Market Distortions, Inequality and Health Outcomes in Zimbabwe, 1999-2005

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Abstract

The policy regime in Zimbabwe between 2000 and 2009 saw a populist undoing of pro-market reforms implemented during structural adjustment programs. This paper investigates the welfare implications of distortions that ensued, with specific reference to child health outcomes. A comparative analysis of the 1999 and 2005/6 DHS data shows that average height and weight for age z-scores for children aged 5 years or under worsened by 19% and 16% respectively. This decline is explained by the 34% decline in the food consumption, especially among children in poorer households which lost out as distortions shifted command over resources in favor of the elite. To assess the distributional effects, the paper overcomes the absence of income and expenditure data in DHS data by using a socio-economic ranking based on an asset index derived from principal component analysis. Based on this index, wealth inequality increased by 16% between 1999 and 2005/06, while the Kakwani concentration index for food consumption increased by 48%. A decomposition of sources of health inequality shows that the increase in inequality in food consumption increased stunting by 11%, more than offsetting the gains from reduced inequality from improvements in equality in access to education.

KEYWORDS: Zimbabwe, Africa, Nutrition, Market Distortions, Asset Indices and Inequality

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1 Introduction

Starting in 1991 Zimbabwe, like most developing countries, adopted structural adjustment programs meant to give market forces a greater role in the economy. However, many of these reforms were reversed between 2000 and 2009, reverting once again towards greater market intervention. For instance, the exchange rate became excessively overvalued, price controls were reintroduced to cover nearly 70% of commodities in the CPI by 2003 (IMF, 2003), and interest rates were kept artificially low. Protecting the poor from the vagaries of the market was the purported rationale behind these reversals but the opposite effect can be observed in reality. However, despite the extensive welfare implications of these reversals, little empirical effort has been directed at measuring the impact of the policy shift on micro level outcomes that are intrinsically important for human life and the policies' effect on the poor. For this reason, this paper seeks to investigate the effects of the policy reversals on child health outcomes in Zimbabwe to make a quantitative assessment of both the impact of the policy shift on the quality of life and its distributional effects.

While the policy reversals in Zimbabwe were in the extreme, this analysis is worthwhile given that distortions still play a prominent role in economic policies in the world. Introduction of controls on the price of tortillas in Mexico in 2008 and an export ban on grains by Russia in August 2010 (which effectively lowers domestic relative to international prices) are recent examples. Nearly 60% of firms surveyed in the World Business Environment Survey for 2000 reported government interference in their pricing decisions (WBES, 2002) while prices of many agriculture goods are distorted resulting in substantial welfare losses (Anderson & Croser 2009). Furthermore, the analysis in this paper moves beyond the usual focus on the impact of market distortions on efficiency and growth, to their implications on welfare at a micro level.

This paper highlights welfare implications of market distortions using children's nutrition as the metric of measurement. The focus on health outcomes is motivated by three major reasons. Firstly, health is a direct measure of well-being and functionings (Sahn & Younger 2005, Sahn & Stifel 2003). Unlike income or expenditure, it adequately captures the notion of poverty as deprivation of capabilities or failure of certain functionings (Sen 1987). Secondly, health achievements largely influence people's ability to exercise most other freedoms and capabilities. Last but not least, analysis of health outcomes is materially relevant if caused by deliberate changes in economic policy (Sen 2002), as with the case of market distortions.

The paper argues that distortions resulting from the policy shift led to asymmetric access to commodities and generated exclusive rents. In addition, distortions hastened an economic contraction that disproportionately affected ordinary citizens while rent seekers were cushioned. These factors shifted the distribution of resources, concentrating access to commodities among the wealthy few and leaving the poor with minimal resources. Consequently, access to food declined while inequality in its access worsened. Reduced food consumption worsened health outcomes while the increase in food consumption inequality had a significant negative impact on health inequality among children.

Evidence from a comparative analysis of the 1999 and 2005/06 DHS data for Zimbabwe supports this argument. The average number of food items consumed by children declined by 34%. The decline occurred across all wealth quartiles but it was greater for children living in households in the poorest and middle wealth quartiles and least for children in the richest quartile. Both means of height for age and weight for age declined significantly. Mean height for age declined by 19%. Its decline was greatest in the middle quartiles. Mean weight for age declined by 16% with the highest decline occurring among the poorest and second poorest wealth quartiles. The coefficient of the food variety score is positive and significant in both height and weight for age regressions in 1999 and 2005/06. Its magnitude implies the decline in mean food consumption reduced means of height and weight for age by 37% and 59% of their average changes. Thus the decline in food consumption under the interventionist policy significantly worsened health outcomes among children in Zimbabwe.

