

**POTENTIAL WELFARE IMPACTS OF TRADE REGIME CHANGES ON RURAL HOUSEHOLDS
IN NIGER: A FOCUS ON CROSS-BORDER TRADE**

by

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1. INTRODUCTION

1.1 General Policy Issues

Over the last decade a number of trade regime policy issues have been debated in Niger: (i) a devaluation of the franc CFA; (ii) an increase in the tariff on rice imports; (iii) changes in cross-border trade regimes to decrease transaction costs and obstacles to cross-border trade within the region.

Devaluation has been a central issue in Structural Adjustment Programs. Rice tariffs and cross-border trade policy have been central to discussions on how to spur West African regional economic integration and growth.

Niger has not undertaken a devaluation. As a member of the West African Monetary Union (WAMU), joint action is necessary for devaluation to occur. It has also not increased tariffs on rice -- rice tariffs are already relatively high (Jabara, 1991). As part of the Structural Adjustment Program it has, however, recently liberalized cross border trade to a certain extent (see section 2 for more details).

It is often argued that trade regime changes such as devaluation are necessary for efficient long-term growth, both of the agricultural subsector and of the overall economy. However, any policy analysis must consider the short-run welfare consequences of efficient long-run food sector development strategies (Timmer, 1981).

1.2 Objective

The short-run welfare consequences of devaluation or protection have, until recently, been compounded by a scarcity of information on consumption and income patterns by income stratum and by agroecological zone. These distinctions are important to policymakers. The data supplied by national statistical services in the Sahel, and in Niger in particular, are inadequate or too aggregated for such purposes.

A number of detailed rural household surveys, have been conducted recently, that help fill this knowledge gap. First, in 1983-85, ICRISAT undertook surveys of 120 households in two agroecological zones of Western Niger (the Sahelian and the Sudano-Sahelian zones). Second, in 1988/89, IFPRI, in collaboration with ICRISAT, undertook follow-up surveys on the same sample. Third, in 1989/90, IFPRI, in collaboration with INRAN, conducted a survey of 135 households in the Sudano-Sahelian and Sudano-Guinean agroecological zones of Western Niger.

The results of these surveys can be used to gain an understanding of the potential welfare effects of trade regime changes (who wins, who loses, and how much). Specifically, based on knowledge of consumption and income patterns in rural areas of western Niger, rough predictions of the direction and magnitude of trade regime changes are made. In particular, the effect on producers and consumers of a devaluation and of a change in cross-border trade policy are examined.

1.3 Method

The method used is partial equilibrium and comparative static. Analyses are limited to the direct effects of policy changes on crop and livestock prices. First, a maintained hypothesis (not tested) of how a given trade regime change would affect the prices households face is presented (e.g. how a devaluation would affect the price of cowpeas, given certain assumptions).

Second, using information on patterns of household behavior (e.g. the share of cowpeas in the value of crop production), we infer how the price change would change nominal income on the production side (how much more cash household income is worth) and reduce real income on the consumption side (how much more cash households have to spend to get the same amount of product).

We do not address the following empirical issues: (i) the indirect effects on key food prices arising from trade regime changes (e.g. how does devaluation affect fuel prices which feed into the cost of rice via transport costs); (ii) the reactions of households to price changes (i.e. only immutable shares are used in the analyses and not price or income elasticities).

There are, of course, intersectoral, indirect, and dynamic effects of policy changes. This paper focuses on the direct and static effects as a first estimate of what the recent household survey data reveal about the short-run effects of policy changes.

1.4 Layout

Section 2 expands on the policy debate concerning trade regimes in Niger. From this we infer what a reasonable simulated policy change would look like (e.g. about how much devaluation is forecast if

it were to happen, how much would prices change due to transaction cost changes and volume changes for a given change in border price policy).

Section 3 describes the general characteristics of the rural economy in Niger, as background and context. Section 4 presents a simple conceptual framework for the simulations.

Section 5 is a discussion of: (i) patterns in incomes, production, and expenditure across zones and (ii) results of the simulation of the effects of policy changes on consumers and producers, having assumed how policy changes would affect the prices households face.

Section 6 suggests some hypotheses and themes for future research concerning the intersectoral, indirect, and dynamic effects of policy change.

Section 7 concludes by outlining policy implications, and in particular discusses some complementary or compensatory policies to soften the losses and bolster the gains from trade regime changes.

2. SPECIFIC POLICY DEBATE AND ASSUMPTIONS CONCERNING POTENTIAL POLICY CHANGES

A brief discussion of the debates related to devaluation and cross border policies is given below. From this discussion, the policy scenarios used in the simulations presented in section 5 are specified.

2.1 Devaluation

Proponents of devaluation argue that the Franc CFA is seriously overvalued. Overvaluation impedes growth and competitiveness by

creating inefficient resource allocation, under-rewarding exporters and over-rewarding importers relative to international opportunity costs.

Most observers posit that a thirty to fifty percent devaluation is necessary to reverse the overvaluation of the Franc CFA in the Sahel (Ka and Van de Walle, 1992). We have used a 50 percent devaluation as the maintained hypothesis concerning policy change in the analyses presented below.

In the simulations, we concentrate on a devaluation which affects both demand and supply sides by affecting the price of exports and imports directly. Protection would have approximately the same effect as devaluation on the demand or import side, as it would raise the price of the protected importable, which in this case is rice.

2.2 Cross-Border Trade Regime Changes

Over Niger's border to the south is an economy with four times the number of consumers as are in all the Sahel, and fifteen times the number in Niger. Niger's trade with Nigeria, as well as with Benin and to a lesser extent its Sahel neighbors, is potentially important for the rural economy of Niger, especially the southern zones.

Historically, trade has flourished between the coastal and sahel economies, in particular among the Hausa who reside on both sides of the border. Cowpeas and cattle have traditionally gone south, and manufactured goods and coarse grains have traditionally gone north (Emmanuel, 1988). More recently, with a ban on imports of rice to Nigeria, rice has been re-exported from Benin via Niger to Nigeria, with purchases by Nigeriens along the way.

Besides devaluation (already of the Naira in the mid 1980s, and at least potentially of the Franc CFA), policies are being debated that would directly affect cross-border trade such as a reduction in border controls and taxes to spur bilateral trade. Some of these have already been put in place (see Jabara, 1991).

One would expect policies that affect these trade flows and the prices at which they take place, to affect the real incomes of Nigerien sellers of cowpeas and livestock, and to affect Nigerien buyers of coarse grains, manufactured goods, and rice. Knowledge of these effects depends on knowledge of the extent of the cross-border flows, and of how policies affect these flows and their prices. Substantial empirical work measuring and characterizing the levels and determinants of these flows has been done Egg (1988), Emmanuel (1988), and Cook (1989).

However, little is known about how changes in volumes or prices would affect Nigerien households. We take the perspective of the latter and examine how changes in the border prices of goods would affect sellers and buyers. Traded volumes are discussed in section 5 which describes expenditure and income patterns, but the effects of volume changes (which might be effected by regulatory changes) are not hypothesized. Hence, we only focus on policy changes that might affect traded goods prices, such as devaluation (which would, for example, make Nigerien livestock and cowpeas cheaper in Nigeria, or make Nigerian manufactured goods and coarse grains more expensive for Nigerien households. Note that the opposite could occur (and has, in the 1980's) with a devaluation of the Naira (vis a vis the FCFA). The

other direct policy change that would affect prices would be a reduction in border taxes.

3. DATA USED AND STUDY ZONE CHARACTERISTICS

This paper uses household data, collected under a USAID funded IFPRI/INRAN project to study the impact of policy changes on rural Nigerien households. The data collected include fortnightly interviews from September 1989 through December 1990 on crop and livestock transactions (purchases, sales, gifts), food consumption, crop production, and non-agricultural income. The interviews were conducted with a sample of 135 randomly chosen households in 15 villages in the Sudano-Sahelian and Sudano-Guinean zones of western Niger. The villages were chosen to reflect the diversity of the region in terms of access to markets, infrastructure, size, etc. The survey methodology is described in more detail in Hopkins and Reardon (1989).

