0	11	29
1996	3	55	0	13	29
1997	2	35	25	9	30
1998	0	42	21	7	30
1999	0	47	15	8	30
2000	0	48	16	5	30
2001	1	46	17	7	30
2002	1	30	30	8	30
2003	2	42	20	7	30
2004	1	31	28	10	30

a. NRAs including assistance to nontradables and non-product specific assistance.
b. The Relative Rate of Assistance (RRA) is defined as $100*[(100+NRAag^t)/(100+NRAnonag^t)-1]$, where $NRAag^t$ and $NRAnonag^t$ are the percentage NRAs for the tradables parts of the agricultural and non-agricultural sectors, respectively.
c. At farmgate undistorted prices, US$ Source: Author's spreadsheet