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Determinants of Rural Poverty in Post-War Mozambique: Evidence from a Household Survey and Implications for Government and Donor Policy

Tilman Bruck*

This research report analyses the welfare effects of rural household coping strategies in post-war Mozambique. In addition, it considers appropriate government and donor policies to assist poor, war-affected farm households. The report discusses the expected theoretical effects of war on smallholder labour, asset, and social capital endowments and thus on household welfare. In addition, it considers the effects of war on land use and market-participation decisions by households and the impact of these choices on post-war household welfare.

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* Queen Elizabeth House, University of Oxford

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Executive Summary: Determinants of Rural Poverty in Post-War Mozambique

Objective

This research report analyses the welfare effects of rural household coping strategies in post-war Mozambique. In addition, it considers appropriate government and donor policies to assist poor, war-affected farm households. The report discusses the expected theoretical effects of war on smallholder labour, asset, and social capital endowments and thus on household welfare. In addition, it considers the effects of war on land use and market-participation decisions by households and the impact of these choices on post-war household welfare.

Key Findings

Household welfare is measured by income, consumption, and food consumption thus assessing several dimensions of welfare. The empirical analysis is carried out using econometric techniques on an agricultural household survey from post-war northern Mozambique.

The war in Mozambique, which ended in 1992, is found to be a strong cause of these poverty traps, ie of economic mechanisms which prevent poor rural farmers from increasing income and food security. The main effects of the war are indirect rather than direct. For example, refugee households do not appear to poorer than non-refugee households.

The negative war effects are very difficult to reverse thus making post-war reconstruction and poverty alleviation much slower than expected. Almost nine years after the end of the war in Mozambique, post-war reconstruction and poverty alleviation in northern Mozambique is thus on-going process.

Quite surprisingly, increasing the area farmed by smallholders has very strong the positive welfare effects. Previous empirical studies for Mozambique under-estimated the sign of this effect. In addition, post-war farm households do not benefit from adopting cotton. Past studies of the welfare effects of cash crop adoption in Mozambique may have found conflicting evidence due to the particular specification of their econometric models. Households do clearly benefit from specialising in agricultural production and from participating in crop markets.

Key Policy Implications

This evidence suggests that farm households should be encouraged to continue their war-time coping strategies, which rely heavily on extreme form of subsistence agriculture, in the immediate post-war period. With a favourable security situation, post-war rural households have a labour supply surplus which can be used to extend the area cultivated. Household asset endowments were badly hit by the war and re-endowing households with tools and assets can help increase this agricultural supply response and can help insure households against short-term income shortfalls.

In the immediate post-war period, rural households are likely to have a low demand for education. Instead, government and donor policies should aim to create markets destroyed by the war and lower transaction costs in the rural economy. Broadly based rural development policies should commence soon after the end of the fighting to increase both household income and food security and to avoid imbalanced rural growth. Preparing government capacity to implement such post-war rural development programme should start before the end of a conflict, thus accelerating genuine post-war poverty alleviation.

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1. Introduction

The objective of this report is to analysis the determinants of household poverty in post-war, rural northern Mozambique. Such analysis yields three benefits. First, it will identify the relative importance of the war's effects on household labour supply, assets and village institutions for post-war poverty, thus gaining a better understanding of how internal war can shape post-war poverty outcomes. Second, the analysis can contribute to ongoing policy debates in Mozambique about the nature of post-war rural "emergency" versus "development" policies, about the importance of education versus land (ie human versus physical capital), and about the importance of household on-farm versus off-farm income sources for alleviating rural poverty.[1] Third, this report will use instrumental variable techniques to assess the welfare effects of endogenous household choices for land use and income activities, thus gaining a better understanding of the effects of these endogenous household choices.

The main hypothesis is that the war legacy continues to affect household welfare significantly through a variety of effects. In particular, it is expected that the war has a stronger negative effect on household income than on household food consumption. Households are expected to exhibit a war-induced labour surplus so that increasing household assets (especially including land) and improving market access will yield large increases in household welfare. The former may help induce increases in food consumption while the latter will also be important for increasing income. Alleviating both constraints would require an integrated approach to rural post-war reconstruction policy, with initially a small emphasis only on human capital formation. If these hypotheses prove to be correct, then policy in the post-war years should aim to stimulate the war-induced supply constraints which in turn would increase the returns to education and the benefits of cash crop adoption.

This report is building on previous work at Queen Elizabeth House (QEH) on the economic effects of war and on post-war reconstruction in developing countries. Many of the general lessons from that work have been published recently by Stewart and FitzGerald (2001) while Brück, FitzGerald and Grigsby look specifically at the macro-economics of post-war reconstruction in Mozambique and Nicaragua (2000). The macro-economic effects of war in Mozambique are also discussed by Brück (1997).

The analysis presented here will make use of a dataset collected by the Food Security Project (FSP) at the Ministry of Agriculture in Maputo in 1994-96 with the assistance of Michigan State University (MAP/MSU Research Team 1996). It is a useful tool for this analysis as it combines evidence on household activity choices with household welfare outcomes from a war-affected area in northern Mozambique. The key variables from this dataset are summarised in figure 3. Unfortunately, the data enumerated in the FSP survey on household crop storage and household calorie intake, which would have provided further evidence of savings behaviour and welfare outcomes, could not be used due to significant inconsistencies in data enumeration (Strasberg 1997: 187-8).

The analysis will commence in section 2 with a theoretical discussion of the effects of war on household welfare. Section 3 will consider different indicators of household welfare, discuss data issues and derive an econometric specification of a household welfare equation. Section 4 will summarise the expected determinants of household welfare in such an equation.

The subsequent section will review the results of a bivariate poverty profile, address if the data should be pooled and discuss in detail the determinants of household welfare, including the effects of endogenous activity choices on welfare. Section 6 will conclude the report. The

[1] These three issues are discussed in the Mozambican context by Lopes and Sacerdoti (1991), Ratilal (1990), World Bank (1993) and White (1994), by IAF (1998), Rose, Strasberg, Jeje and Tschirley (1999), Tschirley and Benfica (2000) and Tschirley and Weber (1994), and by Cramer and Pontara (1998) and Pitcher (1999), respectively.

appendix contains a discussion of the variability of welfare indicators and of inequality in welfare across households, which complement the main analysis. All figures and empirical results are summarised in an appendix at the end of the report.

2. War and Household Welfare

2.1. Definitions

Household poverty is the lack of command over market and non-market goods and services at the household level (Ravallion 1996a: 201) while household welfare is a positive function of a household's command over such resources. Welfare in this report is thus linked closely to notions of income and consumption, in particular of food and non-durable goods and services (Atkinson 1989). The definition of household welfare employed here thus disregards for empirical reasons the consumption of services derived from durables (which are likely to be small as households have only a low asset stock in the post-war period). This view of welfare also disregards any externalities of consumption as well as the effects of illness and death, which are likely to be significant after a war but which are difficult to combine with monetary aggregates in a welfare indicators at the household level.

The term welfare indicator will thus refer to a household's command over resources such as income, overall consumption or food consumption. These indicators thus differ from welfare indicators such as the human development index (HDI) which also includes indicators of educational attainment and health status (UNDP 1998). In the analysis below, education and health are instead determinants of welfare outcomes as households can influence their education and health status to some extent. The income and consumption outcomes at the household level thus implicitly contain the effects of nutrition, health, education, asset endowments, climatic and market risks as well as institutional arrangements.

The indicator of food consumption will allow a discussion of the determinants of household level food security. Food security refers to the reliable and sufficient flow (via home production, markets or social exchange) of calories and other components of nutrition appropriate for a healthy, active and productive live of a household, where the requirements are in turn affected by its members' age, gender, metabolic efficiency and activity levels.[2] Food security is thus a broader term than food consumption but with the available agricultural household surveys, food consumption is the best available estimate of food security for post-war northern Mozambique.

Given the available cross-sectional data, the main focus must be on current poverty and welfare. It would require panel data to understand if a household's experiences transitory poverty (ie if permanent income was above the poverty line but current income was below it) or chronic poverty (ie if permanent income was below the poverty line Atkinson 1989, Morduch 1994). The data may be able to indicate some forms of structural poverty, where poverty is caused by socio-economic exogenous constraints such as female-headed or refugee status or a life-cycle induced high dependency ratio. Other indicators in the analysis may point to poverty being stochastic so that random exogenous events such as a drought force a household below the poverty line (especially with significant borrowing constraints).

[2] The definition of food security is discussed by Alderman and Garcia (1994: 487), Anand and Harris (1992), Behrman and Deolalikar (1988: 654-6), Maxwell (1996), Maxwell and Wiebe (1998: 7-10), Reardon and Matlon (1989: 118-9), Sahn (1989: 3), and Strauss (1990).

2.2. Links between War and Household Welfare

The determinants of household poverty and food security are an important concern of economic research and public policy in their own rights. However, poverty and food security are also closely linked for a number of reasons, especially in war-affected rural economies.

First, pure subsistence households retain all agricultural production for future home consumption. In the absence of storage losses, the latter equals total food production so that poverty and food security are identical for pure subsistence households. In practice, rural households in northern Mozambique have a degree of subsistence production and a significant share of households practices pure subsistence, which is in part a direct result of the war. For a pure subsistence household, therefore, a model of either production or consumption would analyse poverty and food security simultaneously.

Second, both household production and food security are important contributors to household utility. Agricultural production determines available food resources which in turn determine current food actually consumed, which must lie above a given survival threshold. For very poor households close to the threshold it is not the total level of income or its variability which will be the key determinants of its welfare but the proximity to the absolute survival threshold (de Janvry et al 1991, Fafchamps 1999: 66). This has strong implications for household behaviour, eg concerning the decision to adopt cash crops or to alter production technology. This is particularly important for war-affected households who are more likely to face a binding nutrition constraint. So for the modelling of post-war household welfare, it is important to analyse the determinants of both general welfare and food security explicitly.

Third, it has often been assumed that low income equals low food consumption which equals low nutritional intake.[3] In fact, this view is supported by some evidence of a high elasticity of nutrient intake with respect to income or consumption. However, some of these studies estimate food consumption for only a few food categories and then convert their results using possibly biased food-to-nutrient conversion factors thus deriving high nutrient elasticities from food consumption elasticities. This has led to, for example, the World Bank proposing policies which are aimed at creating food security by raising the average incomes of the poor and malnourished.

Yet food has many dimensions and purposes including nutrition, taste, appearance, status, convenience, processing etc. For example, households in northern Mozambique have been observed to spend extra income on dried fish to improve the flavour of their otherwise very monotonous diets (Tschirley and Weber 1994). This implies that high food-income elasticities can be consistent with low nutrient-income elasticities as households with higher income primarily increase spending on dimensions of food other than nutrition. This further strengthens the argument that the determinants of food security and income may actually diverge in practice, so that policies aimed at increasing income may not increase food security. In Mozambique, this debate has concerned itself with the food security effects of cotton adoption, which will be analysed below.

Fourth, one explanation for the poverty-food security relationship derives from the sources of risk a household is exposed to as a result of its portfolio of activities. As a household engages in fewer subsistence activities, the determinants of poverty and food security increasingly diverge (Bouis and Haddad 1990, Kennedy and Bouis 1993, Kennedy and Cogill 1987). For example, cash-cropping households rely on both crop and food markets to convert their production into nutrition consumption. Yet food markets may not work well at either the national or local level, especially with high war destruction and a high degree of economic isolation.

Even abstracting from seasonality and crop risk, a household with a high level of production may thus have little food security and vice versa. According to Behrman and Deolalikar, risk

[3] As discussed by Behrman and Deolalikar (1987: 497, 1988: 653-4), Garrett and Ruel (1999: 1963), and Strauss and Thomas (1995).

is an important determinant of household activity choices but its effect on household food security has not been studied in much detail in the literature (1988: 639). The analysis below will thus help address this gap, especially for the context of a post-war economy.

The implications of these observations is that while the determinants of income and food security may converge for pure subsistence households, this convergence cannot be taken for granted for households facing re-emerging markets. Utility especially for households threatened with survival depends on both income and food security as each captures different elements of household well-being. For the design of poverty alleviation policies it is important to recognise that higher income may not necessarily lead to higher food security, especially when considering the strong impact of the war on household activity choices.

The subsequent paragraphs will analyse some components of the household model which are relevant for the determination of household welfare. In particular, the discussion will emphasise the role of the war in determining income and consumption, bearing in mind that these determinants need not be equal.

2.3. Household Utility

Households utility depends on the consumption of food and other goods and services which may include freedom and security. Households are risk averse, which expresses itself through the shape of the utility function (Brück 1997). It is not possible to directly observe household (or even individual) utility so that household income, total consumption and food consumption will be used as indicators of household welfare instead.

War will not directly affect the utility function of the household. Instead, the level of utility achieved by a household will be reduced indirectly through the effects discussed below. Lower consumption or the consumption of inferior goods thus reduce utility but leave the utility function unchanged. One example is imported yellow maize which was the main form of food aid in Mozambique even though white maize is preferred locally (Dorosh et al 1995, Tschirley et al 1996). As soon as sufficient white maize was again produced locally, consumers purchased this instead of the yellow maize. It thus appears that demand patterns were less affected by the war than, say, income generation patterns, eg through changing gender roles in production and the changing rural-urban and intra-rural output mix in post-war Mozambique.

War may not significantly change the minimum nutritional requirements which represents the survival threshold, either, although some endogenous adaptation to lower calorie intake is possible. In addition, households may exhibit an increased rate of time preference during the war (ie larger impatience). The utility of being alive now may increase in times of war if intergenerational linkages in households are weakened, eg due to refugee movements or lethal attacks. This undermines a basic motive for household formation and implies that there are fewer purposes in building up assets and planning a bequest, for example of land. The war-induced increase in the household discount rate causes an indirect reduction in household assets (cf. Glomm and Palumbo 1993) and hence an indirect reduction in the level of income.

2.4. Household Labour

This section discusses the effects of war on household labour and thus poverty.[4] In summary, war reduces household labour availability but the end of the war only partially reverses this constraint. In addition, war has negative effects on the productivity of labour and on human capital. These effects reduce the valuation of household leisure during a war and may push a household closer to its survival constraint. In addition, they may deepen the war-induced poverty trap and weaken the post-war supply constraint. Household labour characteristics are

[4] The role of household composition and household weights in the calculation and inter-household comparison of welfare indicators is discussed in section 3.

thus crucially affected by the war and these will in turn affect household welfare in the post-war period.

The maximum amount of labour available for work within the household will be diminished as some household members are drafted into an army, maimed or killed by war action, or cannot work productively as the household must constantly look out for further attacks. In addition, war will indirectly increase the general incidence of morbidity and mortality in the population. These effects of war will reduce the effective labour input into production so that household production will shift back towards the origin along the production function.

However, this is not equivalent to a scale reduction of household production if the negative effects on labour are not proportionate to the household's initial demographic characteristics and if it affects the household's consumption-production ratio. This will occur especially with a higher degree of morbidity and agriculturally unproductive sentry duty as these household members still need to be fed even if they cannot directly contribute to agricultural production. Such war-induced increase in the consumption-production ratio in the household will thus increase the valuation of household labour as in the life-cycle effects in a Chayanov model.

In the post-war period, the direct reduction of war-induced mortality will cease suddenly but indirect effects (eg through the weakened health system) will persist. The consumption-production ratio changes may also take many years to reverse themselves. The composition of household labour and the valuation of this labour in the peasant household will thus be war-affected for many years after the ceasefire. A well-known example of this war legacy is the unequal gender composition of the population in post-war Europe.

These slow post-war changes imply that households, which may slowly move away from the survival constraint for other reasons, value leisure more highly in the post-war period. This weakens the supply response in the post-war period as well as creating a bias in the estimation of monetary or calorie-based household welfare indicators which cannot measure the value of leisure per se.

The war-induced changes in the valuation of leisure also help to explain the low level of education attained in northern Mozambique, which is not only the result of the reduced supply of educational opportunities. With a binding survival constraint and war-time household production opportunities which may not directly depend on past household educational achievements, households have a strongly reduced demand for education during the war. With a long-lasting war, this then implies a very low level of education in the post-war period and thus reduced household income opportunities in the post-war period, which in turn increases household welfare vulnerability.

In addition, the effect of (especially food) consumption on health and productivity of the peasant household is likely to increase during a war (Dasgupta and Ray 1986, 1987, Kennedy and Bouis 1993, Singh et al 1986: 38-9, ch. 5). Household health is produced by the consumption of food, non-food goods and leisure, by household health spending, and by community health spending. Health in turn positively affects the productivity which in turn can create more resources required for maintaining household health. The ability to hire in labour may compensate for household's ill-health but such labour markets are also reduced during war. These arguments suggest that war further deepens the poverty trap of war-affected households.

Empirically, this effect is difficult to measure with the FSP survey, which has good data on agricultural household choices but less useful data on health-related indicators (figure 3). These efficiency wage considerations can thus not be integrated fully into the model though the FSP dataset contains some variables which help to control for household ill health.

2.5. Household Assets

War affects different types of assets including land and thus a household's labour-capital ratio in different ways and thus creates varying intensity of war vulnerabilities for assets and activities. To the extent that household production is a function of a given capital-labour ratio

per activity, the war destruction or dislocation of assets will reduce household production but also household technological efficiency.

In particular, war reduces the technical efficiency of the household agricultural production function by destroying tools, disrupting the production process with random attacks, and reducing the level of technical advice a threatened and under funded extension service can provide. This will shift down the production function so that for a given labour input, less crops will be harvested. Such lower labour productivity may induce the household to increase its labour supply relative to its asset endowment to ensure that its minimum consumption target is still attainable. This will alter its optimal production technology and crop mix and thus induce a shift away from market activities and into subsistence activities.

Similarly, war reduces the technical efficiency of the household storage function by exposing the stored produce to random attacks and preventing households from learning or applying the best storage techniques. This will shift down the storage function so that for a given amount put into storage, a smaller amount will be available when taken out of the depot. Households can circumvent this additional constraint either by increasing its area planted thus putting more into storage, by increasing its market participation to bypass crop storage, or by shifting to other activities which require less crop storage (eg social exchange or famine foods).

Assets are a key component of constructing a household livelihood especially by enabling non-food and off-farm activities which may require a minimum asset level before they can be started or which may have IRS (Dercon 1996). Poor households with few assets, even if not facing a credit constraint, will consume (nearly) all their current income (Zeldes 1989). The lower a household's asset endowment, the larger are its consumption fluctuations and the chance of an occasional severe consumption shortfall (ie a "famine") to below the usual survival constraint (Deaton 1990). With credit constraints and an unequal distribution of assets, asset-poor households may find themselves facing a poverty trap situation as less asset constrained households can invest in higher return activities thus increasing the asset and income inequality further (Ravallion 1996b).

War will create asset poverty almost randomly, as there may be little pattern in the direct destruction of household assets during the war. After a long war, households may actually face an equalised distribution of assets but they will have few opportunities to increase their asset holdings initially. Apart from the activity choices this induces, low household endowments imply lower but more variable returns and thus lower household welfare. The increased variability of household income may result in some households being poor in some years while other households (irrespective of the variability of their incomes) may be poor in all years. However, cross-sectional survey data cannot differentiate between such transient and structural poverty.

In addition, these large consumption risks facing war-affected households in the post-war period will induce some precautionary savings, even if the rate of return is negative (Deaton 1992). This applies particularly to savings in the form of agricultural produce, which is increasingly important in an environment in which households have few opportunities for reducing climatic risks through increased input application or for trading outputs in the market. The war thus increases the household demand for savings in terms of on-farm storage.

With endogenous survival, many of these predictions concerning the destruction and dislocation of assets during a war are sharpened (Glomm and Palumbo 1993). Assume that mortality is inversely related to the stock of health, where health depreciates but can be augmented by consumption. Changes in income can be expected to affect the optimal intertemporal allocation of consumption and savings and the depletion of the given initial wealth stock. Three main results obtain from such model.

First, with borrowing constraints and endogenous survival, consumption in each period does not equal permanent income, as would have been expected in the standard life cycle model. Instead, the increased utility of being alive versus being dead is an incentive to move some consumption into the present. If war increases this impatience, as household heads may for example not expect the household to continue to exist beyond their death, then the result will

be less investment and a smaller household endowment even in the absence of direct war effects.