The Sudano-Sahelian zone (the Northern and Southern Boboye survey regions) has an average annual rainfall of 450-700 mm. This zone is moderately-poor agroclimatically, with very variable rainfall within and between years. Millet, cowpeas and some peanuts are produced, with low yields per hectare. There are cropping season labor bottlenecks. Almost no land is irrigated. Livestock husbandry is widely practiced, but degradation has led to rapid reduction in grazing areas. Incomes are diversified, with migration playing a large role in household income generating strategies.

The Sudano-Guinean zone (the Dallol Maouri, Gaya Plateau, and Gaya River survey regions) has an average annual rainfall of 700-1000

mm. It is bordered to the south and east by Nigeria and to the west by Benin. This zone is moderately good agroclimatically, and considered 'high potential', although current performance is only moderate. The inter-annual variation in its rainfall is lower than the other zone. Millet, sorghum, some maize, cowpeas, bambara nut, and peanuts are produced. Yields are moderate. There are cropping season labor bottlenecks. Animal traction is used to a greater extent than in the Sudano-Sahelian zone. Very little area is irrigated. Land constraints are less severe than in the other zone. Livestock husbandry is an important part of the income generating strategies of households.

In general, the overall characteristics with the most import for assessing the impacts of trade regime changes are as follows:

- (i) production tends to be spatially-dispersed, with very high transport costs and poor road infrastructure (Badiane 1992),
- (ii) rainfall is highly variable, and production is risky,
- (iii) land constraints are important relative to their carrying-capacities in the Sudano-Sahelian zone,
- (iv) about four-fifths of the rural Sahel population live in the Sahelian and Sudano-Sahelian zones,
- (v) the highest cropping potential is in the Sudano-Guinean zone,
- (vi) productivity gains require greater use of purchased inputs such as animal traction and fertilizer (Matlon, 1990),
- (vi) incomes tend to be fairly diversified.

4. CONCEPTUAL FRAMEWORK

This analysis addresses the following question: what is the welfare impact on various socioeconomic groups of a change in prices facing the household. The price change could be caused by a

devaluation, a change in cross-border trade regulations, or any of a number of other reasons. Below we use the example of devaluation to trace, conceptually, the impacts on households in a static, partial equilibrium setting. The discussion and analysis focus on the key tradeables and non-tradeable in the food sector. Devaluation would:

(a) raise the farmgate export price of pulses and livestock (key cross-border exports as will be shown in Tables 1a-1b),

We make the simplifying assumption that the Naira price is given (price taker situation, so price is exogenous); if one assumes that arbitrage of border and interior Nigerien trade is perfect, then changes in FCFA prices received in export transmit fully to FCFA prices in the interior for the same product. This is a simplifying assumption. In reality, transmission departs from perfection as a positive function of distance from the border and of the share of domestic products transacted in the total domestic market volume.

(b) raise the farmgate import price of coarse grains, rice, and manufactured goods (the main cross-border and international imports as will be shown in Table 2a-2b),

Given a Naira price for maize and manufactured goods, and a world price in dollars for rice (price taker situation); and if one assumes that arbitrage of border and interior Nigerien trade is perfect, then changes in FCFA prices paid for imports at the border transmit fully to FCFA prices in the interior for the same product. This is pertinent in the case of maize and manufactured goods (given that the domestic rice price is set).

(c) depending on the transmission effect of a rise in the price of an importable or exportable on the non-tradeable coarse grains, raise the price of non-tradeable coarse grains,

(d) raise the price of imported inputs such as fertilizer and fungicides.

For simplicity it is assumed that commerce and manufacturing absolute margins stay the same. Thus, only the crop and livestock

sectors are treated in the simulations. Under these assumptions the impacts of (a)-(d) on household welfare are, conceptually, as follows:

(a) an increase of the exportables prices raises producer nominal incomes (if transmission is perfect, then this effect is in direct proportion to the share of the exportable in production);

(b) an increase in the importables price decreases consumer real incomes (again, according to proportionality in total consumption, if perfect transmission is assumed);

(c) depending on the extent to which the changes in importable (consumer) or exportable (farmgate) price changes are transmitted to non-tradeables (i.e. fonio and millet in the northern areas), nominal and real incomes would be affected proportionately to the transmission effect (from tradeable price to non-tradeable price) and to the proportion of the non-tradeable in income and consumption. We assume that imported coarse grain and rice price increases are transmitted weakly, but positively, to non-tradeable prices;

(d) an increase in imported crop input prices decreases producer nominal incomes.

For any 'average household' per socioeconomic group and per zone, the combination of (a)-(d) will produce a net effect on nominal and on real income. These four channels are simulated in section 5, given consumption, production, and income patterns (derived from survey data) and based on assumptions concerning the 'transmission effect' between tradeable prices and non-tradeable prices.

Three sets of assumptions are important to the size and direction of the effects posited above: (i) whether non-FCFA currency prices for tradeables are exogenous or can be influenced by Nigeriens (hence, whether Niger is a 'small country' or a 'large country' for a given tradeable); (ii) the substitutability in production and in consumption of tradeables for non-tradeables (which influences the transmission effect between them); (iii) the degree of effectiveness of arbitrage of border price changes to interior price changes.

In addition to the above assumptions, the following empirical information is necessary to determine the impact of a trade regime change:

(i) What is the share of each of the tradeables and non-tradeables in consumption and in production over socioeconomic groups and over zones?

Assuming that home consumed goods can be given an imputed value of the market price, and that transmission from the border to the interior is perfect, then a change in price (regardless of how much of a good is sold or bought by a household, or how much of the transaction takes place at the border) will change the nominal income and real income of the household in proportion to their overall consumption or production of the good in question.

For example, if the price of millet rises, and a third of a household's income is composed of millet sales plus home consumption of millet, then a price rise increases the value of the entire production of millet, regardless of the marketed share. The household could trade all the millet for more of another good than it could previously.

The magnitude of these shares for consuming and producing households in rural Niger are presented in the tables in the next section.

(ii) What is the share of imported inputs in overall production inputs, and how does this differ by socioeconomic group and zone?

These are, of course, only direct crop inputs, but one can expect that transport costs (from increased imported fuel prices) will also go up. Increases in imported input prices are also expected to be transmitted to some degree (again, depending on degree of

substitutability) to other (non-traded) inputs such as labor. The share imported inputs is small in Niger and thus we do not address this issue further.

(iii) What is the "transmission effect" of a rise in a tradeable price at the border on prices for the same good in the interior?

This depends on the effectiveness of arbitrage, as noted above, which in turn depends on the distance from the border, the weight of border transactions in volume in total Niger (at least zone) transactions of the good, information, and infrastructure.

We have no empirical evidence on this issue, and so for simplicity we have adopted two approaches: (a) demonstrate (through evidence of patterns) the importance of sales or purchases made at the border; if the magnitude is large, arbitrage is most likely effective; (b) for the key tradeables (pulses, livestock, maize, manufactured goods), arbitrage is assumed to be perfect (with the attendant consequences outlined above).

(iv) What is the "transmission effect" of a rise in the price of a tradeable on the price of the non-tradeable?

This effect requires knowledge of non-tradeable price formation, which in turn relies to a certain extent on the degree of substitutability in consumption and production of tradeables for non-tradeables. In theory, if the goods are significant and strong substitutes, the effect of an increase in the tradeable price on the non-tradeable price will be strongly positive. These cross-price elasticities have not yet been calculated and thus a few simplifying assumptions will be made for the analyses.

We assume that imported rice and coarse grain price increases are weakly transmitted (weak substitutes) to fonio prices (in both zones) and to millet prices (in the Sudano-Sahelian zone), but that there are no other cross-transmission effects (i.e. livestock price changes do not affect millet prices, etc.).¹ The simulation results presented in Tables 3 and 4 arbitrarily assume that 20 percent of the coarse grain and rice (importables) price increase is passed on to the non-tradeables (fonio and millet in the northern zones).

(v) How will devaluation affect domestic prices of tradeables?

The answer to this question depends on whether Niger is considered a "large country" or a "small country" in the world market or the cross-border market for the tradeable good. These terms have no necessary relation to the size of the country, its market share, or the size of its economy. They are terms which distinguish between a country that can sell all of its production at the world market price and a country that cannot.

A "small country" assumption means that the country can sell its entire production to its trading partners at the fixed world price. As a price taker, it faces a dollar or Naira price for the tradeable at which it can sell or buy. Because of the relative sizes of the Niger and Nigerian market, we make the simplifying assumption that

¹ The conventional wisdom in the Sahel is that increases in importables prices would have immediate strong impacts on non-tradeable coarse grain prices. Very little empirical research has been done for the Sahel on the determinants of grain prices, and the transmission effects of macro policy changes on sectoral prices. Hence, the debate is still at the stage of conjecture with respect to how devaluation would affect local coarse grain prices.

Niger is a 'small country' in all tradeables. This may be an extreme assumption.

(vi) What are the dynamic, indirect, and intersectoral effects of trade regime changes?

These issues are not addressed in the simulations but are discussed briefly in section 6.

5. HYPOTHESIZED EFFECTS OF POTENTIAL POLICY CHANGES

Household expenditure and income patterns for each of the survey regions are discussed first (Tables 1a-1b and 2a-2b). These income and expenditure patterns provide knowledge of the share of tradeables and non-tradeables in household consumption (expenditures) and production (income). This information is critical to understanding the impact of trade regime changes on rural households since households will be affected in different ways depending on their income sources and expenditure patterns.

Two policy changes are simulated -- a 50% devaluation and a 30% decrease in transactions costs from a cross-border trade regime change -- under both a full arbitrage assumption (i.e. the price change at the border is passed fully to the interior markets) and a partial arbitrage assumption (i.e. the border price change is transmitted only partially to interior markets). Results are presented in Tables 3 and 4.

5.1 Income and Expenditure Patterns

Table 1a presents household expenditure patterns on broad goods categories. The values given in the table are household averages expressed as FCFA per adult equivalent. Table 1b is the same, with a

breakdown of the crop and livestock sectors. Table 2a and 2b give household income patterns for broad sectors of the economy and separately for the agricultural sector. These patterns are discussed in detail in Hopkins and Reardon (1992) with only the pertinent facts highlighted below.

5.1.1 Patterns in Income

Average annual household income per adult equivalent (AE) ranges from 27,000 FCFA in the northern-most study region (Northern Boboye) to 43,000 FCFA in the southern-most study region (Gaya River). The Sudano-Sahelian zone average is 33,400 FCFA/AE compared with an average of 36,500 FCFA/AE in the Sudano-Guinean zone.

There is greater inequality among household incomes in the Sudano-Sahelian zone (gini coefficient of .30) than in the Sudano-Guinean zone (gini coefficient of .24). Average incomes for the poor tercile of the Sudano-Sahelian zone are 16,800 FCFA/AE (240 kg/ae in millet equivalents) while the rich tercile has an average household income of 54,670 FCFA/AE (780 kg/ae in millet equivalents). In the Sudano-Guinean zone the poor tercile has an average annual income of 22,186 FCFA/AE while the rich tercile has an average annual income of 53,982 FCFA/AE.

Incomes are highly diversified in both zones. In the Sudano-Sahelian zone, crop income accounts for 33 percent of total income, livestock income 8 percent, migration income 20 percent, and local non-farm income 39 percent. In the Sudano-Guinean zone, local non-farm income accounts for roughly the same share of total income (40 percent), cropping income has a larger share of total income (49

percent), livestock accounts for 9 percent, and migration income only 2 percent.

Given the highly diversified income sources, changes in agricultural product prices due to trade regime changes will directly affect only a portion of total household income (about 40 percent in the Sudano-Sahelian zone; 58 percent in the Sudano-Guinean zone).

The share of non-agricultural income (migration and local) varies greatly across regions. Little is known about how this large share of income is affected by food and livestock price changes and changes in the prices of imported manufactured goods. This is an important knowledge gap that needs to be filled to completely trace the effects of trade regime changes on rural households.

As indicated in section 4, the simplified analyses presented below assume no change in margins for commerce or manufacturing. Thus on the income side, the effect of devaluation is felt only through the agricultural sector (crops and livestock) whereas on the expenditure side the effect will be felt through both the agricultural sector and the manufacturing sector.

5.1.2 Crop and Livestock Production and Sales Patterns

In the Sudano-Sahelian zone, millet accounts for 85 percent of total cropping income (imputed and cash); pulses account for 10 percent of cropping income (Table 2b).² Cowpeas are the important cash crop in the drier areas of the zone (Northern Boboye) and peanuts in the higher rainfall areas (Southern Boboye). In this zone, pulses

² Income is home production and sales valued at the producer price.

are traded mostly in regional markets where the bulk of local production is purchased by Nigerian or Nigerien traders for resale in Nigeria. Millet is purchased and consumed locally.

As expected, there is a greater diversity of cropping patterns in the Sudano-Guinean zone. Millet contributes only half of cropping income. Sorghum accounts for 29 percent of cropping income in the well-watered Gaya River region, 5 percent in the Gaya Plateau region, and 11 percent in the Dallol Maouri region. Maize accounts for 2 to 8 percent of cropping income across the southern study zones. Pulses account for 33 percent of cropping income in the Dallol Maouri region, 29 percent in the Gaya Plateau region, and only 7 percent in the Gaya River region.

A large share of the pulses sold in the Sudano-Guinean zone (especially the Dallol Maouri and Gaya River areas which share borders with Nigeria and Benin respectively) are sold directly in Nigerian and Benin markets. The magnitude of these shares places a lower end bound on the importance of cross-border trade to the rural Nigerien economy.

In the Dallol Maouri, pulse sales account for 39 percent of pulse income and 17 percent of these sales occur directly in Nigeria (4 percent in Benin). In the Gaya river region, 42 percent of pulses sold are sold in Benin. In the Gaya Plateau area (where pulses account for a third of cropping income), the majority of pulses are sold in local markets (Malgorou and Sia) to traders who then sell across the border. Coarse grains, on the other hand, are sold mostly in local markets for local consumption.

Livestock play an important role in the income generating strategies of households in both the Sudano-Sahelian zone and the Sudano-Guinean zone. It accounts for roughly 9 percent of total income in both zones. In the Dallol Maouri, 35 percent of household livestock sales occur directly in Nigerian markets (7 percent directly in Benin). In the Gaya River area which shares a border with Benin, 25 percent of household livestock sales occur directly in Benin (7 percent in Nigeria).

5.1.3 Expenditure Patterns

Cereals and pulses account for an average of 36 percent of total expenditures (imputed and cash)³ in the Sudano-Sahelian zone; 41 percent in the Sudano-Guinean zone (Table 1a). Thus on the expenditure side as on the income side, the crop sector is only part of the path through which the demand-side impact of a devaluation would be felt: 59-64 percent of rural household expenditures are on goods other than cereals and pulses.

Millet accounts for the majority of cereal expenditures and is the largest single share of total expenditures -- 21 to 32 percent of total expenditures across zones. In all but the Gaya River area, purchases account for nearly a third of millet expenditures. In the Dallol Maouri 29 percent of these purchases are made directly in Nigeria. Thus, there will be large direct expenditure side impacts on millet (a good that is usually considered to be a non-tradeable) as

³ Expenditure is home consumption and purchases valued at the consumer price.

well as large indirect transmission effects on expenditures of local production of millet.

In the Sudano-Sahelian zone virtually no maize is grown, yet food consumption results show that maize is an important part of the diets in this zone (Hopkins and Reardon, 1990 and 1992). In the northern-most study region (Northern Boboye), maize accounts for 39% of cereal purchases, 16% percent of cereal expenditures, and 6% of overall expenditures. A large share of this maize is imported from Nigeria and Benin.

Increases in maize prices will have fairly strong demand side consequences on real incomes in the northern zones where nearly all maize consumed is purchased. The effect will be greater in the hungry season, when maize plays a larger role in the diets of Sudano-Sahelian households -- providing 20, versus 10, percent of total cereal calories (Hopkins and Reardon, 1992).

Expenditures on sorghum exceed those on maize in the Gaya regions. In the southern-most region, sorghum accounts for 16 percent of total expenditures (14 percent of total income). Maize accounts for only 3 percent of overall expenditures in this region (2 percent of household income).

Cereal and pulse expenditures exceed cereal and pulse incomes in all study regions except the Gaya Plateau region (where peanuts are a large share of household income). Thus, even in the crop sector alone, trade regime and price policy changes will have important demand-side impacts in rural areas (Hopkins and Reardon, 1989 and

1992). In the short-run, the negative demand-side impact from a price increase will substantially dampen the positive income-side impact.