Second, income elasticities of demand for nutrients can be lower than unity. With endogenous survival, it makes sense to spread additional current income across several periods to try to maintain one's survival chances beyond the next time period. Yet at the margin of the survival constraint, very poor agents will allocate increasing amounts of their wealth to current consumption to ensure survival into the next period, even if survival then will be threatened. For such poor households, assets will be low or depleted in the long-term and the stock of assets will have little impact on current welfare.

Third, with an endogenous survival constraint (Gersovitz 1983, Glomm and Palumbo 1993), households will have a higher demand for health services at the same time as the supply of these services is reduced by the war and the productivity of health spending is lower. This deterioration in health spending productivity may be due to a number of factors: Health costs rise, health posts are attacked, and medicines cannot be distributed, or are needed for wounded soldiers. These effects compare in part to an increase in mortality rates during winter when flu viruses require additional health measures to maintain a proper immune system but the supply of health care is also inelastic.

War is thus like an extreme winter season especially when considering the indirect effects of war on survival, such as diseases, poor sanitation and drinking water etc. Health depreciation is likely to worsen during times of war especially for directly war-affected individuals, like soldiers or refugees in a refugee-camp. Individuals need to pay more attention to their health in times of war to ensure a constant rate of survival even if they have fewer resources to do this, their resources will have less productivity in the health production function, and while public health services are much curtailed. It can thus be expected that households with more ill health have a lower welfare both directly (as ill health is unpleasant itself) and indirectly (through the reduced labour market participation while being ill).

These three effects of an endogenous survival constraint in a simple model of consumption indicate how war can cause an indirect depletion of assets over and above any direct reductions in capital holdings as a result of fighting or any indirect portfolio effects of war on asset holdings. The main indirect effects of war operate on the probability of mortality and the marginal productivity of health. Further direct effects of war may be changes in the rate of health depreciation and in the utility of being alive.

2.6. Markets and Social Institutions

In addition to assets' role in maintaining technical efficiency, widening coping strategies, and building precautionary savings, assets also permit a household to improve its social capital and thus its capabilities, ie its ability to conduct a meaningful life and to enhance its decision making (Bebbington 1999, Corbett 1988, Sen 1985, 1997, Webb et al 1992). Social capital is another important determinant of poverty as rural African households hold diversified activity portfolios which are dependent on and interlinked with other actors both via market and non-market interactions (Chambers 1989, Heyer 1996). Social capital can capture some of these linkage channels and effects as well as expressing a household's capabilities. War directly undermines social capital as war dislocates people and institutions thus depreciating contacts, trust, and other components of social capital. This will lead to a further, war-induced reduction in output and thus welfare. In practice, it is difficult to measure social capital but it may be related to a number of indicators reviewed in more detail below.

One key institution for peasant households concerns land tenure. Yet there is little formal analysis and even less evidence of how more secure land tenure will affect household welfare and food security (cf. Maxwell and Wiebe 1998: 2, 21-2). On one hand, it is argued that land is not a key determinant of household welfare in SSA (Lipton 1985) while, on the other hand, it is argued that land is a key determinant of welfare in some areas (Deininger and Binswanger 1999, World Bank 2000). It seems likely that war does affect land tenure

arrangements, especially if local issues and local participants play a large role in the conflict, as was the case in northern Mozambique (Geffray 1991). Yet the nature of these effects is ambiguous a priori. Some households may gain while other households may loose tenure security, cultivated area or physical investments in land infrastructure (eg irrigation). Much depends on the political affiliations of the household and perhaps on the random effects of attacks.

Market institutions also matter to peasant households as they define a household's ability to convert output into consumption goods. The variance of activity returns, transaction costs, and the terms of trade all affect a household's decision to participate in markets and thus its output, cons and welfare. The effect of market risk on poverty depends in part on the share of the poor in society and thus on the choice of the social welfare function (Ravallion 1988). In very poor societies, for instance, an increase in market risk implies that relatively few households will ever be pushed above the poverty line through chance. In other words, in such societies, there is less transient poverty and more structural poverty, so that a reduction in poverty will have less welfare enhancing effects than, say, an increase in endowments of the poor (especially when considering the headcount index of poverty which gives equal weight to all poor households below the poverty line).

Given these considerations, war has a negative effect on poverty through both increases in risk and reductions in assets. However, given that Mozambique is a very poor society, the war induced increase in risk may not have been as important in reducing household welfare as was the loss of assets. In one important instance, however, this does not apply. Households very close to the absolute survival constraint would suffer huge welfare losses from an increase in risk even if the expected income was constant. Therefore, the more severely a household was affected by the war, the more important the distribution of the returns of its activities are to the survival of that household. Conversely, for very poor households a reduction in risk is welfare enhancing if such reduction reduces the risk of starvation.

Finally, household social income depends at least in part on market and non-market institutions and low transaction costs.[5] During the war, risks are highly covariant across large areas and travelling or trading was very dangerous and costly. Thus social exchange would have been suppressed strongly during the war. In the post-war period, households facing lower market transaction costs and perhaps having larger kin networks across larger spaces could thus generate higher social income. In the long-term, however, such activities may become unprofitable as local output markets intensify and thus offer higher returns at lower transaction costs. The determinants of social institutions enabling social exchange thus have an ambiguous effect on household welfare, depending on what stage of the post-war transformation a household and its village and social kin network is.

The following sections will consider how this framework for the analysis of post-war household welfare can be utilised with the available data using econometric techniques. Section 4 will then summarised the expected effects of the independent variables on income, consumption and food consumption.

3. Econometric and Data Considerations

Given the above discussion of the definition of household welfare, this section will consider the suitability of household income and household consumption as household welfare indicators. This section will also derive an econometric specification of a welfare (ie income or consumption) function and will review some data issues relevant to the econometric analysis.

[5] See for example Dercon (2000), Fafchamps and Minten (1999), Lyon (2000) and Platteau (1999).

3.1. The Choice of Welfare Indicator: Income versus Consumption

A number of issues may help determine the appropriate choice of welfare indicator given the available data.[6] Household income or consumption measure a household's ability to obtain goods and services. All indicators typically fail to include leisure, the use of public goods and free public sector services, common property resources and the quality of life (Datt and Jolliffe 1999: 9, Ravallion 1996b: 1331). The income variable may measure their use for production purposes more directly than the consumption variable as the amount of leisure also helps to determine income (but not consumption) while some agricultural production processes depend on the use of "free" common property resources or public goods and thus value their contribution to the final product obtained.

Household income may overestimate household welfare if storage losses are significant, if households are rationed in their purchase of consumption goods, or if households save a significant share of income. However, household income may also underestimate household welfare if borrowing is feasible or if households frequently share in the consumption activities of other households (ie if social income is underreported). Note that household expenditure and consumption may also differ if the latter involves durables from which consumption may be derived over several periods.

The literature on welfare indicators considers that income measures a (potential) welfare opportunity while consumption measures a (realised) welfare achievement, so that the latter is sometimes preferred to the former as an indicator. Furthermore, consumption typically fluctuates less than income due to a household's comparative advantage in smoothing consumption rather than income over time where consumption smoothing activities include savings, loans and non-market transfers (Case 1995, Rosenzweig and Binswanger 1993, Rosenzweig and Wolpin 1993).

However, poor households may smooth income instead of consumption (Morduch 1994, 1995), especially households affected by war with few opportunities for consumption smoothing. In fact, even with no borrowing constraints poor households with no assets will consume all their current income (Fafchamps 1999: 19, Zeldes 1989). The problem of income variability is thus not as great in the immediate post-war period as it is as for peace-time households with better access to financial markets. Also, in the post-war period, storage losses are lower and there is less product market rationing than there had been in the war period, and income is thus a valid welfare indicator. Finally, food consumption is a useful welfare indicator especially if households are similar in regard to activities, prices and the times of visit of the enumerators (Anand and Harris 1990: 327, Ravallion 1988: 1178).

Overall, estimating all three indicators is useful as it is a good check on the robustness of the results, bearing in mind that the determinants of income will not exactly equal the determinants of consumption or food consumption (Appleton 1995: 5).

3.2. The FSP Dataset

The agricultural household survey organised by the Food Security Project (FSP) at the Ministry of Agriculture (MAP) in Maputo with the assistance of the Michigan State University (MSU) and the Land Tenure Centre (LTC) at the University of Wisconsin-Madison took place from 1994 to 1996 in northern Mozambique.[7]

The sample area includes seven villages in Montepuez district in Cabo Delgado, five villages in Monapo district and four villages in Meconta district, both of which are located in Nampula

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[6] The choice between different welfare indicators is also discussed by Anand and Harris (1990: 311), Atkinson (1989, 1991), Deaton and Grosh (1998), Deaton and Muellbauer (1980), Deaton and Zaidi (1999), Lipton and Ravallion (1995), and Ravallion (1992: 13-5).

[7] The data and sampling strategy are explained by MAP/MSU Research Team (1996) and Strasberg (1997). I also interviewed several FSP staff members in Nampula and Maputo in 1995 and in 1999 and discussed the research methods on these occasions.

province. The sampling area thus includes 16 villages, which are the primary sampling units (PSUs) in the survey design. These villages are not densely populated clusters of settlements but rather describe an administrative unit below the district level, where each village can stretch over several square kilometres. The total number of households included in this survey are 371.[8]

The FSP survey is stratified by cotton growing status of each household, with four mutually exclusive categories. Households either farm no cotton, or they farm cotton in one of three different institutional frameworks. Each of the three joint venture companies (JVCs) trading cotton in northern Mozambique during the sample period offered farmers either the opportunity to grow cotton individually on their own farm ("dispersed" growing) or to utilise land in a "block" of adjacent fields, thus in principle easing the delivery of inputs. In Montepuez, Lomaco offered a variant of this scheme where farmers can grow both cotton and maize in such block. Thus the four survey strata are non-growers, dispersed, block and Lomaco-block growers of cotton.

Only villages where at least twenty households grew cotton in 1992 were selected. Both villages and households were selected randomly given these sampling constraints. This makes the FSP sample statistically representative of potential cotton growing areas in relatively accessible parts of Nampula and Cabo Delgado. Broadly speaking, the findings of the survey should be applicable to the more accessible parts of northern Mozambique but not to central and southern Mozambique, which have different cultural, social, geographic and economic conditions.

The FSP conducted a first round of data collection in June 1994. However, subsequent changes to the sampling strategy make the results from that round incomparable with later data. The analysis in this thesis thus focuses on rounds two to five, which too place in January, May and September 1995 and January 1996 and thus cover the period mid 1994 to early 1996. There appeared to be virtually no attrition from the sample over this period which corresponds with the low degree of household mobility since the end of the UN mandate (ONUMOZ) in Mozambique.

The FSP questionnaire contains modules on household characteristics (at both the household and individual level and including some gender aspects of time allocation and the relation of the household to local political authorities), field-level characteristics (including land tenure arrangements), agricultural production activities (including food- and cash-crops, trees, fruit, vegetable and livestock), production and storage tool and technologies, monetary and in-kind transactions (including remittances and gifts), off-farm activities, and consumption.[9]

Enumerators were local extension workers fluent in Portuguese and Macua and resident during the survey work in the sampling villages. To enumerate consumption and income components of the questionnaire, households were visited twice within a week during each survey round. Other questions included longer recall periods, either over the previous four months (ie since the last round) or since the end of the war (eg to assess end of war asset endowments). These recall periods seemed appropriate for the issues questioned and are unlikely to have introduced serious measurement error (cf. Deaton 1997: 24-5).

The same enumerators interviewed both the head of the household and, as appropriate, the person in charge of food storage and preparation in repeated visits. Some modules of the questionnaire were repeated in subsequent visits to track changes in household endowments. While the FSP survey is not a panel, it provides very accurate endowment, production and expenditure data as a result of the repeated household visits.

Given the relative isolation of households during the war, "survey fatigue" did not appear to be a significant problem, with interviewees generally being keen to share their information.

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[8] Parallel to the FSP data and in conjunction with the same research team, the NGO Care collected further data in Nampula province. As this data is not directly comparable in scope, survey design, as well as temporal, spatial and thematic coverage it was excluded from the current analysis.

[9] A copy of the questionnaire used by the FSP is available from the author on request.

The data was check in the field with survey supervisors (thus enabling return visits if necessary) and in the survey offices in Nampula and Maputo. It was entered into SPSS and the data files later converted using Stat/Transfer for analysis in Stata 6.

3.3. Data Issues Relevant to the Calculation of the Welfare Indicators

Given the above considerations, it seems suitable to consider both income and consumption in the post-war period and to compare their determinants. Three suitable welfare indicators can be calculated using the FSP survey, namely net household income, total household consumption, and household food consumption (see figure 3 for a summary of all FSP variables used in this report). Consumption will be measured below by household market expenditure and the value of home-produced and home–consumed agricultural production (called subsistence consumption) valued at seasonal market prices.[10]

Household income data includes various sources of income. It is only available for the calendar year 1995 and not by round of data collection. The measurement error for agricultural household income is possibly lower in the FSP survey used here than in IAF (or other standard LSM surveys) as the former was conceived as an agricultural survey and thus contains an extremely detailed questionnaire enumerating agricultural production (IAF 1998: 182, MAP/MSU Research Team 1996). Livestock production and livestock consumption is not a very well enumerated part of the survey. Yet as the mean stock of large animals is extremely low due to the war, livestock production does not contribute a very large share to household income or consumption.

Payments for marketed goods or services may be in cash or in kind. Total net (gross) household income represents the sum of these components after (before) input costs have been deducted. Income and expenditure data were converted into US$ at the prevailing exchange rate in each reference period (eg round of data collection) so that all indicators are real 1995 values.[11] The household income variable measures, in US$, the natural log of net household income per capita (INCOME04).

It can be difficult to identify household expenditure for peasant households as part of the food expenditure may be used to pay workers, to seed fields or to feed animals (Deaton 1997: 28-9). The FSP survey appears to have captured transactions affecting hired workers and purchased inputs well, though they are not very common in northern Mozambique.

Expenditure data from the FSP survey is available per round of data collection for the round 2 to 5 and for the whole of 1995 (ie for rounds 3 to 5). In addition, imputed values for household subsistence consumption were added to the 1995 annual expenditure values thus deriving a measure of total 1995 household consumption. The expenditure data was enumerated using a very disaggregated list in an environment where most households only consume a small number of products so that the expenditure data can be expected to be very accurate (Deaton 1997: 27, Tschirley et al 2000). A careful use of recall period further strengthens the quality of the welfare indicators.

The expenditure data divides into the categories food, non-food, semi-durable and durable expenditures. The consumption of durables (which are items with a life-span longer than the reference period) is not equivalent to the expenditure on durables for a given period which is

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[10] Gifts received from outside the household are included in this definition as they could potentially form a large share of income for households in distress or for households experiencing a significant income surplus (ie if social insurance exists). This approach risks a degree of double counting of income (Deaton and Zaidi 1999: 34). However, given the careful enumeration process (which excluded for example intra-household gifts), given that unlimited gift exchange is not feasible with high post-war transaction costs, and given the potential importance of gifts in the post-war economy this approach seemed preferable.

[11] The exchange rates used to calculate real values in the FSP survey for rounds 1 to 5 are 5500, 7006, 7979, 9702 and 11097 Mt/US$, respectively, while the official exchange rates on 31/12/1994, 31/12/1995 and 31/12/1995 are 6553, 10776 and 11307 Mt/US$, respectively (Instituto Nacional de Estatística 1997: 82). There was only a small divergence between the official and the actual metical-dollar exchange rate during that period (Andersson and Sjöö 1998, International Monetary Fund 1998, Ubide 1997).

why the durable component of expenditure has been excluded from the analysis below (Anand and Harris 1990: 301, 308). Household consumption also does not include rent or imputed rent as this would be difficult to calculate in rural areas where most building materials are collected from common property resources and where there is no rental market for property which can establish reference values. Other Mozambican household surveys are thus likely to overestimate rural consumption or provide a biased estimate of the value of housing in rural versus urban areas (cf. IAF 1998: 13, 16).

Household expenditures have been weighted by Paasche price indices according to a method suggested by Deaton and Zaidi (1999: equation 2.6). The final expenditure variables exclude durable expenditures but include imputed subsistence consumption. They refer to 1995 and are expressed in US$. They are defined as the natural log of total expenditure per capita (EXP36PCL) and the natural log of total food expenditure per capita (EXP12PCL).

The collection of survey data at the household level may hide a large intra-household variation of welfare.[12] For example, food price changes may induce the reallocation of food resources within household away from women and children to men, depending on the bargaining power of individuals. However, many allocation decisions are taken at the household level, eg concerning total consumption expenditures and food crop cultivation. Children may not choose their level of nutritional intake freely and are strongly dependent on the total availability of resources at the household level. The estimation of welfare at the household level can then be seen as a baseline, which may be worsened by an unfavourable intra-household allocation of resources.

In addition, there are strong practical reasons to support the modelling of data at the household or per capita level (as opposed to the genuine individual level) as most household survey data (including the FSP survey) is obtained from one member of each household who may not report each individual's consumption accurately. Instead, data is collected concerning the household composition which will allow, in the analysis below, some adjustments to be made for nutritional requirements and labour supply availability.

The aggregation to the household level may also cancel out some of the unobservable variable bias resulting from the lack of data on activity levels. It is likely that each household has some members with above average and some members with below average activity levels so that their aggregate calorie requirements can be more accurately estimated than each individual's requirements. This does not hold, however, for genetic factors which may for example influence metabolic efficiency. These are likely to be correlated across household members (especially for smaller households where most household members are relatives).

The choice of weight for household size in the welfare indicator must always be arbitrary, yet some such weight must be chosen.[13] Estimating regressions on genuine per-household data would imply strong economies of scale which may not exist in practice. Also it would make comparisons across households with different age, gender and size compositions impossible. Weighing household members by their perceived consumption requirements or labour contributions (as in ACE and ALE models, respectively) assumes subjective weights for age and gender, which may not be applicable in practice, either.

This analysis thus follows the recommendation of Deaton and Zeaton (1999: 49) and divide all welfare indicators by total number of resident household members. This is feasible as the age and gender structure is less variable across households than the household size. Furthermore, in very poor economies the scope of economies of scale in consumption is smaller, for example because housing is a negligible (if any) part of consumption while the food share is very high.

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[12] As has been discussed by Behrman and Deolalikar (1988: 659), Deaton (1997: 24), Ravallion (1992: 43-4), Strauss and Thomas (1995: 1905), and Svedberg (1990).

[13] For a discussion of equivalence scales in welfare econometrics, see Atkinson (1991), Datt and Jolliffe (1999: 21), De Vos and Zaidi (1997), Deaton (1997: ch. 4.3), Deaton and Muellbauer (1980: 191-5, 1986), Deaton and Zaidi (1999: 48-54), Lanjouw and Ravallion (1995: 1415-6), Nelson (1993), and Ravallion (1992: 15-21).

Finally, the main dependent variables below will be expressed in their natural log form. Most importantly, this yields a distribution of the indicators which is nearly normal (figure 4). It also allows some coefficients of independent variables themselves expressed in log form to be interpreted as elasticities as the log specification implies that, for example, returns to assets are proportionately equal, ie the rate is constant, across households (Appleton 1995: 13).

3.4. An Econometric Specification

Households value consumption smoothed over time but they dislike effort and risk. Household utility is dependent on output consumed and leisure. The household maximises utility subject to a production function and time and budget constraints for given assets, prices and community endowments.

The imperfect nature of markets (eg in the labour market) and the interdependency of household production, labour supply and nutrition decisions imply that the separability property of the household model does not hold and that household welfare is a function of all exogenous (but not of endogenous) prices and assets. Furthermore, the high transaction costs, the low population density and the low level of technology suggest that a variety of location-specific exogenous factors which will co-determine household income, consumption and thus utility.

Ideally, household utility maximisation would thus be modelled directly. However, as actual utility is immeasurable and thus unobservable for the purpose of a household survey, an indirect indicator must be used instead. Such left hand side indicator could be monetary values of income, expenditure, and consumption for the analysis of poverty, and calorie consumption and calories in storage for the analysis of food security. The level of analysis will be the household thus abstracting from intra-household allocation issues, which are not well captured by the post-war FSP data.