On the expenditure side, livestock and livestock products account for 16 percent of household expenditures in the Sudano-Sahelian zone; 14 percent in the Sudano-Guinean zone. This is roughly equivalent to the share livestock sales in total income for these zones. In two of the four regions, expenditures on livestock and livestock products exceed income from livestock sales (by about 4 percent). For the other three regions, income exceeds expenditures by 1-2 percent. This will be an important point in understanding net effects of changes in trade regime effects.

It was noted above that a substantial share of pulse and livestock sales were made directly over the border and in addition, that a large portion of pulses and livestock sold in Nigerien markets were destined for over the border. Cross border trade is equally, if not more, important to real incomes on the consumption side.

In the Dallol Maouri and Gaya River regions bordering Nigeria and Benin, a surprisingly large share of purchases are made directly across the border. In the Dallol Maouri, 24 percent of purchased cereals are purchased directly in Nigeria, 11 percent directly in Benin. This represents 11 percent of total expenditures (cash and imputed). For individual cereals, the shares purchased directly in Nigeria are 19 percent for millet, 24 percent for sorghum, and 51 percent for maize. In the Boboye areas, although maize is not purchased directly across the border, it originates largely from Benin and Nigeria.

Manufactured goods (durables and non-durables) account for 11 to 19 percent of total expenditures across zones. In the Sudano-Guinean zone, a large portion of manufactured goods are purchased directly in Nigeria. In the Dallol Maouri, 38 percent of durables (14 percent of non-durables) are purchased in Nigeria. In the Gaya Plateau area, 13 percent of durables (2 percent of non-durables) are purchased in Nigeria and in the Gaya River area 4 percent of durables are purchased in Nigeria (18 percent in Benin). In the Sudano-Sahelian zone, although manufactured goods are purchased in local markets, a large share of the goods purchased originate from Nigeria.

5.2 Hypothesized Effects of Devaluation

Tables 3 and 4 present the simulation results. The numbers are percent changes in value of nominal income on the income side and percent changes in the value of expenditures on the expenditure side. The calculated impacts are based on assumptions about a given policy effect on price (as laid out in section 4) and knowledge of the shares of exportables, importables and non-tradeables in household income and expenditures (from the household survey data, as described above).

Two scenarios are analyzed to reflect alternative assumptions concerning the degree of arbitrage and price transmission. Table 3 gives results for the extreme assumption of full arbitrage and Table 4 gives results for the more realistic assumption of only partial pass-through to domestic markets of price changes at the border.

Before discussing the results, several caveats need be mentioned. First, these results capture only the very short-run static effects of price changes on real incomes. Consumption and production baskets are

assumed to be fixed. Elasticities are needed to determine the dynamic effects and understand the underlying substitution in consumption and production. Second, as indicated above, very little is known about how crop and livestock price changes effect the non-agricultural sector. Thus, we only show the income side impact that directly affects the agricultural sector (less than half of total income), whereas the expenditure side price changes affect directly both the agricultural and the manufacturing sector.

5.2.1 Full Arbitrage Model

The results for the full arbitrage model are presented in Table 3. This scenario assumes there is full transmission of price changes from the border to the interior for all traded goods. That is, a 50 percent devaluation increases prices of tradeables by 50 percent in all regions, regardless of the distance from the border. Tradeables include pulses, livestock, manufactured goods, and all cereals except fonio in the Sudano-Guinean zone; pulses, livestock, manufactured goods, and all cereals except millet and fonio in the Sudano-Sahelian zone. For non-tradeable cereals, a 20 percent price transmission effect is assumed.

Effect on Producers: Under the full arbitrage model there is a strong positive effect on pulse and livestock producers from the income side (a 6 to 14 percent increase across regions in the value of nominal income). For pulses, the effect is highest in the Gaya Plateau where peanuts contribute significantly to total income. For livestock, the effect is highest in the Northern Boboye and Dallo Maouri where livestock income is a larger share of total income.

There is also a strong positive effect on coarse grain producers in the Gaya Plateau and River areas where millet accounts for nearly a third of total income and, under the assumptions of the model, receives the full border price increase (since it is considered a tradeable in the south). Millet production is a large share of total income in the Northern Boboye as well however millet is taken to be a non-tradeable in that region.

Effect on Consumers: The expenditure side impact reflects the decrease in real income resulting from the increased cost of buying the same basket of consumption goods. Since rural households are both producers and consumers of agricultural products, the expenditure effect will dampen the income side gains to producers of pulses, coarse grains, and livestock. Hopkins and Reardon (1991) show that 75 to 96 percent of households (across regions) are net buyers of crops. Thus, the demand side (expenditure side) impacts of a price change will be substantial in rural areas, even for coarse grains.

In the Sudano-Sahelian zone the negative expenditure side impact on real incomes due to an increase in pulse prices balances with the positive income side impact. The peanut producing Gaya Plateau region has the largest gap between the income effect and the expenditure effect but the expenditure effect serves to dampen the gains in nominal income. The largest negative expenditure effect is for millet in the Sudano-Guinean zone (an 11 to 15 percent increase in the value of expenditures). In this zone, millet is assumed to be a tradeable (based on the substantial share of millet purchased across

the border) and the full impact of a price increase is felt on the expenditure side as well as the income side.

The other large expenditure side impact is for manufactured goods which are largely purchased in (or imported from) Nigeria. The impact is larger in the Sudano-Sahelian zone than the Sudano-Guinean zone.

Net Effects on Producing-Consuming Households: The net effect of a 50 percent devaluation on real income is given by the sum of the positive income side impact on nominal incomes and the negative expenditure side impact on real incomes.

Rural households are both producers and consumers of agricultural products. They are also fairly large consumers of manufactured goods which account for 11 to 19 percent of total expenditures across regions. Taking both the short-run consumption and expenditure effects into account, the net effect of a 50 percent devaluation on real incomes is negative in four of the five study regions resulting in a 3 to 12 percent decrease in real incomes across regions. The Gaya Plateau region is the only region that has no net gain or loss in real terms. This is due to a) the large share of peanut income in household income which compensates for manufactured good purchases and b) the relative balance between income from coarse grain production and expenditures on coarse grains.

The effect in the Northern Boboye is relatively small as well (a 3 percent decrease in real incomes). In this case, livestock sales outweigh livestock and manufactured good purchases; cereal inflows and outflows are nearly balanced.

The area the hardest hit is in the Southern Boboye, where real incomes decrease by 12 percent. This region has the smallest share of crop/livestock income in total income and the largest share of local non-agricultural income. It also has the largest share of manufactured goods in total expenditures. The 12 percent reduction in real income would be equivalent to the average household in this region giving up its non-durable purchases entirely.

5.2.2 Partial Arbitrage Model

The results for the partial arbitrage model are given in Table 4. Under this scenario, there is only partial transmission of border price change. Specifically, the full 50 percent price increase applies only to tradeables sold (purchased) by Nigeriens directly across the border.⁴ This assumption will result in an understatement of the full role of cross border trade.

For tradeables sold (purchased) by Nigeriens in Niger, only half of the price increase is assumed to be passed through to producers (consumers). Tradeables and non-tradeables are defined as in the full arbitrage scenario.

For non-tradeable cereals, a 20 percent price transmission effect is assumed (meaning that only one-fifth of the 50 percent devaluation is transmitted to non-tradeable cereal prices). Given high transport

⁴ The data collected on the transactions questionnaires do not allow us to determine the origin (destination) of the transacted product. We do, however, have information on where the transaction occurred (i.e. the name of the village or town where the purchase or sale took place). Thus we can determine the share of transactions occurring across the border.

costs and possibly incomplete market integration, this is likely a more realistic assumption.

Effect on Producers: In general, the partial arbitrage assumption decreases the gains to producers as only the portion of the good sold directly across the border receives the full impact of the price increase.

Effect on Consumers: Again, the partial arbitrage assumption decreases the negative effect on real incomes since the full price increase only applies to the share purchased directly across the border.