For given assets, prices and community endowments, household welfare can then be assumed to be determined through the following reduced-form equation:[14]

$$y_i = a_0 + a_1\mathbf{L}_i + a_2\mathbf{F}_i + a_3\mathbf{K}_i + a_4\mathbf{V}_i + e_i \quad (1)$$

where y_i is a suitable welfare indicator (for example the natural log of household consumption) for household i = 1…N, $\mathbf{L}_i$, $\mathbf{F}_i$, $\mathbf{K}_i$, and $\mathbf{V}_i$ are vectors representing household, land, asset and village-level endowments and characteristics, respectively, and where e_i is a normally distributed error term which is not correlated with the exogenous variables thus yielding unbiased and consistent estimates for the coefficients a_h for households i = 1…N and coefficients h = 0…4.

There are several advantages in directly estimating the indicators of household welfare using equation (1), which justify adopting this approach in the econometric analysis below. First, this approach uses the maximum information on the distribution of the indicator. Second, the indicator can be estimated consistently under quite weak assumptions about the distribution of the error term. Third, the direct estimation of the indicator avoids strong distributional assumptions which would be required for estimating non-linear limited-dependent models as discussed below. Fourth, in very poor societies only very few households may be above the poverty line thus making inference from such data less reliable.

However, there are also a number of disadvantages to this direct approach. First, there can be substantial errors, especially if the survey uses a bias sample selection technique or if the calculation of the estimator variable is flawed. Second, this approach assumes constant parameters across a range of cases. For example, the poor and non-poor are assumed to behave alike. Both of these issues are reviewed in more detail below.

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[14] See also Behrman and Deolalikar (1988), Datt and Jolliffe (1999), Deaton (1997), Deaton and Grosh (1998), Deaton and Muellbauer (1980), Deaton and Zaidi (1999), Glewwe (1991), Ravallion (1992), Ravallion (1988), and Sahn and Alderman (1997).

The above specification is often extended for the analysis of household welfare relative to some pre-determined poverty line as follows:[15]

$$s_i = 1 \text{ if } y_i \quad z \tag{2}$$

$$s_i = 0 \text{ otherwise}$$

where s_i is a categorical poverty indicator for household i = 1…N and z is a poverty line. The binary specification then is:

$$\text{Prob } (s_i = 1) \tag{3}$$

$$= F\{z - (a_0 + a_1\mathbf{L}_i + a_2\mathbf{F}_i + a_3\mathbf{K}_i + a_4\mathbf{V}_i)\}$$

where F is a cumulative probability function. This equation can be estimated by logit or probit, if the error term follows a logistic or normal distribution, respectively.

An alternative formulation of this second step of the analysis is to calculate:

$$p_{n,i} = \{\max (1 - c_i / z), 0)\}^n \tag{4}$$

where $p_{n,i}$ is the poverty measure for household i = 1…N and n is a non-negative parameter so that the headcount index, the poverty gap index, and the squared poverty gap index can be obtained for n = 0, 1, and 2, respectively. A higher n implies a higher inequality aversion (ie a higher aversion to a large distance between actual welfare y_i and the poverty line z). Combing equation (1) and (4) is useful because in such approach the estimated coefficients for equation (1) are independent from the poverty line. However, is approach is not followed below as equations (3) and (4) do not use full information on the distribution of the household welfare indicator as these values have been converted to a binary variable. On the other hand, not using the full set of information is acceptable if poor households structurally differ from-non poor households, eg if their returns to assets as well as their asset ownership differed substantially. This issue will be discussed in the section below in more detail.

The calculation of a share of the population below a poverty line is most meaningful for nationally or regionally representative surveys. However, the FSP survey is not strictly speaking representative of a given political area thus calculating the incidence of poverty is not very informative. This analysis is also dependent on the actual definition of what is effectively a subjective poverty line. Yet sensitivity analysis could reveal if the results hold across different lines or are specific to one definition of poverty.

None of these techniques can distinguish between structurally and transiently poor households. Intertemporal data would be needed to achieve such identification. Finally, non-monetary measures of welfare would provide useful complements to this type of poverty analysis (Ravallion 1996b: 1330-1, Sen 1985), but the available surveys for the period and location of interest do not provide estimates of life expectancy, infant mortality or literacy which could be used to assess other meanings of poverty in the immediate post-war period.

4. Expected Determinants of Household Welfare

This section will summarise the expected determinants of post-war household welfare (figure 1). These hypotheses will be based on the preceding discussion of the effects of war on rural household welfare and on the proposed specifications of the income and consumption functions. The main determinants of household welfare given the assumptions of the model and the effects of the war will relate to household characteristics, land, technology and various assets, and community variables. There may also be some endogenous variables affecting household welfare (eg area cultivated or cash crop adoption) and these possibilities will be discussed as well.

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[15] For a further discussion of this approach, see Alderman and Garcia (1994), Bardhan (1984), Datt and Jolliffe (1999), Gaiha (1988), Grootaert (1997: 172-4), and Ravallion (1994, 1996b).

The effects of household size on household welfare depend in part on the degree of rivalry in consumption among household members (Lanjouw and Ravallion 1995). One extreme case is that all consumption is public so that every marginal increase in consumption benefits all household members. Examples of such consumption could be increased security or the provision of a tap providing clean drinking water. The other extreme case is that all consumption is private which implies that only one person can benefit from any one consumption activity. Nutrition is almost completely private, except perhaps for pregnant and breastfeeding mothers and to the extent that one person enjoys another being well fed (parents for example may be altruistic towards their children).

In addition, there may be synergies from larger household size, both in production and in consumption. Working in groups can be more productive through improved supervision, pooling of tools and experience, or higher motivation. Food preparation meanwhile can be less wasteful for larger groups. For a given degree of rivalry in production and consumption, returns to scale can thus have an impact on household welfare via household size.

Considering also the additional problems involved in estimating the rivalry and the scale effects of consumption, this analysis cannot attempt to differentiate between the various effects of household composition on household welfare. Instead, these variables will be included both for their role in determining household welfare and to account for differences between households in their composition (cf. Deaton and Zaidi 1999, Glewwe 1991).

Refugee households are more likely to have suffered insecurity, uncertainty and a strong depreciation of all their physical, human and social assets. In particular, refugees may suffer from being considered refugees (a form of "pure discrimination"), eg they may suffer discrimination in the allocation of land, aid and social protection which may be due only to their refugee status. Other variables in this framework already account for the other disadvantages refugees face but "pure discrimination" reduce refugees' welfare and thus make this coefficient negative and significant. Female-headed households similarly may suffer from lower endowments and from "pure gender bias" thus suggesting a negative and significant coefficient for female-headed households, too.

Older heads of households are likely to have more experience and respect in the community thus enhancing their households' welfare. The age of the head can be signed in this way as it does not affect the composition and thus the welfare requirements of the household in the same way that the household mean age and gender composition do.

A larger degree of illness in the household will have a negative effect on household welfare, especially via the indirect effect on labour productivity as discussed above. In addition, if a household lives in an area where the collection of drinking water and firewood is substantially more time-intensive than for other households elsewhere, then there will be less household labour (especially female labour) available in the peak harvest season, which may negatively affect income and thus welfare.

Household education is likely to be have a positive effect on household welfare generally. However, the mean level of education in rural Nampula is very low (about 2 years of schooling) and the economic benefits from it quite limited in the immediate post-war period so that this variable is most likely insignificant in this particular context. The only exceptions may be a variable measuring the maximum number of years of education per household which is more likely to have passed a critical level, or the education level of the mother, which is generally has a larger positive effect on household food consumption than the education of the (generally male) head. These specifications will therefore be tested below as well.

Land may be linked to household welfare through the quality and characteristics of the cultivated land and through the total area farmed per household. These in turn affect household agricultural production, credit opportunities, and (indirectly) household labour availability and thus welfare. These effects are more likely to be significant for the income variable as land may have a more direct impact on household income than on total household consumption. Food consumption, which to a large degree derives from on-farm food

production in northern Mozambique, may also show more significant coefficients for the land variables than total household consumption.

The expected effects on household welfare can be summarised as follows. Higher soil quality will increase, more field pests will decrease, easier land access will increase, a longer distance of the plot from the household residence will decrease, and less rain will decrease household welfare. Some of these variables will have been strongly affected by the war (especially land access) so that land characteristics and use are an important transmission mechanism from war to post-war welfare. The area cultivated is an endogenous household choice and it will be analysed and listed separately below, together with the welfare effects of other endogenous household choices.

Households in land abundant but peaceful areas will hold capital (especially livestock) for production purposes and as an insurance substitute (Binswanger and McIntire 1987). The discussion above suggests that war-affected households will have low endowments (again, especially of livestock) and that with lower endowments households will have lower welfare. However, a relatively high capital stock may be insufficient to raise welfare if there are high barriers to entry for some capital-intensive activities or if the markets for products intensive in capital are weak.

In other words, post-war asset ownership may be dependent on having a critical level of assets and on being in locations suitable to asset-intensive production. The general expectation is thus that more assets raise welfare but that it is important to control for location and household market participation choices as well. The cyclone Nadia in March 1995 primarily affected the stock of cashew trees, thus reducing asset levels especially for cashew farming households and thus lowering their welfare. Household food consumption may be less dependent on asset endowments than household income as subsistence food production is not very capital intensive.

Social capital should help to increase household income and consumption, both through productive effects (eg a higher social position in the village may improve land and market access and thus permit an increase in agricultural production) and by providing consumption insurance if household requirements unexpectedly exceed actual income. The relative importance of these two effects may then help to determine the significance of the social capital variables in the income and consumption regressions.

War cannot be directly identified with any of the social capital variables but war will have shaped the magnitude of these variables for each households. For example, war may have induced households to move many years ago. Such household may not have been a refugee household for many years but it will never have the same local social capital as households whose ancestors are buried locally or who were born locally.

Community level variables are expected to be key determinants especially of household income and consumption. Many households in northern Mozambique succeeded in maintaining minimum consumption levels even during the worst phases of the war so that post-war agricultural output is not very dependent on input and output markets (ie post-war food production growth is starting from a position of relative isolation and subsistence). Household food consumption may thus be less dependent on markets than total consumption or income. The village level illness variables capture the absence of effective drinking water and health infrastructure and their impact on welfare should be negative. Higher crop yields in a village denote a larger agricultural potential and should help to increase household welfare. The price variable indicators reflect changes in inter-seasonal price differences across households. Post-war households are considered to be risk averse so that a higher variable of food crop, non-food crop and consumer good prices should have negative effects on household welfare. The village indicator variables are included in all regressions are controls for unobservable effects and these are likely to be significant in several locations as well.

In addition to the area farmed per household (AREA56), other endogenous household activity choices which may have a welfare effect are the share of income derived from on-farm activities (SHAREONL), the degree of income activity diversification (DIVERS12), the

household crop market participation status (STATUS14), the share of household income derived from subsistence activities (SHARESUL), the household cotton adoption status (COTTON89), the degree of household plot (ie spatial) diversification (PLOT32), and the degree of household social exchange (REMT4).

Figure 1 summaries their expected effects on the household welfare indicators. Given the role of off-farm activities in the post-war period and the low asset endowments of households, it is expected that households engaged in more on-farm activities have a higher welfare (which contrasts with some recent writings on the role of rural off-farm labour in northern Mozambique, cf. Tschirley and Benfica 2000). A large degree of activity diversification would then indicate a household closer to the survival constraint which suggests lower income and consumption. Market participating households, households less engaged in subsistence activities and cotton adopters are expected to be better off, which is in part based on the existing literature of the welfare effects of crop commercialisation in northern Mozambique.[16] Finally, spatially and socially diversified households are expected to be worse off as these activities are likely to represent technical and social insurance mechanisms which are likely to be costly.

In summary, it is thus expected that the war's effects on post-war welfare operate primarily through indirect channels. In fact, some of the most war-affected variables may not be significant determinants in the regressions, though they would be significant in a peace economy (eg educational attainments). It will thus be important to bear in mind the insignificant variables of the regressions to be estimated below, too.

As summarised in figure 1, it is also expected that the determinants of household income and household food consumption in particular will diverge to some degree. For example, some activity choices may lead to higher output but not necessarily to higher food consumption, given the still weak food markets. Household income may be more dependent on labour and asset endowments and markets while food consumption may also depend on increases in area farmed and social capital.

5. Empirical Results and Discussion

This section will first review the results of a bivariate poverty profile, which will provide some indications about the actual determinants of welfare and which contrasts with the multivariate results below. The issue of pooling all observations is addressed next and it will be found that this is a valid approach with the current specification and for the available data. The main regression results are then discussed by group of determining variables (ie household, land and asset endowments, social capital, and markets). The section will conclude with a sensitivity analysis which checks if the determinants of household welfare differ between poorer and less poor households.

The two appendices to this report also contain a discussion of income versus consumption smoothing and of the inequality of household assets and of household welfare outcomes. These appendices are complementary to the discussion of main results. All figures of empirical results are listed at the end of this report.

5.1. Poverty Profile

One simple way of analysing the determinants of poverty is to calculate a poverty profile, where household welfare is compared across population groups with different characteristics, eg by gender of the household head. This is an unconditional analysis as no other information is utilised in the analysis. For example female-headed households may be poorer than male-

[16] The welfare effects of cotton adoption on Mozambique are estimated and discussed by Isaacman (1996), Jeje, Howard, Strasberg and Boughton (1999), MAP/MSU Research Team (1997), Marule, Benfica, Strasberg, Tschirley and Weber (1999), Pitcher (1996), Strasberg (1997), and Tschirley and Weber (1994).

headed households but their poverty may be due to women having less education than men, in which case it is not the "female-headedness" of the household which drives its welfare but the low educational achievement. Nevertheless, a simple poverty profile may help identify some variables worth including in the analysis and it can be useful to compare its conclusions with those from a multi-variate poverty regression, where all other observable factors are controlled for.

Figure 2 summarises the mean household consumption per capita for a variety of indicators, and also shows the share of the sample in each sub-group, the headcount index (ie the proportion of households below the poverty line) and the poverty gap index (equation (4) above). Note that in figure 2 the "poverty" line is set arbitrarily at the median consumption per capita in 1995, thus dividing the sample broadly into poor and very (or ultra) poor households. This has been done as the absolute poverty line estimated by IAF would not leave enough observations above it to conduct any meaningful analysis (1998).

Refugee households are expected to be poorer than non-refugee households but their mean consumption is actually higher and both poverty indices are lower. Female-headed households appear significantly poorer, as expected, but their weighted share in the sample is very low thus making it more difficult to make further inferences about the factors affecting female-headed households.

Households affected by the cyclone Nadia in early 1995 actually appear to have higher per capita consumption (and thus lower poverty indicators) than non-affected households. This may be due in part to the definition of this variable, which relies among other things on the destruction of cashew trees. And as cashew tree growers have higher welfare than non-growers (see below), this means that cyclone-affected households appear better off than non-affected households.

Interestingly, households which subjectively reported a lack of rain in 1995 have average consumption almost half of other households, they are almost twice as likely to be poor, and the poverty gap index for these households is over twice as high as for the other households. In fact, this is likely to represent transitory poverty to the extent that mean expected rainfall in the sample area varies between 922 and 1024 mm per annum and is thus sufficient for rain-fed agriculture in an average year.

The average soil quality of the cultivated household land (where households subjectively graded each plot) appears to be a determinant of household poverty, with poor soil quality associated with headcount ratio of poverty of 0.67 compared to 0.49 for households with better soil. This is not surprising as most households use similar tools and no fertilisers thus making the soil quality a key determinant of labour productivity and hence agricultural output and household welfare. The land tenure status of the household (whether the household was worried about tenure and whether it was easy to obtain land locally) do not have a significant impact on poverty (results not reported).

The subjectively reported state of the local infrastructure does not appear to affect poverty incidence or severity within the sample. The location by province does however matter as average consumption per capita in Cabo Delgado is 70% of the Nampulan value, the headcount ratio is over 50% higher, and the poverty gap is more than twice as large in Cabo Delgado.

With all these self-reported quality characteristics, however, an element of bias may be introduced if rainfall, soil quality, or infrastructure are reported as having been poor if the harvest was lower than expected or required, which may also have been due to other reasons (such as too little labour input, poor management techniques etc). The FSP questionnaire assumed that farm households generally understand the nature of the problems facing them and can differentiate between different types of problems. This view was supported through my own interview evidence where farmers recognised a variety of farm constraints and could generally differentiate clearly between their varying impact. In addition, the regressions below will include a variety of control variables which will at least partially control for household characteristics which are not included in this poverty profile.

Endogenous household activity choices such as farm size measured by cultivated area and the cotton adoption and crop market participation status of a household appear to affect poverty significantly. Households with higher cultivated land per capita have a per capita consumption of US$ 46.74 while households with less land per capita have only an consumption of US$ 26.32. Cashew adopters are marginally better off than non-adopters while cotton adopters are much better off on average and have lower poverty incidence and severity. Finally, crop market participants have a much lower headcount ratio than non-participants, which was expected.

The type of income strategies households adopt thus appear to be important determinants of their welfare. However, the endogeneity of this decision requires a more careful analysis, and these figures can only be first indications that household coping strategies and welfare outcome are somehow but significantly related.

5.2. Pooling or Not Pooling?

Previous studies of northern Mozambique have regularly analysed the determinants of welfare by location, typically disaggregating the analysis to the provincial or district level, of which there are two and three, respectively, in the FSP sample. However, this involves a loss of efficiency as the sample size is restricted in each case. It would thus be preferable to pool the observations from all provinces, if a Chow test of pooling did not reject pooling.

One complication arises in the calculation of the Chow test statistics using Stata 6. In particular, the survey commands (which control for survey design including the choice of strata and clusters across provinces and districts) do not provide the data needed to calculate the test statistics. Using the uncorrected values to conduct the Chow tests, the null hypothesis of pooling cannot be rejected for either income or food consumption. Note that the ratios of the error variances of the sub-samples suggest that the null hypothesis of the equality of the error variances cannot be rejected, either, which is necessary for the Chow test to be valid.

The Chow test casts doubt on the appropriateness of pooling for the regression of consumption (EXP36PCL). Yet several reasons suggest to maintain the current, pooled specification for EXP36PCL. First, the Chow test did not account for the survey design and weights, thus biasing the test results towards the rejection of pooling (for example the fit of the weighted regression is much better than of the unweighted regressions). Second, the large number of control variables for locational effects suggest that the inter-provincial differences are already captured to a large degree. Third, pooling was not rejected for INCOME04, EXP12PCL and none of the categorical variables whose effects on poverty were reviewed in the poverty profile section above thus casting doubt on the need to find different specifications for EXP36PCL. Fourth, the underlying climatic, geographic, social, and economic characteristics of the sample locations are quite similar so that it appears valid to consider a uniform process to determine welfare in all these areas.

5.3. The Determinants of Household Welfare

The three dependent variables INCOME04, EXP36PCL and EXP12PCL and the residuals of their respective regressions are nearly normally distributed (figure 4). The fit and the significance of all three indicators of household welfare is very good, with R^2 values of above 0.72 for the INCOME04 and EXP12PCL regressions and of 0.62 for the EXP36PCL regression. A smaller number of significant coefficients explains the lower R^2 for the latter regression (figures 1 and 7). All three regressions are significant at the 1% level at least. Note that the INCOME04 regression uses only 349 observations as REMT4 is included in that specification and as that variable is only defined for 349 households. It does not appear as if the estimated coefficients are sensitive to the inclusion of the remaining 22 observations (data not shown).

A variance inflation factor (VIF) analysis carried out using the VIF command in Stata 6 had suggested to drop the ILLDAYS4 variable (measuring health at the village level and thus the

availability of local health infrastructure) from the household income equation as it is highly correlated with other village-level variables. All other variables in the regressions do not appear to have problems with high inter-variable correlation coefficients (other than for the squared terms) or with high VIF coefficients. The mean VIF coefficients per regression were also quite low thus indicating that the regressions do not suffer from multicollinearity.

Key Regression Results

The determinants of income and consumption are quite similar in some regards (figure 1). Key similarities across all three regressions are the expected negative effects of female-headedness, the expected positive effects of end-of-war assets, area cultivated, crop market participation, and the unexpected negative effects of cotton adoption on all indicators of household welfare. In addition, all regressions find that refugee status and maternal education have no effects on household welfare.

The largest differences between the regressions are that income is more dependent on assets and village-level variables while food consumption is also affected by land characteristics and social institutions. Some determinants of consumption and food consumption are similar, in part because food consumption is such a large share of total consumption.

These findings suggest that the war legacy has negative long-term welfare effects through widowhood and asset destruction, and through its effects on household labour and markets. The large positive coefficients for area farmed indicate that households have a significant war-induced labour surplus which can be applied profitably to extending the extensive margin of the post-war farm, rather than by intensifying production as cotton adoption does not reduce poverty or raise food security. These first findings also suggest that policy in the immediate post-war period should target female-headed households, provide significant asset assistance and re-establishing all forms of rural markets rather than target aid at refugee households (as defined by the FSP) or by providing inputs to intensify production. These findings also suggest that at very low levels of educational attainment, increasing maternal or female education in the immediate post-war period is a long-term poverty reduction strategy at best.

The following sub-sections will analyse these findings in more detail and discuss the regression results of figures 5, 6, and 7 by group of independent variables.

Household Composition

Given the above discussion of household equivalence scales and weights, the current discussion will not consider in detail the magnitude of the coefficients on household size, mean household age, dependency ratio, and gender composition. Yet all regressions show that larger, older, more dependent, and more female households have lower welfare, which broadly corresponds with expectations.

The age of the household head (AGEHEAD3, AGEHEAD4) was expected to have a positive effect on household welfare. The regressions show that this is significant for consumption and food consumption. In fact, the effect is exponentially stronger for very old heads for food consumption, thus emphasising the important role of age effects in determining food security in rural northern Mozambique. It appears that the age of the head has an important influence on a household's ability to negotiate the control and distribution of resources for all its members with the rest of the community.[17]

Older household heads on the one hand have more experience but they also have diminishing health and strength. This evidence suggests that war in rural Mozambique induced social coping mechanisms which attached great weight on the age and thus the experience of the

[17] In contrast with this finding, another recent household survey from rural Mozambique did not find an effect of the age of the head on household welfare (IAF 1998: 163). This may be due to the fact that the effect observed here is non-linear, thus suggesting that the mere inclusion of a linear age term may result in the hypothesis of age having an effect being rejected falsely.

head of household. Thus rural Mozambique just after the war experienced some social organisation (eg concerning household formation and the control of resources) similar to those described by Meillassoux (1981).

From a policy perspective, this suggests that in the post-war period households with older heads are more food secure than household with younger heads. In fact, a less war-affected but also less socially cohesive and more market dependent society may attach more weight to household's health and human capital which may imply that older household heads are at a relative disadvantage in a more market based economy. Households with older heads may thus suffer from reduce food security if older heads have a reduced ability to participate in a more market based economy (due to dated skills and frailty). It could thus be expected that with increasing market reconstruction and social change households with older heads loose their relative food security.

Unlike expected a priori and unlike suggested by the poverty profile, refugee status (REFUGEE1) has no significant effect on household welfare. These findings concur with a later household survey for Mozambique which only found a significant negative effect of refugee status on household consumption per capita in the centre of the country (IAF 1998: 164).

This is likely to be the result of the definition of a refugee household in northern Mozambique generally. A "refugee" household was generally one which fled either abroad or to a larger, government-held town. It is even conceivable that households displaced to larger towns may have established valuable social networks while living in urban areas for many years. These households may thus obtain better welfare outcomes than more isolated, non-"refugee" households far removed from urban areas.

Yet the majority of war-affected households were internally displaced and did not live in recognised safer urban areas but elsewhere in also insecure rural areas. In fact, many households were occasionally and locally displaced but did not migrate away from their usual residence for long periods of time. Some refugee households in urban areas were officially recognised as such by the government and qualified for assistance, thus perhaps making them better qualified for a return to agricultural activities.

In addition, the refugee variable may involve a small degree of long-term sample selection bias, in that only those households likely to benefit from returning to their village in the post-war period were likely to do so. In fact, many households stayed in the urban areas after the war thus dramatically altering the rural-urban balance in Mozambique. In addition, there was no enforced repatriation to rural areas, especially for domestically displaced civilian households (some demobilised soldiers and international refugees were brought back to their place of origin after the war).

Overall, it can be expected that a majority of the sample households were refugees in some sense of the word during the war, even if they were not officially recognised or identified themselves as such. The use of this variable for the purpose of identifying poorer households (and thus in government welfare targeting) is thus not very helpful but no further variables are available to identify the war-induced displacement experience of sample households.

The female-headed variable FEMHEAD1 is one of the few variables which consistently and significantly predict a change in household welfare across all available indicators. In fact, female-headed households have, on average, 33% less income, 43% less consumption, and 51% less food consumption per capita compared to male-headed households.[18] This is in accordance with the hypothesis of a "pure gender bias" as other household endowments and the household gender composition have already been accounted for.

This is also a much stronger effect than that reported by IAF, which finds that female heads have household consumption per capita which is only 13% lower (1998: 163). This may be due to the closer proximity in time of the war on the sample analysed here and due to the

[18] If the dependent variable Y is measured in natural log form, if the independent variable X takes a binary format and if b is the coefficient of X, then a change in X induces a change with the magnitude e^b-1 in Y.

small number of female-headed households included in the current sample (1% versus 11% in IAF). In fact, some households in northern Mozambique have absentee husbands earning remittances. In the FSP sample the definition of female-headed households excludes such cases thus deriving much larger coefficients.

Based on the interview evidence, it seems plausible that there is a core group of severely impoverished female-headed households in northern Mozambique who also lack alternative income or consumption generating opportunities. It also seems likely that this core group will be larger after a war than during peaceful years. By defining female-headedness broadly, the gender-discrimination effect is reduced as some so called female-headed households may in fact really be sub-households headed by the wife of an absent husband or by the second wife. In such cases, these (sub-) households have broader income generating options and the poverty associated with such female-headedness will be much lower, if not insignificant.

The various education variables were not expected to determine household welfare significantly, mainly because the past provision of education had been very low due to the war. However, all welfare indicators are positively affected by paternal education, though household income is only affected by education in areas with better infrastructure.

The IAF survey also found that education did not have as strong an effect on household welfare as had been anticipated (1998). When the current FSP model is re-estimated using the IAF education specification, a nearly identical and significant linear coefficient for the highest educational achievement of the household (in years of effective education) can be obtained thus suggesting that the underlying educational effects observed in both surveys are very similar. In fact, this analysis suggests that the return to an additional year of effective education for the best educated household member is 5.1% for income, 2.4% for consumption, and 4.9% for food consumption (all per capita).

These values thus suggest that education has positive but limited benefits in rural post-war areas. In fact, with the devastating effect of war on the education system, the mean values for EDINFRA5 and EDUMAX3 are only 1.0 and 3.6 years of education, respectively. This makes predictions about the likely benefit of significantly expanding education under these circumstances very imprecise and thus cautions against emphasising education as a suitable poverty alleviation strategy in the immediate post-war period.

In addition, infrastructure is complementary to paternal education in raising household income thus suggesting that raising education in strongly war-affected, isolated areas will not reduce income poverty. Expressed differently, human capital accumulation in the post-war period requires that there is a demand for slightly more skilled labour (which in turn requires well functioning labour markets) and that households value the future, including future returns to education.

These findings thus support a cautious interpretation of the benefit of education in poor rural areas. Glewwe for example finds that education is “relatively unimportant” in rural areas generally though he hypothesises that it matters more for cash crop growers, which is akin to the role of infrastructure discussed above (1991: 325). Other authors are more positive about the effects of education for reducing the risk of poverty (Gaiha 1988: 240-1, Grootaert 1997: 185). Yet their study areas were not war affected so that the more limited effects of education in northern Mozambique appears to derive from the parallel destruction of the demand for relatively skilled labour and through the destruction of market activity. A common conclusion with the broader education literature is that paternal and maternal education have different effects on household welfare, even in the post-war period (Sahn and Alderman 1997, Svedberg 1990).

Finally, the number of days spent ill per household (ILLDAYS2) have a surprising negative effect on household consumption which may be related to the need for households to increase consumption to treat illness. The time constraint variable (TIME02) has the expected negative effect on household income and food consumption.

Land Characteristics

It was expected that exogenous land characteristics affect especially household income and food consumption (figure 1).[19] The poverty profiles pointed to poor soil quality and a lack of rain as determinants of household poverty (figure 2). However, the regression analysis indicates that household income and household consumption are not affected by any land characteristics while household food consumption declines with lower soil quality (AREAFER6) and with a lack of rain (RAIN4).

The evidence thus suggests that exogenous environmental constraints may amplify food consumption shortfalls and that a lack of rain is indeed one of the largest sources of risk for agricultural households. In fact, rainfall appears to correlate strongly across households within one village but the correlation across villages is much weaker. The small spread of values within each location indicates that neighbouring households experience similar shortfalls of rainfall. It also suggests that a reported lack of rainfall is not an ill-informed excuse for poor output caused by other factors, and that this variable is hence exogenous to short-term household behaviour.

Given this degree of local covariance of rainfall, the predominance of agricultural activities in total household income, and the transaction costs of intensifying remittance and other social income with distant relatives, households facing low rainfall may thus find it extremely difficult to compensate for their income shortfall, thus voluntarily reducing food consumption more strongly than income. It is thus not the war effect on land characteristics which are important for household welfare but the war-induced and reduced ability of the household to insurance against such environmental risks which represents a cost of war to rural households in this context.

Technology and Physical Assets

The war reduced asset endowments for direct and indirect reasons (figure 14). Households with higher surviving asset endowments can then expect to have higher household welfare, though the asset effect on food consumption may be more limited. Two variables show this expected effect on welfare. The number of tools per capita per household (TOOL11) has a positive effect on income while more end-of-war assets (VASSET5 and ASSET13) has a positive effect on all welfare indicators. As expected, the asset effect is stronger for income than for consumption than for food consumption.[20]

Interestingly, owning some livestock has no significant effect on welfare though livestock can be an important store of wealth in developing countries (Dercon 1996, Fafchamps et al 1998). The insignificance of this effect in northern Mozambique probably derives from the absence of a large breeding stock, regular cattle markets and veterinary services which could support livestock, the absence of financial markets which may require livestock as collateral, and the low level of cattle ownership which in turn make a prediction of the possible effects of livestock-rearing difficult using this sample.

Having a large asset endowment at the end of the war may indicate households which avoided the worst direct impact of the war. In addition, such households are likely to have maintained other asset stocks, abilities, contacts etc. This may indicate that helping war-affected households to restock assets in the post-war period may be an effective component of a poverty alleviation and rural growth programme, especially if such assistance is linked with rebuilding market activities and lowering general transaction costs.

Among the other asset variables, the number of types of tools (TOOL2) was expected to proxy for the available household technology, given that households in interviews often emphasised the constraining nature of their narrow and low quality stock of tools. However,

[19] The effects of cultivated area, which is an endogenous variable, will be discussed in more detail in a separate section below.

[20] Re-specifying the INCOME04 regression with the ASSET13 variable yields a coefficient of 0.45, which is highly significant.

this variable was not significant in any regression thus suggesting that perhaps the quality and productivity of tools, which was not measured directly in the FSP survey, was more important than the actual number of types of tools owned. The qualitative interview evidence supports the conclusion that the distribution of high quality tools in the immediate post-war period can help households utilise their war-induced labour surplus in the production of subsistence and perhaps cash crops.

Aid agencies in northern Mozambique repeatedly raised the concern that the limited, free distribution if tools and assets just after the war created disincentives for farmers and for the tool marketing system. However, given the regression and the interview evidence (including discussions with rural traders), the shortage of tools in northern Mozambique persisting in 1999 (six to seven years after the war and the tool distribution programmes ended) is not primarily caused by disincentive programmes and the welfare loss resulting from the low asset endowments is significant. The benefits of the distribution of high-quality, hand-held tools and other assets thus appear to outweigh the possible dis-incentive costs of such programme.

This conclusion on agricultural production aid is akin to the one for food aid in Mozambique, which was found to stimulate the growth of a small scale milling industry and maize marketing system (Tschirley et al 1996). It appears as if with the preceding, serious destruction of assets and markets, the stimulating effect of aid on rural supply mechanisms outweighs the negative effects of aid on incentives and prices. This argument has also been extended to the macro-economic level for Mozambique where it was found that macro-economic aid indices a supply response which outweighs the Dutch disease effects of aid (Brück et al 2000).

Finally, the cyclone dummy CYCLONE2 was significant only for household income, where it had a positive effect. This may seem surprising initially but, as explained in the section on the poverty profile above, it may be due to the cyclone variable capturing the destruction of cashew trees, which in turn indicate higher household wealth.

Social Capital

Social capital was expected to have positive effects on income and consumption as it can help increase production (eg by providing land access, extension advice or contacts with crop traders) and consumption (eg by facilitating informal social exchange). War is expected to have strong negative effects on social capital, especially through displacement and its effects on local political leaders. Renamo rebels were likely to attack especially Frelimo officials in rural areas, thus making these households very war vulnerable. On the other hand, these political connections may help these households to recover more quickly from the war.

The strongest social capital households can possess is the political position of the household head (AUTH12). AUTH12 measures a long-term effect of social capital as household heads typically maintain their traditional or political influence over many years or even for life, unless the war forced a locally unpopular authority to move location or to step down from his position. In either case, the variable is clearly exogenous at the time of the survey. AUTH12 has a positive coefficient for all indicators and is highly significant for income per capita and food consumption per capita. The latter are higher for households with a political leader as its head by about 38%.

These strong positive effects are likely to result from much reduced transaction costs for these heads as they are well integrated in information flows and decision making. Being a political leader also provides social insurance. The position itself does not require heads necessarily to possess more assets or be richer but they can claim resources and receive donations from associated leaders and their subjects. In several interviews with various such leaders in Nampula province, it became apparent that these households may not own many more resources but they can draw on the resources of their communities at any time, thus making them face much lower uncertainty.

It is not clear, however, if social capital acts as a substitute for markets in the aftermath of war or if perhaps social capital can further augment the benefits households can derive from market activity. That is, social capital could be a substitute for market activity or a complement for market activity. Households in a privileged political position may already have easier access to markets, being well integrated into information channels, having frequent contacts with other officials and traders, perhaps being able to enforce contracts more easily as well as being able to make more credible commitments to contracts. Therefore, this type of social capital appears to complement, if not enhance, market activities of these households.

The local origin of the two most senior members of the household was expected to have a positive effect on household welfare. However, the two variables coding for the female and male local origins (ORIGINF1 and ORIGINM1, respectively) are insignificant for the income and consumption regressions and have significant negative coefficients in the food consumption regression. Households where both the wife and the husband are from the local area have food consumption per capita which is about 30% less than households where both partners are from other villages.

This indicates the role of inter-village social insurance which is encouraged by the matrilineal Macua culture which covers the entire FSP sample area and much of northern Mozambique. Young couples are encouraged to move to the household's village some years after the wedding and social obligations between the wife and her relatives are stronger than between the husband and his (male) relatives, thus creating important linkages across villages of different agronomic and climatic risk characteristics. These social patterns thus help maintain food entitlements especially for households which have experienced some mobility with northern Mozambique.

This also explains how the displacement experience of Macua households in northern Mozambique appeared to have had relatively small welfare effects, as households already had some strong social networks capable of absorbing some degree of mobility and locally covariant risks. The nature of the conflict with its random, local attacks thus allowed households to cope with the war's negative effects more easily than had the conflict be a more technology-intensive and systematic with clear frontlines preventing movement and exchange of goods and labour.

Village-Level Variables and Controls

The village-level variables were expected to have a strong impact on household welfare, especially on income and consumption through the ability of household to sell produce and purchase non-food items in the market. As discussed above, the variable ILLDAYS4 is highly correlated with other village level variables and has thus been dropped from the specifications. In addition, the infrastructure variable INFRA4 had to be omitted from this category of regressors as it was interacted with some education variables.

The analysis indicates that most market indicators have no effect on household welfare, except that more crop sales per village in 1993-94 (MARKET7) reduce food consumption. The elasticity is –0.18 which seems quite a strong effect and counterintuitive. Perhaps households know that markets are unstable and unpredictable and they choose to sell more food crops and thus forego some of the food consumption instead. Alternatively, households respond to larger crop market activity at the village level in the previous year by planting more cash crops thus reducing their food consumption in the current year. Yet the reason for the sign of this coefficient is not entirely clear.

The log of the cotton yield at the village level in kg/ha (YIELDL8) is significant with a strong positive coefficient in the income regression only. This variable captures some of the underlying differences in natural resource endowments across villages which are common to all households in each location. This allows the regression results to be more comparable across villages and households.

In addition, the variable suggests that improvements in the yield of the main cash crop has important effects on household income but not on household food security.[21] This suggests that the link between cash crop adoption, cash crop yields and household food security may not be very strong. It is possible that such links are particularly weak in the post-war period where yields are very low and there is still some slack labour and high aversion to output uncertainty. Households might thus satisfy their food security requirements before increasing their monetary income surplus, thus making household food consumption less sensitive to cotton yields.

Finally, some price variance variables (PRICEV1 to PRICEV3) and a set of categorical variables which code one for each of the sample villages (ALD111 to ALD332) are included in all three regressions to make the results more comparable across households and to indicate the importance of unobservable village-level effects. PRICEV3 is the only significant price variance variable in any regression and it has a negative effect on household income. Its coefficient indicates that a 4% rise in the variability of inter-seasonal food crop prices reduces income per capita by 1%. This represents a significant welfare loss from the war-affected trading infrastructure which accentuates the variability of crop prices (except for cotton which has a government-set price). The post-war period has generally seen an improved integration of agricultural prices across space at the national and international levels (Jayne and Jones 1997, Tschirley and Santos 1999). Yet this does not imply that all localities face uniform prices and that households can cope with output price fluctuations equally.

Some village indicators were omitted from the analysis to avoid multicollinearity and the remaining indicators are jointly significant. Other studies have also found community-level variables to have significant effects on household welfare outcomes, thus confirming the finding of this analysis that more could be done in future surveys to capture further market and institutional effects on household welfare.[22]

Endogenous Land Choices

Households in land abundant areas such as northern Mozambique have some control over the size of their cultivated land. In addition, it is expected that this choice of area will have strong effects on household welfare. This section will explore the effects of endogenous area choices on household welfare. It will be found that cultivated land is a significant and large determinant of household welfare, which is in contradiction to other recent findings from Mozambique. Some causes and consequences of this important finding will be discussed.

An augmented regression or Durbin-Wu-Hausman (DWH) test can indicate if a set of OLS estimates is consistent or not (Cong 1999, Davidson and MacKinnon 1993). The DWH test statistic for AREA56 is significant at 1% for the income regression but the DWH tests do not reject the null hypotheses of exogeneity of AREA56 for the consumption regressions. AREA56 is thus included in the consumption regressions directly. These results are summarised in figure 8. The figure also shows the fit of the first stage regression of AREA56 which is very good with an R^2 value of 0.69 and it shows that the first round instruments are jointly significant below 1%, which is a further test of significance of the instruments (Deaton 1997: 116).

The variable AREA56 is highly significant in all three regressions and its coefficients range from 0.14 in the consumption regression to 0.66 in the income regression. As both welfare and land are measured in natural logs, these values can be interpreted as elasticities. A 10% increase in cultivated land thus leads to almost 7% increases in household income per capita. This result is not sensitive to the use of an area per household specification as a similarly

[21] Re-estimating the INCOME04 regression with the maize yield variable taking the place of the cotton yield variable leads to a similar elasticity of yield to income. The strong collinearity of these two variables and their similar effects on income thus indicate that the determinants of agricultural productivity are similar across food and cash crops, which is not surprising given the low use of purchased inputs in agricultural production.

[22] See for example Alderman and Garcia (1994), Behrman and Deolalikar (1988, 1989), Singh, Squire and Strauss (1986), Thomas and Strauss (1992).

positive and significant coefficient obtains when using an area per capita specification (data not shown).

This strong coefficient suggests that post-war rural households have a large supply of surplus labour they can employ profitably by extending the area farmed. The extension of the agricultural production margin is thus a key poverty alleviation strategy for a post-war, rural economy with initial land abundance. The advantage of this strategy are that with abundant land households have a degree of choice about their future income growth.

This responsiveness of household income to area farmed appears to depend on three factors. First, the relative land abundance of northern Mozambique actually makes farm size a decision variable and reduces the cost of extending the area farmed. Not all African countries (or indeed southern Mozambique) face similar land abundance and land such high quality. The land abundance is partly due to the war which reduced population density in rural areas and encouraged rural-urban migration to a large extent. With some refugees choosing to stay in urban areas after the war due to their newly found social and economic opportunities there, the rural population density, which had been low in northern Mozambique historically, remained low even after the end of the war.