Net Effects on Producing-Consuming Households: The negative net short-run effects of devaluation are diminished under a partial arbitrage scenario. With the exception of the Southern Boboye, the range across zones of reductions in real incomes is from 0 to 4 percent. In summary, even under the extreme full arbitrage assumptions, a 50 percent devaluation has only a 0 to 6 and 12 percent negative impact on real incomes in the short run. Under the more realistic partial arbitrage assumptions, the effect is only a 0-4 and 6 percent negative impact on real incomes. The negative effect means the expenditure side predominates -- rural Nigerien households are both producers and consumers of agricultural products as well as consumers of manufactured goods which originate, in large part, from Nigeria.

These are short-term effects with some simplifying assumptions. Elasticities are needed to judge sort of any behavioral response

(whether in the short or medium run) and to make any justified assumptions about cross price effects.

5.3 Hypothesized Effects of Changes in Cross-Border Trade Regulations

The results of simulating a change in cross border trade regulations (under both full and partial arbitrage assumptions) are given in Tables 3 and 4. A 30 percent reduction in per unit transactions costs, due to a change in cross border trade regulations, is assumed. Under the full arbitrage scenario the full 30 percent reduction in transactions costs is passed through to producers and consumers -- commerce margins are assumed not to change. For the partial arbitrage scenario the assumptions are the same as for devaluation.

A reduction in transactions costs is a "win-win" situation. It helps producers by allowing them a greater share of the border price and it helps consumers by not adding to much to the border price.

5.3.1 Effect on Producers

Producers gain substantially, under the full arbitrage scenario, from a decrease in transactions costs. Nominal incomes increase by 5 to 19 percent across regions. The smallest gain (5 percent) is in the Southern Boboye which has the smallest share of agricultural income in total income. Producers in the southern high potential areas gain the most (14-19 percent increase in nominal incomes). Producer gains under the partial arbitrage scenario range from 2 to 4 percent.

5.3.2 Effect on Consumers

Consumers gain substantially from a decrease in transactions costs under the full arbitrage scenario. In the Sudano-Sahelian zone,

real incomes increase by 12 percent from the reduction in prices. The gain is even higher in the Sudano-Guinean zone (17-19 percent). Under the partial arbitrage scenario consumers gain 3-4 percent.

5.3.3 Net Effects on Producing-Consuming Households:

For both the full arbitrage model and the more realistic partial arbitrage model, the net effect of a reduction in transactions costs is positive -- a 17 to 41 percent increase in real incomes under the full arbitrage scenario and 5 to 9 percent increase under the partial arbitrage scenario. Under both scenarios, the net gains to a decrease in transactions costs are higher in the southern zone. The more tradeability in a region' economy (as in the Gaya region bordering Nigeria and Benin) the stronger the effect of a decrease in transactions costs will be. Thus, decreasing transactions costs via reductions in constraints to cross border trade flows or improved infrastructure results in a "win-win" situation.

6. DIRECTIONS FOR FUTURE RESEARCH: THE DYNAMIC, INDIRECT, AND INTERSECTORAL EFFECTS OF TRADE REGIME CHANGES

The following section is adapted and summarized from Reardon, Hopkins, and Kelly (1992). There are five main issues that need to be addressed by future research.

(i) the dynamic effects of devaluation on the pulse and livestock sectors, conditioned by pass-through policy and supply responsiveness: the extent of supply responsiveness of agriculture in general and pulses and livestock in particular to increases in prices induced by devaluation is a very important empirical issue. Matlon (1990)

suggests that for all the West African semi-arid tropics crop responsiveness is low.

(ii) the dynamic effects of devaluation on the general level of prices and its increase: it is worth worrying about the inflation effects over the medium run caused by devaluation, and the attendant exacerbation of the above regressive equity effects. Berg et al. 1990 note:

Very few African countries south of the Sahara have been able to contain the inflationary effects of nominal devaluations. A real depreciation of the currency has been sustained in most cases by repeated nominal devaluations (page 21).

(iii) the dynamic and intersectoral effects of higher prices on the development of the non-agricultural sector: based on classical Ricardian reasoning concerning the effects of 'food bottlenecks' on real wage costs to non-agricultural employers, and Ranis-Fei's extension of that to agricultural costs, we can expect that rural wages will be driven up, reducing competitiveness of export crops, increasing food costs in urban areas, and stymieing the development of 'intersectoral growth linkages' (Lele/Mellor 1981).

(iv) In a longer run sense, even if devaluation increased average long-term incentives to producers directly on pulses and indirectly on coarse grains, this does not solve the fundamental problem of high risk and inter-year instability that appears to impede adoption of technology and conservation improvements that would increase long-term productivity of cropping. Sahel farmers are forced by risk to have a short planning horizon, and hence cannot afford to make decisions based on longer term average (Reardon 1991).

(v) Another intersectoral issue is that devaluation will increase (imported) fuel and vehicle prices. These can be important in the poor's budget.

The fuel and vehicle price increases could also increase general price instability and further dampen technology adoption and supply responsiveness through increasing risk and transaction costs. With high transaction/transport costs driving import and export parity prices far apart, there is relative 'enclavement', and local prices tend to be quite volatile. It is plausible to expect that an increase in transport costs will increase the 'enclavement', and lead to even higher price instability, hence risk, and to higher transaction costs. Beside the well-known negative effects this has on cropping productivity investments (Newbery and Stiglitz 1981), the larger price band also discourages supply responsiveness of farmers.

7. CONCLUSIONS AND POLICY IMPLICATIONS

It is clear that there are very severe fiscal and balance of payment deficits and currency overvaluation in the Sahel. However, the analyses presented here, have shown that the short (and even medium) term effects of devaluation on the real incomes of rural Nigerien household can be quite negative.

Rather than argue that there is no need for more efficiency, or a reversal of overvaluation, or more health in government budgets, we argue that one should be very careful not to perceive SAP measures as panaceas, or even as positive, without certain concomitant, and perhaps prior, public and private investments in structural change.

The latter suggests the search for concomitant measures. First among these would be key investments in reversing structural constraints to agricultural supply response, especially in the high potential Sudano-Guinean zone.

Second is investment in ways to make coarse grain processing cheaper and more accessible so that local grains can gradually replace rice as the grain that meets the needs of the poor in growing cities.

Third is investments in infrastructure and transport, and certainly a protection from spending cuts in this domain, so as not to allow devaluation and public spending cuts to increase price instability and transaction costs, thus choking off supply response.

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Table 1a: Household expenditures on all goods by zone (average FCFA/AE, harvest year 1989)

	Cereals	Pulses	By-prod & proc. crops	Live- stock	Meat/ eggs	Stimu- lants	Dura- bles	Non- Dura- bles	Services	Total Expendi- tures
SUDANO-SAHELIAN ZONE										
Northern Boboye										
a. Value of expenditures on i (b+c)	15553	937	5874	3297	3690	1232	2935	1766	3576	38859
b. Imputed value of home consumption of i	9328	745	0	0	0	0	0	0	0	10072
c. Value of purchases of i	6225	192	5874	3297	3690	1232	2935	1766	3576	28787
c1. Share of i purchased in Niger	98	100	100	100	100	100	97	100	99	99
c2. Share of i purchased in Nigeria	0	0	0	0	0	0	0	0	0	0
c3. Share of i purchased in Benin	2	0	0	0	0	0	3	0	1	1
d. Share of purchases of i in EXP on i (c/a)	40	20	100	100	100	100	100	100	100	74
e. Share of i purchased in Nigeria/Benin in TEXP	1	0	0	0	0	0	0	0	0	1
f. Share of expenditures on i in TEXP	40	2	15	8	9	3	8	5	9	100
Southern Boboye										
a. Value of expenditures on i (b+c)	12713	615	6832	2941	2860	1034	2861	4768	5013	39637
b. Imputed value of home consumption of i	7512	133	0	0	0	0	0	0	0	7645
c. Value of purchases of i	5201	482	6832	2941	2860	1034	2861	4768	5013	31992
c1. Share of i purchased in Niger	99	100	100	100	100	100	99	100	100	99
c2. Share of i purchased in Nigeria	0	0	0	0	0	0	0	0	0	0
c3. Share of i purchased in Benin	1	0	0	0	0	0	1	0	0	1
d. Share of purchases of i in EXP on i (c/a)	41	78	100	100	100	100	100	100	100	81
e. Share of i purchased in Nigeria/Benin in TEXP	0	0	0	0	0	0	0	0	0	1
f. Share of expenditures on i in TEXP	32	2	17	7	7	3	7	12	13	100