Second, this geographic isolation is reinforced by strong economic isolation, which means that the population density is reinforced by a war-induced, very low market density in many districts of northern Mozambique. Only those districts served by key long-distance transport routes experienced a significant reduction in transaction costs three years after the ceasefire (ie at the time of the FSP survey). While the threat of insecurity diminished significantly with the end of the war, the poor state of rural transaction infrastructure meant that the war damage has had a prolonged effect on transaction costs.

Third, the long, destructive nature of the war resulted in households producing below capacity in the immediate post-war period. Most post-war households have very low asset endowments and would thus have reduced the scale of farm production especially if farm production requires a certain capital-labour or capital-land ratio. Post-war households also had low effective labour endowments which did not necessarily translate into lower consumption requirements as much labour was used ineffectively during the war on sentry duty, queuing for aid, being ill or nursing the ill. In addition, post-war households face high transaction costs and low market opportunities which reduce the incentive to produce a marketable surplus. All these factors combine to keep the scale of war and post-war farm operations smaller than the peace time scale, thus creating a slack in war-affected labour supply and farm production.

This is a very different effect of war on production than, say, was observed in Europe during World War two when production was reaching full capacity and war-time economic policies was concerned with managing potentially large household income (Keynes 1978). The observed agricultural production slack in Mozambique, however, implies that households face incentives to increase farm sizes over the course of the post-war period, as endowments are rebuild, consumption-labour ratios adjusted, and transaction costs reduced.

However, extending the area cultivated is not only the product of a household decision but may be constrained by asset, market and social constraints. Releasing the productive capacity of the post-war agricultural sector will thus require to address these constraints to land access as much as addressing the direct constraints on household welfare discussed above. In addition, increasing the area farmed yields much smaller benefits in especially for household consumption. The diverging coefficients on AREA56 may thus also indicate that the determinants of income poverty and consumption poverty will diverge as households reduce their reliance on subsistence activities.

Other studies of post-war Mozambican have found much smaller land coefficients. IAF for example estimates a consumption elasticity of area farmed of 0.05 for northern Mozambique for 1996-97 (1998: 165). However, the study is not an agricultural household survey thus paying less attention to the measurement of, for example, land area and not differentiating clearly between farmed area and total household land. Furthermore, the IAF study did not control for the endogeneity of area which is likely to lead to inconsistency and smaller

estimated coefficients. While this study found the smallest welfare effect of land in the consumption regression, the estimated elasticity using the FSP dataset is still almost three times larger than the IAF elasticity.

Marule uses the same data as this study and finds a positive and significant effect of land owned on household income (1998: 40). However, by not controlling for the endogeneity of the area farmed, he derives coefficients which are about half of those presented here. Marule's results can be replicated with the current data when omitting survey design effects, the more detailed regression specification, and the IV technique used for this analysis. This suggests that by not controlling for the endogeneity of land, the resulting inconsistency of the regression biases the coefficients downwards and thus biases the conclusions derived from the analysis.

Benfica also analyses household survey data from northern and central Mozambique and finds a positive and significant effect of cultivated land on household income in a regression not controlling for endogeneity (1998: 135). His estimated coefficient for land is similar to that of Marule. The much higher coefficients presented in this study suggest that land quantity, rather than land productivity, plays an even more important role in household welfare in northern Mozambique than argued previously, especially given the war's effects on land, assets, human capital and markets. Yet it is expected that as the effects of the war subside slowly, as markets are rebuild in Mozambique and as the population density in rural areas increases, the effects noted here will diminish in importance and the experience of peaceful and more developed African countries will become increasingly pertinent to Mozambique.

Overall, the IAF values and even some previous estimates of the land-welfare relationship using FSP data are implausible given that land is the key production input in post-war Mozambican agriculture. The rate of return of land estimated by IAF suggests a much smaller role for land than it really played throughout the conflict and since its end. In part, the previous results are the consequence of employing inappropriate techniques. In part, they may derive from underestimating the negative effects of the war in rural areas and how the end of the war can and did release some surplus resources, mainly in the form of extra labour, into the rural economy, which then found employment in farming extra land. This relative shortage of labour compared to land empirically also emphasises how the modified analysis of the Binswanger and McIntyre (BM) model is appropriate for the post-war Mozambican case.

Endogenous Activity Choices

This section addresses the welfare effects of household activity choices. It will be found that activity choices have strong welfare implications indeed, thus emphasising the trade-off between the risk characteristics and returns of post-war activities. Most welfare effects correspond to expectations but cotton has strong negative effects on income, consumption and food consumption, which contradicts previous findings for northern Mozambique and casts doubt on some recent policy advice based in such findings. In addition, some spatial and social diversification activities have surprisingly positive welfare effects, which indicates that war-affected households have found some non-market ways of coping with the negative effects of war.

Figures 5, 6 and 7 show the second stage coefficients for the activity variables and figure 8 summarises some additional auxiliary parameters. The DWH test results indicate that several activity choices have indeed endogenous welfare effects, though the endogeneity depends on the welfare measure. For household income, the degree of income diversification (DIVERS12) and the cotton adoption status (COTTON89) are endogenous. For household consumption, the share of on-farm income in total income (SHAREONL) and the crop market participation status (STATUS14) are endogenous. For household food consumption, only the share of on-farm income in total income (SHAREONL) is endogenous. The larger number of endogenous indicators for household income is intuitively convincing, as the activity indicators themselves are measures related to income.

Figure 8 also shows that the endogenous activity indicators could be well instrumented with first round R^2 values of above 0.53 and with the instruments being jointly significant at 1% or better. The three regressions also contain activity indicators which were found not to be endogenously determined, such as STATUS14, SHARESUL, PLOT32 and REMT4 in the income regression, COTTON89 in the consumption regression, and DIVERS12, STATUS14, COTTON89 and PLOT32 in the food consumption regression.

The significant coefficients indicate a number of interesting effects about the welfare implications of post-war, agricultural activity choices. The discussion of these effects is organised into five themes covering the share of on-farm income, the degree of income diversification, subsistence versus market-based activities, cotton adoption, and non-market (ie spatial and social) diversification indices.

First, a higher share of on-farm activities (SHAREONL) raises consumption and food consumption but does not affect household income.[23] Household food security may thus be better protected by on-farm (ie agricultural) activities, rather than households having to depend on weak markets twice – first to earn extra income and then to convert that income into consumable resources. This welfare effect on on-farm activities may of course change with increasingly reliable markets both for labour and for consumer good and food. Yet conversely, in the immediate post-war area these coefficients may have been larger still thus indicating that war-affected households best protect their food security through on-farm work.

For Mozambique, it has been argued that rural food security and poverty alleviation depend on increasing off-farm income diversification.[24] Such view may in part be influenced by the empirical evidence from other Sub-Saharan areas. For example, a study of the determinants and effects of farm income diversification in Burkina Faso finds that on-farm income strongly reduced household income (Reardon et al 1992). This effect in Burkina Faso is related to the better functioning markets and the different nature of the risks encountered by households in the study area, which in turn helps to explain the observed insignificance of on-farm income share for income in northern Mozambique.

Second, the degree of income diversification across different activities (DIVERS12) has a negative effect on income and food consumption, which was expected. This is further evidence of households diversifying their portfolios of activities despite the cost associated with such diversification. Phrased differently, there are large benefits of income specialisation to be gained in rural northern Mozambique. This then also helps to explain the very low yields obtained in post-war Mozambican agriculture, which are at least in part not due to exogenous input constraints but due to endogenous household choices in the post-war period.[25]

Third, engaging in more subsistence activities (SHARESUL) has a negative effect on household income but not on household consumption or food consumption. Furthermore, being a household participating in at least one crop output market (STATUS14) has positive effects for income, food consumption and especially for consumption. The joint analysis of the degree of on-farm and subsistence income and of the binary decision to participate in crop markets thus indicates that households forego some income but no loss in consumption by engaging in more subsistence activities. At the same time, households which can participate in some markets strongly benefit from doing so.

Households are thus best off by engaging in a large share of on-farm activities which can contain a significant proportion of subsistence activities, which help to protect household food

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[23] Note that SHAREONL, DIVERS12, SHARESUL, PLOT32 and REMT4 are all expressed in natural logs so that their coefficients can be interpreted as elasticities.

[24] Recent contributions to this debate include Cramer and Pontara (1998, 1999), O'Laughlin (1996), Pitcher (1999), and Tschirley and Benfica (2000).

[25] For example, the mean monocropped maize yield in the FSP sample is only 319 kgs/ha in 1995 compared to a Southern and Eastern African mean maize yield of 1,500 kgs/ha and a developing country mean maize yield of 2,700 kgs/ha in 1995-97 (Heisey and Edmeades 1999: 44, 62).

security. The negative income effect of subsistence activities can then be compensated with a limited involvement in crop markets which give a one-off boost to household welfare.

Stated differently, a household emerging from complete, war-induced subsistence production would benefit most from participating in some food crop markets but keeping a large share of on-farm activities. Reducing subsistence activities at the expense of on-farm activities is not worthwhile as it is the fixed benefit of the initial market participation which yields a strong welfare benefit, not the complete dependence on market income.

Fourth and perhaps most surprisingly, the adoption of cotton (COTTON89) reduces household welfare significantly. Households growing some cotton have 27% less income, 14% less consumption and 10% less food consumption per capita than comparable households not growing cotton. These values thus clearly reject the hypothesis that cotton enhances income and perhaps food security for post-war households in northern Mozambique.

This result derives from the fact that this analysis controls also for other activity shares and other market participation decisions, thus isolating the pure cotton effect in welfare, which is negative. The positive effect of cotton adoption observed in the poverty profile above (and in some of the literature on Mozambique's cotton sector) may thus derive from the positive effects of on-farm income activities, of income specialisation, and of crop market participation as discussed above. In a sense, the positive effect of cotton adoption on household income is not doubted by these results. Instead, they question strongly if cotton adoption is an activity which has on balance positive returns, considering that households have alternative income sources.

The net negative effect of cotton adoption for household welfare may be related to households still being unable to insure well against risks as a result of the war. As cotton is a very risky crop, households may thus make complementary income choices which lower household welfare to insure through activity choices against a possible failure of the cotton harvest or the setting of a low cotton price in line with world prices.

In addition, cotton adoption may induce an overall unfavourable intra-household allocation of resources (Dasgupta 1993: 525). It is conceivable that the institutional structures of the cotton companies thus displace other income activities which may have been equally or better suited to the highly vulnerable welfare and production circumstances of most rural households. For example, cotton land may have displaced maize land without the household finding appropriate new activities to employ the labour with which previously worked on the maize land.

The seasonal balance of labour requirements may also have been unbalanced by cotton production thus preventing households from applying their labour to traditional crops if cotton required their labour at key certain moments in the agricultural calendar instead. Overall, it is difficult to judge from the survey data why cotton adoption has such strong negative welfare effects. Yet the key result in this context is the doubt it casts on previous findings using this dataset which had expressed a cautious optimism as to the welfare effect of cotton adoption.[26] On a methodological level, this finding also cautions against the use of bivariate poverty profiles as a basis for policy recommendations for rural post-war poverty alleviation.

The results presented here also corresponds with a study of cash crop farmers in Côte d'Ivoire where cash crop adopters also had a lower poverty incidence in the poverty profile and a higher incidence of poverty in the regression analysis (Grootaert 1997: 189). More generally, the results support the view expressed by von Braun and Pandya-Lorch who note that the welfare and food security effects of cash crop adoption are very location-specific (von Braun and Pandya-Lorch 1991: 44).

Fifth, non-market diversification indices measuring the degree of spatial diversification (PLOT32) and social exchange (REMT4) were expected to have a negative effect on

[26] This includes for example some studies from the FSP such as Jeje, Howard, Strasberg and Boughton (1999), MAP/MSU Research Team (1997), Marule, Benfica, Strasberg, Tschirley and Weber (1999), Strasberg (1997), and Tschirley and Weber (1994).

household income but in fact they have a positive or no significant effects. PLOT32 has a positive effect on income and food consumption which suggests that households adjust their crop choices to the variety of plot opportunities and thus maximise household welfare. This contrasts with the cost of income diversification noted above. This again emphasises how rural households have an advantage in specialising in agricultural activities, though they may apply their agricultural activities across several locations. This strategy can thus simultaneously reduce risks and improve household welfare.

Finally, the degree of social exchange (REMT4) has a small positive effect only on household income but no significant effect on either household consumption variable. This indicates that households will engage in more social activities as they have a higher income but that social exchange is not directly, causally related to maintaining consumption or food consumption entitlements. It appears that in an economy where absolute poverty is the norm and where covariant risks are still large, households cannot use social exchange to affect their permanent income. The large transaction costs of travelling and transporting gifts (especially of bulky agricultural commodities) across space may further diminish the use of social income as a source of household welfare and insurance.

Instead, the interview evidence also supported the view that social exchange provides small consumption loans and provided an element of leisure and consumption. Households may thus insure occasional, idiosyncratic shortfalls in income (eg in case of individual illness) but social exchange cannot provide long-term insurance from large scale disaster or poverty. Future household survey research may need to account for social income more explicitly in the design of the questionnaire to design better variables and thus a better understanding of these issues.

Overall, the significance of the variety of endogenous variables, including area cultivated, is not surprising when considering that the war in Mozambique greatly reduced the number of economically viable income-generating activities. In more developed economies in times of peace (or alternatively, in economies more akin to the perfect competition model of economic theory) the determinants of income include subjective preferences between portfolio asset class decisions, with instrument (ie intra asset class) choices only marginally affecting income. In the post-war context of Mozambique, however, most households are employed within agriculture, irrespective of preferences or comparative advantage. The remaining (ie intra-rural or intra-agricultural) activity choices thus have larger than expected effects on household welfare.

War reduces the number of available options (eg by making some activities more war-vulnerable or by destroying some markets) and increases the cost of making some choices (eg temporary or partial migration may be less feasible with higher information and transaction costs during the war). The remaining available activity options are thus not necessarily well suited to the preferences and endowments by households thus forcing households to pursue activities which they may not do well in. Households thus face discontinuous trade-offs and have little information to base their choices on. In effect, households are not optimising an ideal choice problem but are faced with few available and problematic options over which many households may not have clearly defined preferences or advantages or for which it is not clear how to solve the decision optimally.

The remaining choices between activities, even if they belong to the same class of agricultural activities, thus do not have continuous or smooth effects on household welfare. In a more competitive model with low transaction costs and many divisible options, marginal household choices should only have marginal household welfare effects. However, this evidence suggests that household choices are more important in determining household welfare than previously thought. The war legacy has a crucial role in this process, by creating discontinuities and raising transaction costs, including those affecting the availability of activity choices and the actual choice between them.

In addition, households may be caught as a result of the war in poverty traps, for example by living in an isolated location. Migration with large transaction costs and low endowments to

finance such move may not be feasible thus forcing households to depend on exogenous interventions to improve their welfare. Yet not all exogenous interventions turn out to be welfare enhancing, such as the provision of cotton inputs. Based on existing data but employing a new methodological approach in its analysis it was found that cotton adoption is welfare reducing and that households would be better off maintaining high on-farm and even high subsistence shares of total income as long as some crop market participation was made possible.

6. Summary and Conclusions

The objective of this report has been to analysis the determinants of household poverty in post-war, rural northern Mozambique and thus to understand how poor peasant households behave under post-war conditions, how war affects their welfare, and how policy can alleviate and overcome these adverse effects. This concluding section will assess these three themes drawing on the theoretical discussion and empirical findings above.

6.1. Post-War Poverty Traps

The first theme involved uncovering the detailed determinants of household income, consumption and food consumption in the post-war period. The main hypothesis was that the war legacy continues to affect household welfare significantly through a variety of mainly indirect effects, that these war effects may create poverty traps from which households cannot escape endogenously, and that these adverse war effects may differ by type of indicator.

Households can indeed become trapped in a low-level equilibrium situation in the post-war period. For instance, households were expected to reduce their labour supply in the war period and this effect might have persisted post-war. Instead, it appears that peasant households apply increasing amounts of labour to their farm activities thus generating large returns from farming extra land. However, this post-war labour supply response appears to be limited by the low asset endowments and by poor household technology which jointly restrict total farm output and thus create a poverty trap.

The war also destroyed on a very large scale the infrastructure to provide rural primary education. More significantly and less obviously, however, the war also destroyed the demand for education as activities with higher human capital requirements were made unprofitable or unfeasible by the war. While the reconstruction and funding of schools in itself is a large challenge with a state strongly burdened by war debt, stimulating rural demand for more skill-intensive activities is more challenging still. The more war affected local markets and the more economically isolated a household is, the lower will be the demand for education and the higher will be the benefits of pursuing subsistence activities, including those carried out by school-age children. This then represents a second dimension of the rural, war-induced poverty trap.

The war also encouraged households value current utility more highly than future utility (ie war increased the discount rate) which is a particularly strong effect for households close to the survival constraint. In addition, the war reduced household assets directly and indirectly so that post-war households have low asset endowments, a low incentive to re-capitalise their endowments, and few opportunities to do so. This process thus represents a third aspect of the post-war poverty trap.

The above analysis also identified social exchange as a possible but war vulnerable alternative to income generation and income insurance. Due to the war-induced and wide-spread destruction of livelihoods and the resulting high level of transaction costs it was found that the potential benefit of social exchange in the post-war period is limited to insuring against unexpected and uncorrelated income shortfalls, eg due to individual illness. Social exchange may thus be a short-term coping strategy but it is not a long-term poverty alleviating strategy. Factors helping to make social exchange profitable would also make market-based activities

more profitable thus casting doubt on the potential scale of benefits accruing from such activities.

The war destruction of human and physical capital and various institutions encouraged households to engage in risk reducing mechanisms. Households were found to make use of social exchange as described above but also to diversify their income sources and their spatial use of land. Income diversification in particular has a large welfare cost, however measured. Spatial diversification on the other hand is associated with higher income and food consumption thus suggesting that households used several plots also to raise production by optimising their production choices for given field-level characteristics.

There are thus several mechanisms which accentuate post-war rural poverty at the household level. These may be compounded in the worst war-affected and in the economically most isolated areas of northern Mozambique if the household choice to continue in a dominant subsistence mode of production has externality effects on other local farm households, in turn reducing their incentives to engage in market activity. Government intervention in establishing and building markets in such areas will thus be particularly important to create the initial incentive to join a market.

Considering that the FSP survey was not conducted in the first two years after the ceasefire and that it is slightly biased towards less isolated rural areas, it can be expected that in earlier seasons and in more isolated areas the benefits of market participation would be weaker and the welfare losses associated with cotton adoption stronger. Overcoming the post-war poverty traps may thus involve stimulating household production through government and donor aid, especially in the early post-war years and in the most-war affected areas. This issue will be addressed in more detail below.

6.2. War Effects on Household Welfare

The second theme of this analysis was an assessment of the nature of the war's legacy in northern Mozambique, its relative impact on labour, land, assets, markets and social institutions, and the subsequent effect of that legacy on household welfare. At the household level, the war reduced the household labour supply and damaged household human capital. The former appears more reversible in the post-war period than first expected but the latter will be slow to reverse due to the costs of providing education and the low demand for education.

The war also forced households to reduce their planning horizon which had particularly strong effects for households close to the survival threshold. This further reduced asset holdings and investment in productive assets and long-term activities. Some of these effects appear difficult to reverse unless aid provides a large boost to assets which can help re-establish some forms of production (eg in the cashew sector) and which can help insure very poor households against some forms of risk.

At the market level, some social institutions of the Macua society appeared surprisingly resilient to the war and helped households cope with its long-term, adverse effects. But market institutions suffered severely and households retreated into isolation and subsistence production to provide at least a minimal level of food consumption. The destruction of market institutions thus indicates how some of the most significant war effects, from the point of view of household welfare and economic development, occurred indirectly and are not easily and endogenously reversible. The reversibility of the indirect war effects then emerges as a key characteristic determining the speed of post-war production recovery, poverty alleviation and food security.

Overall, the behaviour of the post-war peasant households then appears quite rational and predictable once two factors are taken into account. First, the impact of the war resulted in a long-term, massive, broad and on-going destruction of all dimensions of a farm household's livelihood, thus forcing it to adjust and adopt under very difficult circumstances. Second, the land abundance of the post-war period, which in part was caused by the war itself, further

explains observable household coping strategies and opens the opportunity for an accelerated improvement in post-war household welfare through an aid-assisted increase in area farmed in northern Mozambique.

6.3. Post-War Poverty Alleviation Policies

The third issue was the analysis of the empirical foundations of some policy debates concerning the apparent choices between emergency and development aid, between human capital and physical capital development, and between on-farm and off-farm coping strategies and their impact on household welfare in the post-war period.

To analyse these issues, it is helpful to recall that similar variables affected all three indicators of welfare. The signs of the coefficients were also similar. For example, female-headed households or asset-constrained households being significantly poorer as measured by all indicators, even if the strength of the effects varied between indicators. However, different groups of variables determined these indicators. In particular, household income was affected by assets, markets, prices and activity choices while household food consumption was affected by land characteristics and social institutions, in addition to common determinants such as household characteristics. Both the difference in groups of significant determinants and the scale of the individual effects are shaped by the experience of the war at the household and market levels.

The implications for the policy debates are that there is a core set of common welfare determinants while at the same time there is some degree of divergence between the determinants of the different aspects of household welfare. Some policies may thus help to alleviate poverty and increase food security while other policies may achieve only one of these objectives. Most importantly, the distinction between emergency and development policies in the post-war period is artificial. Instead, policies should be evaluated as to their effect on household income, consumption and food consumption, and any other indicator of interest.

What were considered emergency policies in the immediate post-war period in northern Mozambique (eg distributing seeds and tools) may thus have positive long-term effects on household income if such policy helps to alleviate a household asset constraint and thus increases the household labour supply response. Similarly, what are considered development policies in the later post-war period (eg the construction of schools) may have little impact on most rural households as long as complementary, genuine development policies aimed at restoring the demand for education are ignored. In the worst case, offering only a selected or unbalanced set of post-war development programmes for rural areas may lead to the divergence between income and food security intensifying and could make seemingly prospering households become very food insecure indeed.

The evidence also suggests that the debates between the relative importance of human capital versus physical capital policies is misguided as the broad destruction of war at the household and the market levels requires an integrated approach to rebuilding human and physical and institutional assets. It may of course be administratively easier to organise the large scale asset distribution programme than to organise a large scale public infrastructure rehabilitation programme. Yet the key war legacies will not be overcome with selective but only with integrated rural development programmes.

Finally, the debate between the relative importance of off-farm versus on-farm activities and within the latter the debate between food crop versus cash crop programmes also appears to disregard the prevailing constraints and incentives in post-war rural areas. Based on the evidence of the FSP dataset from northern Mozambique, the contribution of off-farm activities for post-war household welfare is very limited and probably was even more limited during the war. Households under conditions of war maintained their food security to an incredible degree by retreating into food subsistence production. In the post-war period, they have faced increasing incentives to return to market based agricultural and especially tradable

food crop activities. The welfare effects of adopting cotton or off-farm activities has been more limited if not negative. Policy makers can thus either encourage war-affected households to consolidate their post-war welfare gains through strengthening rural food crop markets or they can try to improve the incentives for adopting cash cops and expanding off-farm activities. Given the persisting war legacy, the consequent need to restore basic market and social institutions, and the weak capacity of the state in rural northern Mozambique, the former policy option appears to offer higher returns for some time to come.

Appendix 1: Income and Consumption Variability

The two appendices presented here discuss auxiliary data and issues not directly relevant to the main discussion but of interest in themselves. The first appendix reviews the extent of welfare variability and derives some conclusions about income and consumption smoothing. The second appendix analyses the degree of welfare inequality across households in the FSP sample and considers if this inequality may be caused by the war's effects on asset endowments.

In estimating welfare and the determinants of welfare, using a long-run indicator of household welfare is preferable to short-run indicators which also reflect inter-year variability induced by random events such as weather. However, measuring long-run welfare is very difficult and household income and consumption per capita only manage to capture this imperfectly as reviewed above. Following Anand and Harris (1990: 311-7), figure 9 shows the weighted mean income, consumption and food consumption per capita per income per capita decile in columns 2, 4, and 5, respectively. Note that the total consumption excludes durables. In the absence of savings, life cycle effects and seasonality, and abstracting from the role of durables in expenditure, the values for income and consumption should be similar, with the former at least as large as the latter, in each decile.

In fact, figure 9 shows that mean consumption per capita exceeds mean income per capita in five of the six lowest deciles, thus suggesting that poorer households dissave to a large extent. In none of the deciles does household food consumption exceed household income, which is expected. In the third poorest income decile, households dissaving amounts to 22% of household income. In all other deciles, the gap is much smaller thus suggesting that households do in fact smooth both income and consumption in northern Mozambique. T-tests of equality of mean for income and consumption in column 3 suggest that the difference between the means are not significant in five deciles thus leaving two out of ten deciles with significant income shortfalls. As expected, these deficit deciles are among the poorest of the households.

Given the post-war scarcity of capital markets, the high transaction costs of conducting informal social security and the low level of assets in the whole sample (figure 14), it is surprising that consumption (especially after excluding the use of durables) exceeds household income in several deciles. This may be explained by, first, the difficulty in estimating subsistence household income, which is larger for poorer households as shown in column 6 in the figure. It is thus conceivable that subsistence income has been underestimated thus increasing the estimated shortfall for some income deciles. Second, animal breeding, sales and slaughters are the worst enumerated sections for the FSP survey thus underestimating those components of household income likely to be used for adjusting shortfalls in crop income. Third, the cyclone in early 1995 may have reduced household income below the long-run expected mean thus explaining the large number of deciles in deficit in 1995. The seasonality and chance involved particularly in low-input agricultural activity thus imply that income cannot be smoothed as much as household consumption even if the household actively aims to smooth household income as well as consumption.

Figures 10 and 11 calculate the same measures as figure 9 but group and rank the data by consumption per capita and food consumption per capita, respectively. No decile has an income deficit in either figure thus suggesting that the genuine variability of income underlies the actual income shortfalls observed in figure 9. On the other hand, and as shown in figure 13, the high food share across households in the sample implies that food consumption may not predict changes in household welfare accurately. In figure 11, for example, the fourth, sixth, and eighth deciles have a mean income per capita smaller than the third, fifth and seventh deciles, respectively (ie mean income does not increase monotonically with mean food consumption across all deciles). If household income is more variable due to economic choices and outcomes (and not due to enumeration error) then analysing household income

can capture differences between household welfare better than household food consumption. This also applies to household consumption to some extent, as household food consumption is such a large component of household consumption.

Compared with the estimates from rural Sri Lanka obtained by Anand and Harris (1990), household income in rural northern Mozambique is less variable and fewer deciles are in significant deficit despite the cyclone in Mozambique in that year. This is probably due to the extent of income smoothing practiced in Mozambique, where capital markets are less developed than in Sri Lanka. The surplus income deciles in Mozambique also have much larger surpluses than those in Sri Lanka, thus suggesting that some richer households in rural Mozambique engage in a process of positive and significant saving. However, it is not possible to say without panel data if these households are experiencing a temporary income surplus or if they are continuously building up their asset position over several years.

The degree of consumption smoothing can also be illustrated with figure 12. It plots the rank of 100 groups sorted by household income versus the rank of 100 groups sorted by household consumption excluding durables in 1995. The figure shows that income and consumption are clearly and positively correlated. The weighted correlation coefficient of the natural logs of per capita income and consumption is 0.85. However, more than 10% of all households change more than 30 rank groups, which suggests that some households are very income-poor but less consumption-poor and vice versa.

This may be due to measurement error, as suggested by the subsistence share column in figure 9, or it may be due to actual consumption smoothing. In that case, an income-poor household can compensate for an income shortfall by dissaving and thus increasing its consumption in the short-term. If ranked separately by income and by consumption, such household would occupy different ranks in these calculations. Column 7 in figure 9 summarises the mean change in income versus consumption ranks per income decile.[27]

Broadly speaking, better off (poorer) households are more likely to (dis-) save compared to median income households. This indicates that income poorer households dissave to compensate for the current shortfall in income while currently less poor households save some of their windfall income. The households not located on the 45º-degree line in figure 12 may thus be reacting to realised deviations from their permanent income, rather than having their actual income recorded incorrectly.

The conclusion from this evidence is that household income per capita leads to a clearer differentiation of households into poorer and less poor households and that a small part of that differentiation may be due to data imperfections. More significantly, some of the differentiation can be compensated by households as some degree of consumption smoothing is possible even in post-war rural Mozambique. Using only the data available, it is difficult to distinguish between the degree of measurement error the degree of consumption smoothing. Both are likely to affect the indicators presented here. It appears as if the conjecture that household income captures "welfare opportunities" and household consumption "realised welfare" has some merit in practice and that with imperfect data, all indicators can contribute something to the analysis of poverty.

[27] Note that its values will correlate strongly with the income-expenditure gap between columns 2 and 4. However, these columns are both ranked by income while column 7 measures a change in ranks based on income and expenditure.

Appendix 2: Income, Consumption and Asset Inequality

This appendix analyses the degree of welfare inequality across households in the FSP sample and considers briefly if this inequality may be caused by the war's effects on asset endowments. Figure 13 shows the mean level of household income per capita, consumption per capita and food consumption per capita across the whole sample and by total household per capita consumption quintiles. In 1995, household income per capita was US$ 37.13 and household consumption per capita was US$ 33.05. With the rural poverty line calculated by IAF in 1997 adjusted for 1995 prices, this suggests a headcount poverty ratio of about 98% for the FSP sample (1998).

While one might expect war-affected households to be very poor, it appears that poverty within the sample is not uniform. Instead, there is a large degree of inequality even among these poor households, with income inequality being marginally higher than consumption inequality. The Gini coefficients for income per capita, consumption per capita and food consumption per capita are 0.37, 0.34, and 0.35, respectively.

Yet despite such inequality, the food share (ie the proportion of consumption spent on food) is almost constant (and very high) across consumption quintiles, thus implying that there is a high elasticity of food consumption with respect to income (figure 13). More household resources can thus be expected to raise household food consumption, which may in turn consist of increases in food quantity, food quality, and food prices (especially during the hungry season, when unit food prices rise significantly). It is difficult to distinguish these three effects with the available data. But given the restricted nature of food markets with few processed foods being available it can be assumed that a significant share of the increase in food consumption will also increase food quantity (eg as measured by calories).

Households in northern Mozambique have been observed to spend marginal food expenditure on improving the flavour of their (generally quite bland) diet by buying dried fish (Tschirley and Weber 1994). Figure 13 shows how better off households spend absolutely more money and relatively a higher share of the food budget on this commodity, which is expensive per calorie. Yet even the least poor households only spend 5.5% of their income on dried fish, thus suggesting that more basic food items are very important for all households. Note that while dried fish may be highly valued for its flavour, it also contains valuable protein and can be transported and stored easily thus explaining why even the poorest households spend 3.2% of their income on dried fish.

Finally, the observed inequality in income and consumption may be the result of an inequality in asset ownership. Figure 14 summarises different indicators of asset ownership by human capital, physical capital and social capital, all ranked by household consumption per capita. The human capital variables in figure 14 all show very low absolute values, no systematic differentiation by poverty group, and low Gini values. This is due to the systematically devastating effect of the war on the education infrastructure in Mozambique, which was a deliberate war aim by the rebel movement. This confirms the hypothesis proposed above that educational achievement is unlikely to explain welfare differentials in a post-war environment.

Livestock, tools and trees do not appear to be correlated strongly with the distribution of consumption, though the poorest households have less livestock and tools than any other group. It appears as if livestock inequality as measured by the Gini coefficient has lessened since the end of the war and tools are quite equally distributed, too, perhaps due to the emergency aid programmes in the province focussing on the distribution of tools and seeds, or perhaps because agricultural tools are among the most important assets for farm households thus encouraging most households to have at least some. In addition, for tools their quality may be more important than their quantity for productivity though the quality of tools could not be measured in this survey.

The average value of total household assets does not appear to have changed significantly since the war (assets at the end of the war are measured in constant prices). However, the distribution of assets, which is clearly related to consumption group, has become even less equal, with a Gini coefficient of 0.61 for the value of current assets. The lack of asset ownership may thus be an important determinant of ultra poverty, though its impact may not vary much among the higher welfare groups.

The distribution of some social capital indicators are also shown in figure 14. In particular a household's relation to the local authority seems an important determinant of household consumption, as more poorer households are related to a local chief than better off households, and as more better off households are themselves in a position of authority than the poorer households. While the latter observation accords with intuition, the former is hard to explain. It may be that such households are part of larger family networks where resources are concentrated around the head of a kin network and thus, on average, households more distanced from such centre of authority but still related with it have fewer resources under their control. In the absence of a closer anthropological understanding of Macua culture, this variable will be difficult to interpret.

Appendix 3: Figures

Figure 1: Summary Welfare Hypotheses and Outcomes

	Income		Consumption		Food Consumption	
	Expected	**Actual**	**Expected**	**Actual**	**Expected**	**Actual**
Household Characteristics						
household composition variables†						
refugee household?	decr		decr		decr	
female-headed household?	decr	decr	decr	decr	decr	decr
age of head	incr		incr	incr	incr	incr
days ill	decr		decr	incr	decr	
environmental time constraint	decr	decr	decr		decr	decr
paternal education	insig	incr	insig	incr/decr	insig	incr
maternal education	insig		insig		incr	
Land Characteristics						
low soil quality?	decr		(decr)		decr	decr
many pests?	decr		(decr)		decr	
easy land access?	incr		(incr)		incr	
distance to fields	decr		(decr)		decr	
low rainfall?	decr		(decr)		decr	decr
Assets Endowment						
# tools	incr	incr	incr		incr	
# types of tools	incr		incr		incr	
storage technology?	incr		incr		incr	
end-of-war assets	incr	incr	incr	incr	(incr)	incr
end-of-war livestock	incr		incr		(incr)	
affected by cyclone?	decr	incr	decr		(decr)	
Social Capital Endowment						
local husband origin?	incr		incr		incr	decr
local wife origin?	incr		incr		incr	decr
related to authority?	incr		incr		incr	
head is local authority?	incr	incr	incr		incr	incr
ancestors buried here?	incr		incr		incr	
Markets						
labour market density	incr		incr		(incr)	
output market density	incr		incr		(incr)	decr
village days ill	decr		decr		decr	
village maize yield	incr		incr		incr	
village cotton yield	incr	incr	incr		incr	
variance of prices	decr	decr	decr		decr	
village control variables	sig		sig		sig	
Endogenous Choices						
cultivated area	incr	incr	(incr)	incr	incr	incr
% of income from on-farm activities	incr		incr	incr	incr	incr
degree of activity diversification	decr	decr	decr		decr	decr
crop market participating household?	incr	incr	incr	incr	incr	incr
% of income from subsistence activities	decr	decr	decr		decr	
cotton adopting household?	incr	decr	incr	decr	incr	decr
degree of plot diversification	decr	incr	decr		decr	incr
degree of social exchange	decr	incr	decr		decr	

† These effects are not signed for reasons discussed in the text. Incr: positive significant coefficient. Decr: negative significant coefficient. Incr/decr and decr/incr: quadratic relation where the linear/quadratic variables have an increasing/decreasing effect on welfare and vice versa. Insig (or empty cell): an insignificant variable with a p-value of above 0.10 which may was omitted from the final regression. Sig: significant variable with an unknown sign. Signs enclosed in brackets also suggest a possible insignificance of the coefficient.

Figure 2: Poverty Profile

	Population Share (%)	Mean Consumption ($)	Headcount Ratio	Poverty Gap
All Households	100	33.05	0.54	0.22
Refugee Household?				
No	84	32.61	0.56	0.23
Yes	16	35.39	0.44	0.16
Female-Headed?				
No	99	33.27	0.54	0.22
Yes	1	17.35	0.91	0.49
Affected by Cyclone?				
No	67	30.25	0.61	0.26
Yes	33	38.70	0.41	0.13
Severe Lack of Rain?				
No	72	37.27	0.43	0.15
Yes	28	21.95	0.83	0.39
By Soil Quality				
Good	71	36.11	0.49	0.19
Bad	29	25.42	0.67	0.30
By Infrastructure				
Good	55	33.99	0.54	0.21
Bad	45	31.91	0.55	0.23
By Province				
Cabo Delgado	50	27.22	0.66	0.30
Nampula	50	38.90	0.42	0.14
By Farm Size				
Large	33	46.74	0.28	0.08
Small	67	26.32	0.67	0.29
By Cashew Adoption				
Non-Adopter	80	32.20	0.55	0.23
Adopter	20	36.45	0.51	0.19
By Cotton Adoption				
Non-Adopter	50	27.86	0.65	0.27
Adopter	50	38.15	0.43	0.17
By Crop Market Status				
Not Participating	21	21.14	0.81	0.40
Participating	79	36.30	0.47	0.17

The poverty line is the median consumption per capita in 1995 (ie US$ 30.92), which broadly divides the sample into the ultra poor and the poor. Both mean consumption and the farm size variables are calculated on a per capita basis using WEIGHT2. The total sample size is 371. This table was calculated using the command povdeco in Stata 6.

Source: FSP data and own calculations.

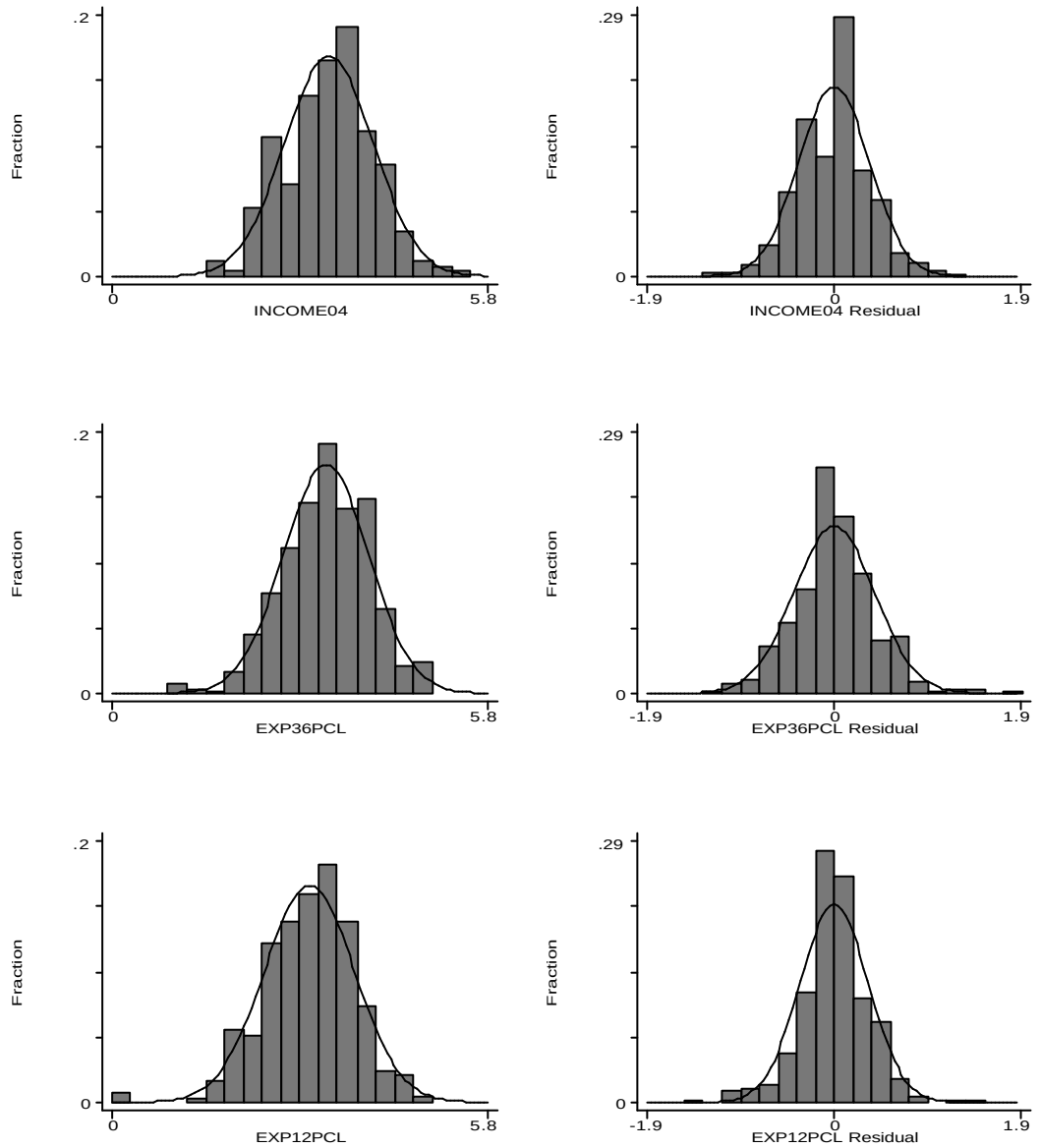
Figure 3: Definition and Summary Statistics of Variables