Table 1a: Household expenditures on all goods by zone (average FCFA/AE, harvest year 1989)

	Cereals	Pulses	By-prod & proc. crops	Live- stock	Meat/ eggs	Stimu- lants	Dura- bles	Non- Dura- bles	Services	Total Expendi- tures
SUDANO-GUINEAN ZONE										
<u>Dalol Maouri</u>										
a. Value of expenditures on i (b+c)	12753	2522	4970	2350	3962	1955	2509	5019	4281	40321
b. Imputed value of home consumption of i	6913	2212	0	0	0	0	0	0	0	9125
c. Value of purchases of i	5840	310	4970	2350	3962	1955	2509	5019	4281	31196
c1. Share of i purchased in Niger	65	95		74	100	100	57	86	85	80
c2. Share of i purchased in Nigeria	24	3		17	0	0	38	14	12	16
c3. Share of i purchased in Benin	11	2		9	0	0	4	8	3	4
d. Share of purchases of i in EXP on i (c/a)	46	12	100	100	100	100	100	100	100	77
e. Share of i purchased in Nigeria/Benin in TEXP	11	0	0	2	0	0	3	3	2	20
f. Share of expenditures on i in TEXP	32	6	12	6	10	5	6	12	11	100
<u>Gaya Plateau</u>										
a. Value of expenditures on i (b+c)	17054	3711	5291	1659	2522	2451	2139	3303	3025	41155
b. Imputed value of home consumption of i	13230	3373	0	0	0	0	0	0	0	16603
c. Value of purchases of i	3824	338	5291	1659	2522	2451	2139	3303	3025	24552
c1. Share of i purchased in Niger	99	100		100	100	99	86	98	92	97
c2. Share of i purchased in Nigeria	0	0		0	0	0	13	2	8	3
c3. Share of i purchased in Benin	1	0		0	0	1	0	0	1	0
d. Share of purchases of i in EXP on i (c/a)	22	9	100	100	100	100	100	100	100	60
e. Share of i purchased in Nigeria/Benin in TEXP	0	0	0	0	0	0	1	0	1	3
f. Share of expenditures on i in TEXP	41	9	13	4	6	6	5	8	7	100
<u>Gaya River</u>										
a. Value of expenditures on i (b+c)	22747	1289	4108	5063	2668	2293	1784	3284	2989	46225
b. Imputed value of home consumption of i	19891	1109	0	0	0	0	0	0	0	21000
c. Value of purchases of i	2856	180	4108	5063	2668	2293	1784	3284	2989	25225
c1. Share of i purchased in Niger	84	100		47	94	92	78	85	97	80
c2. Share of i purchased in Nigeria	10	0		0	0	0	4	1	2	1
c3. Share of i purchased in Benin	16	0		53	6	8	18	14	1	19
d. Share of purchases of i in EXP on i (c/a)	13	14	100	100	100	100	100	100	100	55
e. Share of i purchased in Nigeria/Benin in TEXP	13	0	0	6	0	0	1	1	0	20
f. Share of expenditures on i in TEXP	49	3	9	11	6	5	4	7	6	100

Table 1b: Household expenditures on crops and livestock by zone (average FCFA/AE)

	Cereals						Pulses				Livestock		
	Millet	Sorghum	Maize	Rice	Fonio	Total	Cowpeas	Peanuts	Wanzou	Total	Small Rumin.	Large Rumin.	Total
SUDANO-SAHELIAN ZONE													
Northern Boboye													
a. Value of expenditures on i (b+c)	12475	491	2451	136	0	15553	671	118	147	937	548	2481	3297
b. Imputed value home consumption of i	8975	353	0	0	0	9328	518	112	115	745	0	0	0
c. Value of purchases of i	3500	138	2451	136	0	6225	153	6	32	192	548	2481	3297
c1. Share of i purchased in Niger	100	100	94	100	0	98	100	100	100	100	100	100	100
c2. Share of i purchased in Nigeria	6	0	0	0	0	0	0	0	0	0	0	0	0
c3. Share of i purchased in Benin	0	0	6	0	0	2	0	0	0	0	0	0	0
d. Share of purchases of i in EXP on i (c/a)	28	28	100	100	0	40	23	5	22	20	100	100	100
e. Share of i purchased in Nigeria/Benin in TEXP	0	0	0	0	0	1	0	0	0	0	0	0	0
f. Share of expenditures on i in TEXP	32	1	6	0	0	40	2	0	0	2	1	6	8
Southern Boboye													
a. Value of expenditures on i (b+c)	10321	176	1472	744	0	12713	80	412	123	615	1211	1568	2941
b. Imputed value home consumption of i	7326	93	0	93	0	7512	0	40	93	133	0	0	0
c. Value of purchases of i	2995	83	1472	651	0	5201	80	372	30	482	1211	1568	2941
c1. Share of i purchased in Niger	100	100	95	100	0	99	100	100	100	100	100	100	100
c2. Share of i purchased in Nigeria	0	0	0	0	0	0	0	0	0	0	0	0	0
c3. Share of i purchased in Benin	0	0	5	0	0	1	0	0	0	0	0	0	0
d. Share of purchases of i in EXP on i (c/a)	29	47	100	87	0	41	100	90	24	78	100	100	100
e. Share of i purchased in Nigeria/Benin in TEXP	0	0	0	0	0	0	0	0	0	0	0	0	0
f. Share of expenditures on i in TEXP	26	0	4	2	0	32	0	1	0	2	3	4	7

Table 1b: Household expenditures on crops and livestock by zone (average FCFA/AE)

	Cereals						Pulses				Livestock		
	Millet	Sorghum	Maize	Rice	Fonio	Total	Cowpeas	Peanuts	Wanzou	Total	Small Rumin.	Large Rumin.	Total
SUDANO-GUINEAN ZONE													
<u>Dalloy Maouri</u>													
a. Value of expenditures on i (b+c)	8522	2392	1104	88	646	12753	208	1000	1314	2522	1258	1043	2350
b. Imputed value home consumption of i	5037	1192	218	0	465	6913	142	864	1206	2212	0	0	0
c. Value of purchases of i	3485	1200	886	88	181	5840	66	136	108	310	1258	1043	2350
c1. Share of i purchased in Niger	71	76	19	100	94	65	81	100	100	95	89	55	74
c2. Share of i purchased in Nigeria	19	24	51	0	0	24	12	0	0	3	8	38	17
c3. Share of i purchased in Benin	10	0	30	0	6	11	7	0	0	2	3	17	9
d. Share of purchases of i in EXP on i (c/a)	41	50	80	100	28	46	32	14	8	12	100	100	100
e. Share of i purchased in Nigeria/Benin in TEXP	6	1	2	0	0	11	0	0	0	0	0	1	2
f. Share of expenditures on i in TEXP	21	6	3	0	2	32	1	2	3	6	3	3	6
<u>Gaya Plateau</u>													
a. Value of expenditures on i (b+c)	12374	1570	877	234	1998	17054	25	2670	1016	3711	1197	366	1659
b. Imputed value home consumption of i	9715	1005	610	0	1899	13230	0	2387	986	3373	0	0	0
c. Value of purchases of i	2659	565	267	234	99	3824	25	283	30	338	1197	366	1659
c1. Share of i purchased in Niger	100	98	85	100	100	99	100	100	100	100	100	100	100
c2. Share of i purchased in Nigeria	0	2	0	0	0	0	0	0	0	0	0	0	0
c3. Share of i purchased in Benin	0	0	15	0	0	1	0	0	0	0	0	0	0
d. Share of purchases of i in EXP on i (c/a)	21	36	30	100	5	22	100	11	3	9	100	100	100
e. Share of i purchased in Nigeria/Benin in TEXP	0	0	0	0	0	0	0	0	0	0	0	0	0
f. Share of expenditures on i in TEXP	30	4	2	1	5	41	0	6	2	9	3	1	4
<u>Gaya River</u>													
a. Value of expenditures on i (b+c)	12665	7532	1964	587	0	22747	1059	223	7	1289	1292	3552	5063
b. Imputed value home consumption of i	11549	6329	1786	228	0	19891	931	178	0	1109	0	0	0
c. Value of purchases of i	1116	1203	178	359	0	2856	128	45	7	180	1292	3552	5063
c1. Share of i purchased in Niger	95	78	76	76	0	84	100	100	100	100	55	40	47
c2. Share of i purchased in Nigeria	0	0	0	0	0	10	0	0	0	0	0	0	0
c3. Share of i purchased in Benin	5	22	24	24	0	16	0	0	0	0	45	60	53
d. Share of purchases of i in EXP on i (c/a)	9	16	9	61	0	13	12	20	100	14	100	100	100
e. Share of i purchased in Nigeria/Benin in TEXP	1	4	1	0	0	13	0	0	0	0	1	5	6
f. Share of expenditures on i in TEXP	27	16	4	1	0	49	2	0	0	3	3	8	11