Variable	Definition	Estimate	Std. Err.
AGEHEAD3	age of household head as of 7/1995	40.92767	1.353915
AGEHH01	average age of household in round 2	22.11376	.9997481
ANCEST1	does the household have ancestors buried here?	.8441806	.0410295
ANIMAL5	household has at least one large animal in 10/92?	.1122767	.0269243
AREA56	ln of cultivated area 1995/96 /household in hectare	.7116516	.052911
AREAFER6	low soil quality /household (weighted)?	.2855877	.0471713
ASSET13	# of durables per capita /household in 1992	.4051645	.0543273
AUTH12	is household head in any position of authority?	.0706833	.0133304
COTTON89	does household grow cotton in 1995?	.5049237	.0615038
CYCLONE2	affected by cyclone Nadia?	.3320939	.0818275
DEPEND95	dependency ratio /household as of 7/1995	.2551475	.0163533
DIS1	Montepuez district?	.5006326	.1130641
DIS3	Monapo district?	.3838848	.1100692
DISTANC3	distance to fields in minutes in 1995 /household (weighted)	40.66891	3.480748
DIVERS12	ln of Herfindahl-Hirschman index of income diversification	.6999716	.043508
DONA1	Received food, seed or in-kind aid?	.0784944	.0269238
EDINFRA3	maternal level of education in more accessible areas in years	.4894198	.176307
EDINFRA5	paternal level of education in more accessible areas in years	1.021477	.2754409
EDUMAX3	years of effective education /household (adjusted for literacy)	3.582144	.21309
EXP12PCL	ln of total weighted food expenditure per capita in US$, 1995	3.040109	.0876863
EXP36PCL	ln of total weighted per capita expenditure in US$, 1995	3.295522	.0790872
FEMALE1	# females /household in 1995	3.471747	.1976431
FEMALE2	ratio of females over total # of people /household in 1995	.4698371	.0146422
FEMHEAD1	female-headed household in 7/1994?	.013337	.0059791
ILLDAYS1	total # days ill /household in 1994/95	46.06626	10.59845
ILLDAYS2	total # days ill /household in 1995/96	21.77186	2.351444
INCOME04	ln of household income per capita in US$ in 1995	3.374176	.1005397
LABOUR3	ln of # of hrs of labour hired for farm work /village	7.233919	.1875831
LABOUR5	ln of # of hrs of labour hired for farm work per capita /village	1.401693	.1839907
MARKET7	ln of total crop sales per village in US$ in 1993/94	7.830082	.1779303
MEMD11	# dependent residents /household as of 7/1995	1.888777	.1110507
MEMND11	# non-dependent, resident members /household, 7/1995	5.571982	.3301401
MILL21	ln of # of mills nearby /household in 1995	.5616465	.1291187
ORIGINF1	origin of main woman in household is this village?	.6522242	.0500325
ORIGINM1	origin of main man in household is this village?	.6783995	.0493036
PEST01	do most crops suffer from pests in 95 (unweighted)?	.4036263	.0705596
PEST13	do >75% of stored food crops suffer from storage problems?	.4585917	.0404611
PLOT32	plot diversification index	.3810542	.0372611
PRICE13	Paasche price index for purchased food in round 3 /household	1.093434	.0436801
PRICE14	Paasche price index for purchased food in round 4 /household	.9286817	.0359689
PRICE15	Paasche price index for purchased food in round 5 /household	1.128293	.073155
PRICE23	Paasche price index for purchased non-food in round 3	1.050193	.0592872
PRICE24	Paasche price index for purchased non-food in round 4	.978166	.0507507
PRICE25	Paasche price index for purchased non-food in round 5	1.064236	.0380119
PRICE33	Paasche price index for home-produced food crops in round 3	1.043877	.065688
PRICE34	Paasche price index for home-produced food crops in round 4	1.09606	.1523256
PRICE35	Paasche price index for home-produced food crops in round 5	1.298885	.2075789
PRICEV1	variance of purchased food prices	.0899251	.0146091
PRICEV2	variance of purchased non-food prices	.0578338	.0131029
PRICEV3	variance of home-produced food crops	.4025571	.1104082
RAIN4	proportion of cultivated area with lack of rain in 1994/95	.2955185	.0490937
REFUGEE1	has household been recognised as a refugee household?	.1586516	.0463936
REMT4	index of social exchange (in natural log)	.0031617	.0661236
SHAREONL	ln of share of income derived from on-farm activities	-.22697	.0261434
SHARESUL	ln of share of income derived from subsistence activities	-.57741	.0499953
STATUS14	type of household by crop market participation in 1994-95	.7858442	.0553766
TIME01	# hours/month wife spent collecting firewood in hungry season	7.314534	.7708736
TIME02	# hours/month wife spent collecting firewood in harvest season	7.345335	.8433959
TIME03	# hours/month wife spent collecting water in hungry season	15.05994	1.000796
TIME04	# hours/month wife spent collecting water in harvest season	24.62916	3.273859
TOOL11	# tools per capita /household in 5/1995	.9257478	.0627375
VASSET5	ln value of assets in real 1996 US$ /household, 10/1992	2.924692	.2539344
YIELDL8	ln of mean yield for cotton /village in 1994/95 in kg/hectare	6.350975	.1336814
YIELDL7	ln of mean yield for maize /village in 1994/95 in kg/hectare	5.609315	.1133047

The mean and standard errors are weighted using WEIGHT2 and adjusted for survey design effects using the Stata 6 svyset and svymean commands. Source: FSP and own calculations.

Figure 4: Distribution of Dependent Variables and their Regression Residuals

The figures show weighted histograms (using WEIGHT2) and superimposed Normal distributions.



Source: FSP data and own calculations.

Figure 5: Determinants of Income

```
Survey Instrumental Variables Regression
pweight:  WEIGHT2                                 Number of obs    =       349
Strata:   CATEG1                                  Number of strata =         4
PSU:      ALD                                     Number of PSUs   =        43
                                                  Population size  =  30505.29
                                                  F(  38,      2)  =     84.68
                                                  Prob > F         =    0.0117
                                                  R-squared        =    0.7208
------------------------------------------------------------------------------
INCOME04 |      Coef.    Std. Err.       t     P>|t|      (95% Conf. Interval)
---------+--------------------------------------------------------------------
 MEMND11 |   -.244606    .0816773    -2.995   0.005     -.4098139   -.0793982
 MEMND12 |   .0093799    .0058438     1.605   0.117     -.0024403    .0212002
DEPEND95 |  -1.473872    .2796488    -5.270   0.000     -2.039515   -.9082287
 FEMALE2 |  -.1199673    .1739991    -0.689   0.495     -.4719137    .2319792
 AGEHH01 |  -.0332137    .0137195    -2.421   0.020     -.0609641   -.0054633
 AGEHH02 |   .0004565    .0002198     2.077   0.044      .0000119    .0009011
AGEHEAD3 |   .0025155    .0082639     0.304   0.762     -.0141998    .0192308
AGEHEAD4 |   6.99e-06     .000072     0.097   0.923     -.0001387    .0001526
FEMHEAD1 |  -.4012829    .1487346    -2.698   0.010     -.7021271   -.1004387
  TIME02 |  -.0089415    .0025924    -3.449   0.001     -.0141852   -.0036979
EDINFRA5 |  -.0416433    .0603412    -0.690   0.494     -.1636948    .0804083
EDINFRA6 |   .0142647    .0100234     1.423   0.163     -.0060095    .0345389
EDINFRA3 |   .0044013    .0605038     0.073   0.942     -.1179791    .1267817
EDINFRA4 |   .0040367    .0133748     0.302   0.764     -.0230163    .0310897
  TOOL11 |    .212001    .0912487     2.323   0.025      .0274331    .3965688
 ANIMAL5 |   .1802253    .1252647     1.439   0.158     -.0731463     .433597
CYCLONE2 |   .1728028    .0853863     2.024   0.050      .0000927     .345513
 VASSET5 |   .0463049    .0147734     3.134   0.003      .0164228    .0761869
  AUTH12 |   .3324322    .1051083     3.163   0.003      .1198306    .5450337
 YIELDL8 |   .3513762    .0589914     5.956   0.000      .2320548    .4706976
 PRICEV1 |    .010162    .1277668     0.080   0.937     -.2482708    .2685948
 PRICEV2 |  -.0497663    .1339837    -0.371   0.712     -.3207739    .2212413
 PRICEV3 |  -1.585979    .3492754    -4.541   0.000     -2.292455   -.8795026
  AREA56 |   .6574404    .1207019     5.447   0.000      .4132979     .901583
DIVERS12 |  -.7993689    .3742041    -2.136   0.039     -1.556268   -.0424696
STATUS14 |   .2467969    .0837172     2.948   0.005      .0774629     .416131
SHARESUL |  -.3486792    .1333948    -2.614   0.013     -.6184955   -.0788628
COTTON89 |  -.3205112    .1823947    -1.757   0.087     -.6894392    .0484169
  PLOT32 |   .4645806    .0887742     5.233   0.000      .2850178    .6441434
   REMT4 |   .0486189     .024046     2.022   0.050     -.0000188    .0972565
  ALD111 |  -.0884474    .1268193    -0.697   0.490     -.3449636    .1680688
  ALD112 |  -.1358157    .1641588    -0.827   0.413     -.4678582    .1962269
  ALD113 |  -.1275608    .3279126    -0.389   0.699     -.7908266    .5357051
  ALD114 | (dropped)
  ALD121 |   .5156376    .1821128     2.831   0.007      .1472796    .8839955
  ALD122 | (dropped)
  ALD123 |   1.352448    .3531916     3.829   0.000      .6380506    2.066845
  ALD214 |    .085128    .1758689     0.484   0.631     -.2706003    .4408564
  ALD215 |    .130924    .2211673     0.592   0.557     -.3164292    .5782771
  ALD221 |   .5173103    .1638056     3.158   0.003      .1859821    .8486384
  ALD231 |   .5813827    .1639945     3.545   0.001      .2496726    .9130928
  ALD232 |   .0537003    .1157973     0.464   0.645     -.1805218    .2879225
  ALD312 |   1.371343    .3655466     3.751   0.001      .6319547     2.11073
  ALD313 |   1.164763    .2286975     5.093   0.000      .7021787    1.627347
  ALD321 |   .4103915    .1810355     2.267   0.029      .0442127    .7765704
  ALD332 |   .3985852    .1360771     2.929   0.006      .1233433    .6738271
   _cons |   2.298335    .4466111     5.146   0.000     1.394979    3.201692
------------------------------------------------------------------------------
Instrumented:  AREA56 DIVERS12 COTTON89
Instruments:   FEMALE1 FEMALE3 ILLDAYS1 ILLDAYS2 REFUGEE1 TIME01 TIME03 TIME04
AREA53 AREAFER6 DISTANC3 DISTANC9 PEST01 RAIN4 MILL21 PEST13 DONA1 ANCEST1 OR
IGINM1 LABOUR5 MARKET7 PRICE13 PRICE14 PRICE15 PRICE23 PRICE24 PRICE25 PRICE3
3 PRICE34 PRICE35 DIS1 DIS3  + STATUS14 SHARESUL PLOT32 REMT4 MEMND11 MEMND12
DEPEND95 AGEHH01 AGEHH02 AGEHEAD3 AGEHEAD4 FEMHEAD1 FEMALE2 TIME02 EDINFRA3 E
DINFRA4 EDINFRA5 EDINFRA6 TOOL11 ANIMAL5 CYCLONE2 VASSET5 AUTH12 YIELDL8 PRIC
EV1 PRICEV2 PRICEV3 ALD111 ALD112 ALD113 ALD114 ALD121 ALD122 ALD123 ALD214 A
LD215 ALD221 ALD231 ALD232 ALD312 ALD313 ALD321 ALD332
------------------------------------------------------------------------------
```

Adjusted Wald tests of jointly zero coefficients: MEMND11 and MEMND12: F(2, 38) = 72.10, Prob > F = 0.0000. AGEHH01 and AGEHH02: F(2, 38) = 2.93, Prob > F = 0.0656. AGEHEAD3 and AGEHEAD4: F(2, 38) = 0.48, Prob > F = 0.6233. AGEHH01 to AGEHEAD4: F(4, 36) = 1.60, Prob > F = 0.1944. EDINFRA3 and EDINFRA4: F(2, 38) = 0.81, Prob > F = 0.4535. EDINFRA5 and EDINFRA6: F(2, 38) = 2.76, Prob > F = 0.0759. EDINFRA3 to EDINFRA6: F(4, 36) = 3.42, Prob > F = 0.0181.

Source: FSP data and own calculations.

Figure 6: Determinants of Consumption

```
Survey Instrumental Variables Regression
pweight:  WEIGHT2                                 Number of obs    =       371
Strata:   CATEG1                                  Number of strata =         4
PSU:      ALD                                     Number of PSUs   =        43
                                                  Population size  =  32539.53
                                                  F(  38,      2)  =    864.48
                                                  Prob > F         =    0.0012
                                                  R-squared        =    0.6164
------------------------------------------------------------------------------
EXP36PCL |      Coef.    Std. Err.       t     P>|t|      (95% Conf. Interval)
---------+--------------------------------------------------------------------
 MEMND11 |  -.1339431    .0940716     -1.424   0.162     -.3242208    .0563347
 MEMND12 |   .0039355    .0072182      0.545   0.589     -.0106647    .0185358
  MEMD11 |   -.200286    .0865714     -2.314   0.026     -.3753932   -.0251788
  MEMD12 |   .0074661    .0205484      0.363   0.718      -.034097    .0490292
 FEMALE2 |  -.4332336    .1746231     -2.481   0.018     -.7864421   -.0800252
 AGEHH01 |   -.034995    .0152916     -2.289   0.028     -.0659251   -.0040649
 AGEHH02 |   .0003003    .0002066      1.454   0.154     -.0001176    .0007182
AGEHEAD3 |    .014244    .0111285      1.280   0.208     -.0082654    .0367534
AGEHEAD4 |  -.0000586    .0001298     -0.452   0.654     -.0003213     .000204
FEMHEAD1 |  -.5609736    .1603482     -3.498   0.001     -.8853085   -.2366387
ILLDAYS2 |   .0022798    .0009594      2.376   0.023      .0003391    .0042204
 EDUMAX3 |   -.033002    .0492194     -0.671   0.506     -.1325576    .0665535
 EDUMAX4 |   .0068529    .0057754      1.187   0.243     -.0048289    .0185347
EDINFRA3 |  -.0449154      .06504     -0.691   0.494     -.1764711    .0866404
EDINFRA4 |   .0119461    .0108136      1.105   0.276     -.0099265    .0338186
 ANIMAL5 |   .0436279    .1003251      0.435   0.666     -.1592987    .2465546
 ASSET13 |   .3782624    .0871722      4.339   0.000        .20194    .5545848
  AUTH12 |   .1206285    .0843355      1.430   0.161     -.0499561    .2912132
 LABOUR3 |   .0267581    .0340387      0.786   0.437     -.0420917     .095608
 PRICEV1 |   .2157894     .199686      1.081   0.286     -.1881137    .6196925
  AREA56 |   .1364993    .0640873      2.130   0.040      .0068704    .2661281
SHAREONL |   .8935434    .4021657      2.222   0.032      .0800865       1.707
STATUS14 |   .6019751    .2320506      2.594   0.013      .1326084    1.071342
COTTON89 |  -.1508039     .072918     -2.068   0.045     -.2982945   -.0033132
  ALD111 |   .0547251    .2634764      0.208   0.837     -.4782063    .5876564
  ALD112 |  -.6091222    .1112914     -5.473   0.000     -.8342303    -.384014
  ALD113 |  -.5273597    .1701727     -3.099   0.004     -.8715664    -.183153
  ALD114 | (dropped)
  ALD121 |   .0565536    .0865187      0.654   0.517     -.1184469    .2315541
  ALD122 |    -.33957    .1360725     -2.496   0.017     -.6148026   -.0643375
  ALD123 |  -.1983622    .1075031     -1.845   0.073     -.4158079    .0190834
  ALD214 |   -.125512    .1363817     -0.920   0.363     -.4013701    .1503461
  ALD215 |  -.2985392    .1504358     -1.984   0.054     -.6028244    .0057459
  ALD221 | (dropped)
  ALD231 |   .1363223    .1409484      0.967   0.339     -.1487728    .4214174
  ALD232 |  -.1791666    .1657645     -1.081   0.286     -.5144568    .1561237
  ALD312 |  -.7111879    .1420036     -5.008   0.000     -.9984174   -.4239585
  ALD313 |  -.0393424    .1572609     -0.250   0.804     -.3574325    .2787478
  ALD321 |   .0117189    .2107703      0.056   0.956     -.4146043    .4380421
  ALD332 |   .2167968    .1185652      1.829   0.075     -.0230239    .4566176
   _cons |   4.032277    .4172842      9.663   0.000      3.18824    4.876314
------------------------------------------------------------------------------
Instrumented:  SHAREONL STATUS14
Instruments:   FEMALE1 FEMALE3 ILLDAYS1 ILLDAYS2 REFUGEE1 TIME01 TIME03 TIME04
AREA53 AREAFER6 DISTANC3 DISTANC9 PEST01 RAIN4 MILL21 PEST13 DONA1 ANCEST1 OR
IGINM1 LABOUR5 MARKET7 PRICE13 PRICE14 PRICE15 PRICE23 PRICE24 PRICE25 PRICE3
3 PRICE34 PRICE35 DIS1 DIS3 + AREA56 COTTON89 MEMND11 MEMND12 MEMD11 MEMD12 A
GEHH01 AGEHH02 AGEHEAD3 AGEHEAD4 FEMHEAD1 FEMALE2 ILLDAYS2 EDUMAX3 EDUMAX4 ED
INFRA3 EDINFRA4 ANIMAL5 ASSET13 AUTH12 LABOUR3 PRICEV1 ALD111 ALD112 ALD113 A
LD114 ALD121 ALD122 ALD123 ALD214 ALD215 ALD221 ALD231 ALD232 ALD312 ALD313 A
LD321 ALD332
------------------------------------------------------------------------------
```

Adjusted Wald tests of jointly zero coefficients: MEMND11 and MEMND12: F(2, 38) = 17.69, Prob > F = 0.0000. MEMD11 and MEMD12: F(2, 38) = 22.72, Prob > F = 0.0000. MEMND11 to MEMD12: F(4, 36) = 27.51, Prob > F = 0.0000. AGEHH01 and AGEHH02: F(2, 38) = 3.06, Prob > F = 0.0588. AGEHEAD3 and AGEHEAD4: F(2, 38) = 2.66, Prob > F = 0.0827. AGEHH01 to AGEHEAD4: F(4, 36) = 1.77, Prob > F = 0.1566. EDUMAX3 and EDUMAX4: F(2, 38) = 2.75, Prob > F = 0.0767. EDINFRA3 and EDINFRA4: F(2, 38) = 1.09, Prob > F = 0.3469. EDUMAX3 to EDINFRA4: F(4, 36) = 2.64, Prob > F = 0.0496.

Source: FSP data and own calculations.