Table 2a: Household income from all sources by zone (average FCFA/AE, harvest year 1989)

	Cereals	Pulses	Live- stock	Commerce	Migration	Food Process.	Other	Total income
<u>SUDANO-SAHELIAN ZONE</u>								
<u>Northern Boboye</u>								
a. Value of income from i	10472	1177	5504	378	5195	40	6096	28861
b. Imputed value of home consumption (a-c)	9328	745	0	0	0	0	0	10072
c. Value of sales	1144	432	5504	378	5195	40	6096	18789
c1. Share of i sold in Niger	100	100	100	100	100	100	100	
c2. Share of i sold in Nigeria	0	0	0	0	0	0	0	
c3. Share of i sold in Benin	0	0	0	0	0	0	0	
d. Share sales of i in income from i (c/a)	11	37	100	100	100	100	100	65
e. Share of i sold in Nigeria/Benin in TINC	0	0	0	0	0	0	0	
f. Share of income from i in total income	36	4	19	1	18	0	21	100
<u>Southern Boboye</u>								
a. Value of income from i	8100	932	4101	4820	8347	4825	11986	43119
b. Imputed value of home consumption (a-c)	7512	133	0	0	0	0	0	7645
c. Value of sales	596	799	4101	4820	8347	4825	11986	35474
c1. Share of i sold in Niger	100	100	100	100	100	100	100	
c2. Share of i sold in Nigeria	0	0	0	0	0	0	0	
c3. Share of i sold in Benin	0	0	0	0	0	0	0	
d. Share sales of i in income from i (c/a)	7	86	100	100	100	100	100	82
e. Share of i sold in Nigeria/Benin in TINC	0	0	0	0	0	0	0	
f. Share of income from i in total income	19	2	10	11	19	11	28	100

Table 2a: Household income from all sources by zone (average FCFA/AE, harvest year 1989).

	Cereals	Pulses	Live- stock	Commerce	Migration	Food Process.	Other	Total income
SUDANO-GUINEAN ZONE								
Dalol Maouri								
a. Value of income from i	7195	3597	5883	2591	1119	2065	11241	33691
b. Imputed value of home consumption (a-c)	6913	2212	0	0	0	0	0	9125
c. Value of sales	282	1385	5883	2591	1119	2065	11241	24566
c1. Share of i sold in Niger	96	79	59	100	100	100	100	
c2. Share of i sold in Nigeria	0	17	35	0	0	0	0	
c3. Share of i sold in Benin	4	4	7	0	0	0	0	
d. Share sales of i in income from i (c/a)	4	39	100	100	100	100	100	73
e. Share of i sold in Nigeria/Benin in TINC	1	2	7	0	0	0	0	
f. Share of income from i in total income	21	11	17	8	3	6	33	100
Gaya Plateau								
a. Value of income from i	13834	5900	4107	1267	837	1403	7885	35233
b. Imputed value of home consumption (a-c)	13230	3373	0	0	0	0	0	16603
c. Value of sales	604	2527	4107	1267	837	1403	7885	18630
c1. Share of i sold in Niger	100	97	91	100	100	100	100	
c2. Share of i sold in Nigeria	0	2	0	0	0	0	0	
c3. Share of i sold in Benin	0	1	9	0	0	0	0	
d. Share sales of i in income from i (c/a)	4	43	100	100	100	100	100	53
e. Share of i sold in Nigeria/Benin in TINC	0	1	1	0	0	0	0	
f. Share of income from i in total income	39	17	12	4	2	4	22	100
Gaya River								
a. Value of income from i	20537	1597	5946	6062	2461	2447	6894	45944
b. Imputed value of home consumption (a-c)	19891	1109	0	0	0	0	0	21000
c. Value of sales	646	488	5946	6062	2461	2447	6894	24944
c1. Share of i sold in Niger	100	58	99	100	100	100	100	
c2. Share of i sold in Nigeria	0	0	0	0	0	0	0	
c3. Share of i sold in Benin	0	42	1	0	0	0	0	
d. Share sales of i in income from i (c/a)	3	31	100	100	100	100	100	54
e. Share of i sold in Nigeria/Benin in TINC	0	1	0	0	0	0	0	
f. Share of income from i in total income	45	3	13	13	5	5	15	100

Table 2b: Household income from the agricultural sector by zone (average FCFA/AE)

	Cereals					Pulses				Livestock			
	Millet	Sorghum	Maize	Rice	Fonio	Total	Cowpeas	Peanuts	Wanzou	Total	Small Rumin	Large Rumin	Total
SUDANO-SAHELIAN ZONE													
Northern Boboye													
a. Value of income from i	10119	353	0	0	0	10472	941	118	118	1177	1952	3403	5504
b. Imputed value of home consumption (a-c)	8975	353	0	0	0	9328	518	112	115	745	0	0	0
c. Value of sales	1144	0	0	0	0	1144	423	6	3	432	1952	3403	5504
c1. Share of i sold in Niger	100	100	0	0	0	100	100	100	100	100	100	100	100
c2. Share of i sold in Nigeria	0	0	0	0	0	0	0	0	0	0	0	0	0
c3. Share of i sold in Benin	0	0	0	0	0	0	0	0	0	0	0	0	0
d. Share of sales of i in income from i (c/a)	11	0	0	0	0	11	45	5	3	37	100	100	100
e. Share of i sold in Nigeria/Benin in TINC	0	0	0	0	0	0	0	0	0	0	0	0	0
f. Share of income from i in total income	35	1	0	0	0	36	3	0	0	4	7	12	19
Southern Boboye													
a. Value of income from i	7922	93	0	93	0	8108	0	839	93	932	1087	2948	4101
b. Imputed value of home consumption (a-c)	7326	93	0	93	0	7512	0	40	93	133	0	0	0
c. Value of sales	596	0	0	0	0	596	0	799	0	799	1087	2948	4101
c1. Share of i sold in Niger	100	0	0	0	0	100	100	100	0	100	100	100	100
c2. Share of i sold in Nigeria	0	0	0	0	0	0	0	0	0	0	0	0	0
c3. Share of i sold in Benin	0	0	0	0	0	0	0	0	0	0	0	0	0
d. Share of sales of i in income from i (c/a)	8	0	0	0	0	7	0	95	0	86	100	100	100
e. Share of i sold in Nigeria/Benin in TINC	0	0	0	0	0	0	0	0	0	0	0	0	0
f. Share of income from i in total income	18	0	0	0	0	19	0	2	0	2	3	7	10

Table 2b: Household income from the agricultural sector by zone (average FCFA/AE)