Figure 7: Determinants of Food Consumption

```
Survey Instrumental Variables Regression
pweight:  WEIGHT2                                 Number of obs    =       371
Strata:   CATEG1                                  Number of strata =         4
PSU:      ALD                                     Number of PSUs   =        43
                                                  Population size  =  32539.53
                                                  F(  38,      2)  =    516.54
                                                  Prob > F         =    0.0019
                                                  R-squared        =    0.7534
------------------------------------------------------------------------------
EXP12PCL |      Coef.    Std. Err.       t     P>|t|      (95% Conf. Interval)
---------+--------------------------------------------------------------------
 MEMND11 |  -.1599799    .0551495     -2.901   0.006     -.2715302   -.0484295
 MEMND12 |   .0052606    .0042695      1.232   0.225     -.0033753    .0138965
  MEMD11 |  -.1577354    .0302187     -5.220   0.000     -.2188585   -.0966123
 FEMALE2 |  -.1865782    .1675034     -1.114   0.272     -.5253857    .1522293
 AGEHH01 |  -.0362171    .0124465     -2.910   0.006     -.0613926   -.0110416
 AGEHH02 |   .0004853    .0001729      2.806   0.008      .0001354    .0008351
AGEHEAD3 |   .0059279    .0081164      0.730   0.470      -.010489    .0223449
AGEHEAD4 |   .0000344    .0000911      0.378   0.708     -.0001498    .0002186
REFUGEE1 |   .1188171    .0755645      1.572   0.124     -.0340265    .2716607
FEMHEAD1 |  -.7044754    .1550828     -4.543   0.000      -1.01816   -.3907908
  TIME02 |  -.0134871    .0033433     -4.034   0.000     -.0202495   -.0067247
 EDUMAX3 |   .0274989    .0329467      0.835   0.409     -.0391421    .0941399
 EDUMAX4 |   .0031283    .0040681      0.769   0.447     -.0051003    .0113568
EDINFRA3 |  -.0696631    .0466683     -1.493   0.144     -.1640586    .0247323
EDINFRA4 |   .0102255    .0079963      1.279   0.209     -.0059486    .0263996
AREAFER6 |   -.082418    .0484067     -1.703   0.097     -.1803298    .0154938
   RAIN4 |  -.2029822    .1131915     -1.793   0.081     -.4319336    .0259692
 ANIMAL5 |    .039291    .0880524      0.446   0.658     -.1388118    .2173937
 ASSET13 |    .318572    .0661106      4.819   0.000      .1848508    .4522933
  AUTH12 |   .3188338    .1027581      3.103   0.004      .1109858    .5266817
ORIGINF1 |  -.2460459    .0579577     -4.245   0.000     -.3632763   -.1288154
ORIGINM1 |  -.1138888    .0660364     -1.725   0.093     -.2474601    .0196825
 MARKET7 |  -.1816463    .0487053     -3.729   0.001      -.280162   -.0831306
 PRICEV1 |   .0531992    .1397043      0.381   0.705     -.2293794    .3357778
  AREA56 |    .443588    .0738905      6.003   0.000      .2941303    .5930457
SHAREONL |   .5932566    .2917696      2.033   0.049       .003097    1.183416
DIVERS12 |  -.3682106    .1448249     -2.542   0.015     -.6611466   -.0752746
STATUS14 |   .1258708    .0747885      1.683   0.100     -.0254032    .2771447
COTTON89 |   -.107901    .0595732     -1.811   0.078     -.2283992    .0125972
  PLOT32 |   .3361708    .0692831      4.852   0.000      .1960324    .4763092
  ALD111 |   .4537965    .1929016      2.352   0.024      .0636162    .8439768
  ALD112 |   -.277147    .1064588     -2.603   0.013     -.4924801   -.0618138
  ALD113 | (dropped)
  ALD114 |   .4184794    .1899922      2.203   0.034       .034184    .8027748
  ALD121 |   .2870687    .0979971      2.929   0.006      .0888509    .4852865
  ALD122 |  -.4210132    .1153138     -3.651   0.001     -.6542573   -.1877691
  ALD123 |   .2141659     .125937      1.701   0.097     -.0405657    .4688976
  ALD214 |   -.008862    .1040064     -0.085   0.933     -.2192349    .2015108
  ALD215 | (dropped)
  ALD221 |  -.2974061    .2210773     -1.345   0.186     -.7445773     .149765
  ALD231 |   .7137438    .1143298      6.243   0.000        .48249    .9449976
  ALD232 |  -.1312145    .0856826     -1.531   0.134      -.304524    .0420949
  ALD312 |  -.7378389    .0852489     -8.655   0.000     -.9102711   -.5654068
  ALD313 |   .3821011     .120393      3.174   0.003      .1385833    .6256189
  ALD321 |   .6612416    .1509388      4.381   0.000      .3559391    .9665441
  ALD332 |   .3811662    .1152782      3.306   0.002      .1479941    .6143383
   _cons |   5.704634    .5006679     11.394   0.000      4.691938    6.717331
------------------------------------------------------------------------------
Instrumented:  SHAREONL
Instruments:   FEMALE1 FEMALE3 ILLDAYS1 ILLDAYS2 REFUGEE1 TIME01 TIME03 TIME04
AREA53 AREAFER6 DISTANC3 DISTANC9 PEST01 RAIN4 MILL21 PEST13 DONA1 ANCEST1 OR
IGINM1 LABOUR5 MARKET7 PRICE13 PRICE14 PRICE15 PRICE23 PRICE24 PRICE25 PRICE3
3 PRICE34 PRICE35 DIS1 DIS3 + AREA56 DIVERS12 STATUS14 COTTON89 PLOT32 MEMND1
1 MEMND12 MEMD11 AGEHH01 AGEHH02  AGEHEAD3 AGEHEAD4 REFUGEE1 FEMHEAD1 FEMALE2
TIME02 EDUMAX3 EDUMAX4 EDINFRA3 EDINFRA4 AREAFER6 RAIN4 ANIMAL5 ASSET13 AUTH1
2 ORIGINF1 ORIGINM1 MARKET7 PRICEV1 ALD111 ALD112 ALD113 ALD114 ALD121 ALD122
 ALD123 ALD214 ALD215 ALD221 ALD231 ALD232 ALD312 ALD313 ALD321 ALD332
------------------------------------------------------------------------------
```

Adjusted Wald tests of jointly zero coefficients: MEMND11 and MEMND12: F(2, 38) = 38.33, Prob > F = 0.0000. AGEHH01 and AGEHH02: F(2, 38) = 4.14, Prob > F = 0.0237. AGEHEAD3 and AGEHEAD4: F(2, 38) = 3.25, Prob > F = 0.0497. AGEHH01 to AGEHEAD4: F(4, 36) = 2.56, Prob > F = 0.0551. EDUMAX3 and EDUMAX4: F(2, 38) = 13.52, Prob > F = 0.0000. EDINFRA3 and EDINFRA4: F(2, 38) = 1.10, Prob > F = 0.3418. EDUMAX3 to EDINFRA4: F(4, 36) = 7.65, Prob > F = 0.0001.

Source: FSP data and own calculations.

Figure 8: Summary of Endogenous Determinants of Household Welfare

	Instrument			Regression	
	R^2	F	DWH	Coeff	P
INCOME04					
AREA56	0.69	0.00	0.01	**0.66**	0.00
SHAREONL	0.56	0.00	n.a.	n.a.	n.a.
DIVERS12	0.54	0.00	0.02	**-0.80**	0.04
STATUS14	0.58	0.00	n.a.	**0.25**	0.01
SHARESUL	0.37	0.00	n.a.	**-0.35**	0.01
COTTON89	0.53	0.01	0.15	**-0.32**	0.09
PLOT32	0.54	0.02	n.a.	**0.46**	0.00
REMT4	0.41	0.00	n.a.	**0.05**	0.05
EXP36PCL					
AREA56	0.67	0.00	n.a.	**0.14**	0.04
SHAREONL	0.55	0.00	0.01	**0.89**	0.03
DIVERS12	0.48	0.00	n.a.	n.a.	n.a.
STATUS14	0.58	0.00	0.01	**0.60**	0.01
SHARESUL	0.36	0.00	n.a.	n.a.	n.a.
COTTON89	0.53	0.01	n.a.	**-0.15**	0.05
PLOT32	0.52	0.01	n.a.	n.a.	n.a.
REMT4	0.40	0.00	n.a.	n.a.	n.a.
EXP12PCL					
AREA56	0.67	0.00	n.a.	**0.44**	0.00
SHAREONL	0.55	0.00	0.09	**0.59**	0.04
DIVERS12	0.49	0.00	n.a.	**-0.37**	0.02
STATUS14	0.58	0.00	n.a.	**0.13**	0.10
SHARESUL	0.37	0.00	n.a.	n.a.	n.a.
COTTON89	0.53	0.01	n.a.	**-0.11**	0.08
PLOT32	0.52	0.02	n.a.	**0.34**	0.00
REMT4	0.40	0.00	n.a.	n.a.	n.a.

The “F” column reports the p-value of the F-test of joint insignificance of the coefficients of all variables used to instrument AREA56. Small values indicate that the null hypothesis of an unsuitable choice of instruments can be rejected (Deaton 1997: 116).

The “DWH” column reports the p-value of the weighted DWH test of endogeneity. Independent categorical variables report the unweighted DWH test statistic. Small values indicate that the null hypothesis of exogeneity can be rejected.

AREA56: The natural log of cultivated area per household in hectare in 1995/96.

INCOME04: The natural log of household income per capita in US$ in 1995.

EXP36PCL: The natural log of household expenditure per capita in US$ in 1995.

EXP12PCL: The natural log of household food expenditure per capita in US$ in 1995.

SHAREONL: The natural log of the share of total household income derived from on-farm agricultural activities in 1995.

DIVERS12: The natural log of the Herfindahl-Hirschman index of income diversification in 1995.

STATUS14: Discrete variable which codes one if a household participates in any crop market in 1995.

SHARESUL: The natural log of the share of total household income derived from subsistence agricultural activities in 1995.

COTTON89: Discrete variable which codes one if household grows cotton in 1995.

PLOT32: The natural log of the effective number of plots per hectare per household in 1995.

REMT4: The natural log of remittances and gifts given and received per capita per household in 1-9/1995 in US$.

Source: FSP data and own calculations.

Figure 9: Variation of Income and Consumption (Ranked by Income)

Column	1	2	3	4	5	6	7
Income Decile	**n**	**Income**	**T-Test**	**Consumption**	**Food Consumption**	**Subsistence Share**	**Change in Rank**
1 (Poorest)	26	8.86	=	9.62	7.89	62%	-2.7
		(0.34)		(0.66)	(0.65)		
2	24	13.54	<	15.75	12.79	66%	-5.0
		(0.30)		(0.68)	(0.99)		
3	33	18.35	<	22.34	16.00	63%	-9.6
		(0.15)		(1.38)	(1.50)		
4	30	22.75	=	22.69	17.25	65%	-1.5
		(0.21)		(1.64)	(1.79)		
5 (Middle)	34	28.18	=	32.39	23.27	62%	-5.7
		(0.39)		(4.22)	(3.85)		
6	32	33.24	=	33.64	28.59	61%	-1.6
		(0.31)		(3.37)	(2.85)		
7	35	39.16	=	36.26	28.61	56%	2.9
		(0.52)		(2.29)	(2.12)		
8	43	47.43	>	40.55	33.64	61%	6.5
		(0.75)		(2.37)	(2.15)		
9	44	59.94	>	46.99	36.75	47%	10.0
		(0.91)		(3.46)	(2.27)		
10 (Least Poor)	69	102.22	>	72.36	57.21	47%	7.5
		(5.46)		(7.40)	(7.54)		
Mean	370	37.13	>	33.05	26.05	59%	0.0
		(3.87)		(2.75)	(2.37)		

Values are the weighted mean of income per capita, non-durable consumption per capita and food consumption per capita per income decile and over the whole sample in 1995 in US$. The values in brackets are standard errors. The inequality signs in column 3 indicate that a t-test rejects the null hypothesis of equality at a 5% level of significance. Column 6 summarises the share of total household income derived from subsistence production. Column 7 indicates the mean number of ranks the households in each decile change from income to consumption, where households are grouped in 100 groups according to either variable (ie change in rank = income rank – consumption rank). A positive value suggests saving while a negative value suggests dissaving. Pweight: WEIGHT2; strata: CATEG3; psu: ALD.

Source and methods: FSP data, own calculations, and Anand and Harris (1990).

Figure 10: Variation of Income and Consumption (Ranked by Consumption)

Column	1	2	3	4	5
Consumption Decile	**n**	**Income**	**T-Test**	**Consumption**	**Food Consumption**
1 (Poorest)	38	11.56	>	9.56	7.44
		(1.00)		(0.32)	(0.20)
2	37	17.45	=	15.27	12.26
		(1.51)		(0.36)	(0.70)
3	37	24.43	=	19.10	14.99
		(2.60)		(0.15)	(0.65)
4	37	32.42	>	23.69	19.30
		(2.11)		(0.29)	(0.66)
5 (Middle)	37	29.74	=	28.64	23.33
		(1.94)		(0.26)	(0.75)
6	37	37.53	=	33.27	26.62
		(4.25)		(0.39)	(0.84)
7	37	44.75	=	39.53	32.32
		(2.96)		(0.50)	(1.15)
8	37	52.87	=	46.74	35.47
		(5.91)		(0.44)	(1.51)
9	37	58.62	=	58.99	44.20
		(4.54)		(0.65)	(2.62)
10 (Least Poor)	37	99.24	=	92.58	73.61
		(10.61)		(6.14)	(6.98)
Mean	371	37.13	>	33.05	26.05
		(3.87)		(2.75)	(2.37)

Values are the weighted mean of income per capita, non-durable consumption per capita and food consumption per capita per consumption decile and over the whole sample in 1995 in US$. The values in brackets are standard errors. The inequality signs in column 3 indicate that a t-test rejects the null hypothesis of equality at a 5% level of significance. Pweight: WEIGHT2; strata: CATEG3; psu: ALD.

Source and methods: FSP data, own calculations, and Anand and Harris (1990).

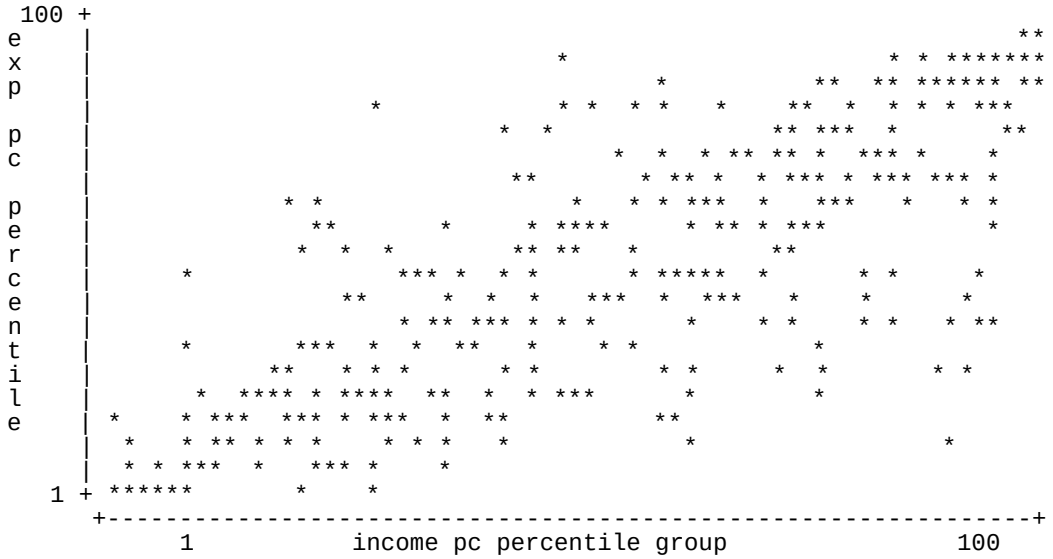
Figure 11: Variation of Income and Consumption (Ranked by Food Consumption)

Column	1	2	3	4	5
Food Consumption Decile	**n**	**Income**	**T-Test**	**Consumption**	**Food Consumption**
1 (Poorest)	38	11.90	>	9.33	6.69
		(1.06)		(0.55)	(0.30)
2	37	17.16	=	17.62	12.24
		(1.60)		(2.37)	(0.21)
3	37	27.26	>	20.84	14.82
		(2.59)		(1.12)	(0.17)
4	37	25.84	=	21.94	18.52
		(3.97)		(0.94)	(0.39)
5 (Middle)	37	39.24	=	30.01	22.65
		(8.18)		(1.43)	(0.13)
6	37	32.36	=	32.00	26.03
		(2.95)		(0.99)	(0.29)
7	37	53.69	>	40.78	30.89
		(3.05)		(1.76)	(0.16)
8	37	47.06	=	46.34	37.08
		(2.11)		(2.52)	(0.52)
9	37	57.24	=	56.76	45.67
		(3.56)		(1.50)	(0.47)
10 (Least Poor)	37	95.69	=	88.08	76.39
		(12.02)		(6.69)	(5.41)
Mean	371	37.13	>	33.05	26.05
		(3.87)		(2.75)	(2.37)

Values are the weighted mean of income per capita, non-durable consumption per capita and food consumption per capita per food consumption decile and over the whole sample in 1995 in US$. The values in brackets are standard errors. The inequality signs in column 3 indicate that a t-test rejects the null hypothesis of equality at a 5% level of significance. Pweight: WEIGHT2; strata: CATEG3; psu: ALD.

Source and methods: FSP data, own calculations, and Anand and Harris (1990).

Figure 12: Rank Changes in Income and Consumption



Source: FSP data and own calculations.

Figure 13: The Distribution of Welfare and Consumption Shares

	Mean	Poorest		Middle		Least Poor
Income						
US $	37.13	13.74	23.17	31.54	45.24	72.94
% of Total		6	12	16	23	43
Consumption						
US $	33.05	11.01	19.55	28.67	39.69	67.30
% of Total		7	12	17	24	40
Food Consumption						
US $	26.05	8.64	15.77	23.05	32.05	51.43
% of Share of Total		7	11	18	23	41
Consumption on						
Food (%)	79	78	80	80	81	75
Non-Food (%)	12	12	11	11	10	14
Semi-Durables (%)	9	10	9	9	9	11
All Items (%)	100	100	100	100	100	100
Dried Fish Consumption						
US $	1.21	0.26	0.68	1.16	1.48	3.33
% of Food Consumption	4.4	3.2	4.3	4.8	4.9	5.5
Healthcare Consumption Per Capita						
US $	0.22	0.09	0.13	0.20	0.27	0.43
% of Non-Food Consumption	6.7	7.4	6.9	6.3	7.2	5.6
% of Total Consumption	0.7	0.8	0.7	0.7	0.7	0.7
Sample Size	371	64	62	73	78	93

All income and consumption values are weighted annual per capita values. The five groups and the consumption shares are based on total household consumption per capita in 1995. The sample sub-groups are not of equal size due to weighting. The weight used is WEIGHT2.

Source: FSP data and own calculations.

Figure 14: Distribution of Assets

	Gini	Mean	Poorest		Middle		Least Poor
Human Capital							
Education of Head (yrs)	0.26	1.91	1.92	1.61	1.86	2.03	2.13
Education of Head*Infrastructure (yrs)	0.27	1.02	1.11	0.93	0.67	1.39	0.98
Maternal Education*Infrastructure (yrs)	0.24	0.49	0.44	0.61	0.37	0.72	0.28
Highest Education (yrs)	0.25	3.59	3.24	3.98	3.65	3.91	3.08
Total Education (yrs)	0.37	7.26	7.48	7.55	7.43	7.55	6.22
Physical Capital							
Large Livestock at End of War (#)	0.48	0.67	0.09	1.54	0.63	0.72	0.32
Current Large Livestock (#)	0.36	1.42	0.35	2.58	1.54	1.31	1.29
Number of Tools	0.23	6.17	4.79	5.82	6.69	7.31	6.23
Number of Types of Tools	0.18	2.90	2.63	2.87	3.13	2.81	3.03
Number of Trees Per Capita	0.47	1.22	1.23	0.46	1.78	1.29	1.32
Assets at End of War (US$)	0.49	166.80	51.06	162.45	128.80	269.76	222.78
Current Assets (US$)	0.61	165.31	43.64	121.79	310.78	187.19	162.56
Social Capital							
Ancestors Buried Here (%)	n.a.	84	86	89	78	86	80
Household is Related to Authority (%)	n.a.	48	61	55	36	44	39
Head is an Authority (%)	n.a.	7	3	2	6	11	12
Local Origin of Husband (%)	n.a.	68	66	69	66	74	62
Local Origin of Wife (%)	n.a.	65	58	63	66	64	74

Sample has been grouped by total household consumption per capita. Social capital is measured with categorical variables. The data indicates the proportion responding yes. Data have been weighted using WEIGHT2.

Source: FSP data and own calculations.

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