	Cereals						Pulses				Livestock		
	Millet	Sorghum	Maize	Rice	Fonio	Total	Cowpeas	Peanuts	Wanzou	Total	Small Rumin	Large Rumin	Total
SUDANO-GUINEAN ZONE													
<u>Dalio Maouri</u>													
a. Value of income from i	5232	1199	218	0	545	7195	436	1526	1635	3597	2339	3150	5883
b. Imputed value of home consumption (a-c)	5037	1192	218	0	465	6913	142	864	1206	2212	0	0	0
c. Value of sales	195	7	0	0	80	282	294	662	429	1385	2339	3150	5883
c1. Share of i sold in Niger	94	100	0	100	98	96	78	93	60	79	86	34	59
c2. Share of i sold in Nigeria	0	0	0	0	0	0	8	4	40	17	4	62	35
c3. Share of i sold in Benin	6	0	0	0	3	4	15	3	0	4	10	4	7
d. Share of sales of i in income from i (c/a)	4	1	0	0	15	4	67	43	26	39	100	100	100
e. Share of i sold in Nigeria/Benin in TINC	1	0	0	0	0	1	0	0	2	2	1	6	7
f. Share of income from i in total income	16	4	1	0	2	21	1	5	5	11	7	9	17
<u>Gaya Plateau</u>													
a. Value of income from i	10172	1017	610	0	2034	13834	0	4679	1221	5900	2234	1381	4107
b. Imputed value of home consumption (a-c)	9715	1005	610	0	1899	13230	0	2387	986	3373	0	0	0
c. Value of sales	457	12	0	0	135	604	0	2292	235	2527	2234	1381	4107
c1. Share of i sold in Niger	100	100	100	0	100	100	100	100	67	97	99	73	91
c2. Share of i sold in Nigeria	0	0	0	0	0	0	0	0	20	2	1	0	0
c3. Share of i sold in Benin	0	0	0	0	0	0	0	0	13	1	0	27	9
d. Share of sales of i in income from i (c/a)	4	1	0	0	7	4	0	49	19	43	100	100	100
e. Share of i sold in Nigeria/Benin in TINC	0	0	0	0	0	0	0	0	1	1	0	1	1
f. Share of income from i in total income	29	3	2	0	6	39	0	13	3	17	6	4	12
<u>Gaya River</u>													
a. Value of income from i	11866	6618	1826	228	0	20537	1369	228	0	1597	1822	3954	5946
b. Imputed value of home consumption (a-c)	11549	6329	1786	228	0	19891	931	178	0	1109	0	0	0
c. Value of sales	317	289	40	0	0	646	438	50	0	488	1622	3954	5946
c1. Share of i sold in Niger	100	100	100	100	0	100	54	100	0	58	65	67	99
c2. Share of i sold in Nigeria	0	0	0	0	0	0	0	0	0	0	0	10	0
c3. Share of i sold in Benin	0	0	0	0	0	0	46	0	0	42	35	23	1
d. Share of sales of i in income from i (c/a)	3	4	2	0	0	3	32	22	0	31	100	100	100
e. Share of i sold in Nigeria/Benin in TINC	0	0	0	0	0	0	1	0	0	1	1	3	0
f. Share of income from i in total income	26	14	4	0	0	45	3	0	0	3	4	9	13

Table 3: Potential Impact of Trade Regime Changes in Terms of Percent Changes in Real Incomes -- Full Arbitrage Model

	Sudano-Sahelian		Sudano-Guinean		
	Northern Boboye	Southern Boboye	Dalloy Maouri	Gaya Plateau	Gaya River
POLICY SCENARIOS ----- percent change -----					
A. 50% devaluation					
1. Income Side Impacts					
1a. Pulses	2	1	5	8	2
1b. Livestock	10	5	9	6	6
1c. Cereals					
Millet	4	2	8	14	13
Sorghum	1	0	2	1	7
Maize	0	0	0	1	2
Rice	0	0	0	0	0
Fonio	0	0	0	1	0
2. Expenditure Side Impacts					
2a. Pulses	-1	-1	-3	-5	-1
2b. Livestock	-4	-4	-3	-2	-5
2c. Cereals					
Millet	-3	-3	-11	-15	-14
Sorghum	-1	0	-3	-2	-8
Maize	-3	-2	-1	-1	-2
Rice	0	-1	0	0	-1
Fonio	0	0	0	0	0
2d. Manufactured goods	-6	-10	-9	-7	-5
3. Net Effects	-3	-12	-6	0	-6
B. 30% decrease in transactions costs					
1. Income Side Impacts					
1a. Pulses	1	1	3	5	1
1b. Livestock	6	3	5	3	4
1c. Cereals					
Millet	2	1	5	9	8
Sorghum	0	0	1	1	4
Maize	0	0	0	1	1
Rice	0	0	0	0	0
Fonio	0	0	0	0	0
2. Expenditure Side Impacts					
2a. Pulses	1	0	2	3	1
2b. Livestock	3	2	2	1	3
2c. Cereals					
Millet	2	2	6	9	8
Sorghum	0	0	2	1	5
Maize	2	1	1	1	1
Rice	0	1	0	0	0
Fonio	0	0	0	0	0
2d. Manufactured goods	4	6	6	4	3
3. Net Effects	21	17	33	38	41

Notes: 1. The full arbitrage model assumes full transmission of price increases and decreases to all tradables. Tradables are pulses, livestock, manufactured goods, and all cereals except fonio in Sudano-Guinean zone and except fonio and millet in the Sudano-Sahelian zone.

2. For a 50% devaluation, the income-side impacts are calculated as follows: line f of Table 2b multiplied by 0.5 for tradables; line f of Table 2b multiplied by 0.5 and by 0.2 for non-tradables. The expenditure-side impacts are calculated in a similar fashion, using shares from Tables 1a-1b.

3. For a 30% decrease in transactions costs, the income-side impacts are calculated as follows: line f of Table 2b multiplied by 0.3 for tradables; line f of Table 2b multiplied by 0.3 and by 0.2 for non-tradables. The expenditure-side effects are calculated in a similar fashion using shares from Tables 1a-1b.

Table 4: Potential Impact of Trade Regime Changes in Terms of Percent Changes in Real Incomes -- Partial Arbitrage Model

	Sudano-Sahelian		Sudano-Guinean		
	Northern Boboye	Southern Boboye	Dallol Maouri	Gaya Plateau	Gaya River
POLICY SCENARIOS					
	----- percent change -----				
A. 50% devaluation					
1. Income Side Impacts					
1a. Pulses	1	1	3	4	1
1b. Livestock	5	2	5	3	3
1c. Cereals					
Millet	4	2	4	7	6
Sorghum	0	0	1	1	4
Maize	0	0	0	0	1
Rice	0	0	0	0	0
Fonio	0	0	0	1	0
2. Expenditure Side Impacts					
2a. Pulses	-1	-0	-2	-2	-1
2b. Livestock	-2	-2	-1	-1	-3
2c. Cereals					
Millet	-3	-3	-6	-8	-7
Sorghum	-0	-0	-2	-1	-4
Maize	-2	-1	-1	-1	-1
Rice	-0	-0	-0	-0	-0
Fonio	0	0	-0	-0	0
2d. Manufactured goods	-3	-5	-5	-3	-3
3. Net Effects	-1	-6	-3	0	-4
B. 30% decrease in transactions costs					
1. Income Side Impacts					
1a. Pulses	0	0	1	1	0
1b. Livestock	1	1	1	1	1
1c. Cereals					
Millet	2	1	1	2	2
Sorghum	0	0	0	0	1
Maize	0	0	0	0	0
Rice	0	0	0	0	0
Fonio	0	0	0	0	0
2. Expenditure Side Impacts					
2a. Pulses	0	0	0	1	0
2b. Livestock	1	0	0	0	1
2c. Cereals					
Millet	2	2	2	2	2
Sorghum	0	0	0	0	1
Maize	0	0	0	0	0
Rice	0	0	0	0	0
Fonio	0	0	0	0	0
2d. Manufactured goods	1	1	1	1	1
3. Net Effects	7	5	8	8	9

Notes: 1. The partial arbitrage model assumes full transmission of price increases and decreases to all goods directly traded across the border and partial (half) transmission to all tradeables not traded directly across the border. Tradeables are pulses, livestock, manufactured goods, and all Cereals except fonio in Sudano-Guinean zone and except fonio and millet in the Sudano-Sahelian zone.

2. For a 50% devaluation, the income-side impacts are calculated as follows: line f of Table 2b multiplied by line e of Table 2b multiplied by 0.5 plus line f of Table 2b multiplied by (1-line e) of Table 2b multiplied by 0.25 for tradeables; and as line f of Table 2b multiplied by 0.5 and by 0.2 for non-tradeables. The expenditure-side impacts are calculated in a similar fashion using shares from Table 1a and 1b.

3. For a 30% decrease in transactions costs, the income-side impacts are calculated as follows: line f of Table 2b multiplied by line e of Table 2b multiplied by 0.3 plus line f of Table 2b multiplied by (1-line e) of Table 2b multiplied by 0.2 for tradeables; and as line f of Table 2b multiplied by 0.3 and by 0.2 for non-tradeables. The expenditure-side impacts are calculated in a similar fashion using shares from Table 1a and 1b.