Wealth status is measured using an asset index derived from principal component analysis. Based on this index, the McKenzie (2005) measure of inequality indicates that wealth inequality in 2005/06 was 16% higher than in 1999. The estimated Kakwani concentration indices for the food variety score increased by of 48% implying that consumption inequality increased too. The increase in food consumption inequality increased stunting inequality by 11% or 33% of the overall increase in stunting inequality. These results show that contrary to policy intentions, price controls and market distortions in general, did not protect the poor. Instead, they inhibited access to basic commodities for the poor while rent seeking opportunities they generated created benefits that amassed to the wealthy. The result was widening inequality and deterioration in welfare.

This paper is organized as follows: Sections two and three empirically assess changes in food consumption, health outcomes and wealth inequality after the policy changes starting in the year 2000. Section 2 introduces the data and focuses on measurement of changes in wealth inequality, food consumption and health outcomes. Section 3 then investigates the contribution of changes in food consumption on changes in health outcomes. An explanation of how market distortions contributed to the observed changes in outcomes is then provided in section 4 which discusses the findings of the analysis. Lastly section 5 concludes the paper.

2 Measuring changes in food consumption, wealth and health outcomes after the policy shift

Taking the year 1999 as a point of reference, changes in wealth, food consumption and child health outcomes from their 1999 levels are analyzed in this section. Assuming similar population characteristics before and after 2000, one would expect similar outcomes before and after 2000 if the policy environment had not changed. If the 1999 and post 2000 samples are comparable in all aspects other than policy regimes, then differences in health outcomes can be attributable to the policy change.

2.1 Data and measurement of variables

DHS data for the 1999 and 2005/06 surveys is used for the analysis. From each survey, only children aged 5 years and under are selected. This gives sample sizes of 3892 from the 1999 DHS and 5943 from the 2005/06 DHS. Restricting the sample to 5 year olds or less ensures that only children born after 1999 are included in the 2005/06 sample. This facilitates a distinct comparison of health outcomes for the two periods. It removes overlaps and aids the identification of the impact of the policy changes on outcomes of interest. Measures from the 1999 DHS data reflect the state of outcomes just before the policy change while measures from the 2005/06 DHS data will reflect the state of outcomes after the policy changes.

However, comparative analysis is valid only if the two samples are comparable or if differences can be controlled for, as is the case with these samples. The DHS data was collected consistently for the two surveys while summary statistics presented in table A1 in the appendix show similar geographic and demographic compositions in the two samples. The only notable difference is the survival of children born smaller than average. This shall be controlled for in the analysis.

Measures for child health outcomes

The assessment of changes in health outcomes is based on height for age z-scores (HAZ) and weight for age z-scores (WAZ) using WHO growth standards. Anthropometric measures are widely used and preferred because of their objectivity (see Wagstaff, at.al. 2003, Pradhan, Sahn & Younger 2003, Sahn & Younger 2005). They do not have self reporting errors while measurement errors are likely to be random. Children's HAZ and WAS have an additional advantage in that the distribution of healthy children's height is invariant to ethnic and racial differences (Habitch et al. 1974), unlike that of adults which is also sensitive to childhood health shocks.

The mean HAZ and WAZ are respectively -1.17 and -0.61 in 1999 and -1.36 and -0.69 in 2005/06. A negative/positive z-score implies that a child is below/above the median of the distribution of healthy children. Therefore, negative mean HAZ and WAZ indicate that Zimbabwean children are below the reference child growth standards on average. The averages for 2005/06 are significantly lower than corresponding averages in 1999. Using -2 standard deviations as the height/weight poverty line, the prevalence of stunting increased from 32.6% in 1999 to 34.1% in 2005/06 and the prevalence of underweight children increased from 12.1% to 13.9%. These statistics show worsening health among children in Zimbabwe.

Food consumption index

Consumption expenditure is not captured in DHS data. Therefore, a food variety score shall be used as a proxy of food consumption. The score is constructed by summing up 11 food items consumed by the child, basing on responses to questions on consumption of specific food items in the DHS. Among selected food items are consumption of legumes, vegetables, meat, vitamin A fruits, other fruits, grains, cereals and milk products. The constructed food variety score for 1999 has a mean of 3.41, mode of 4 and lower and upper quartiles of 2 and 5 respectively. In 2005/06 the mean is 2.24, mode is 1 and lower and upper quartiles are 1 and 3 respectively. These are lower than the corresponding food consumption mean and quartiles for 1999. A weakness of using this proxy is that DHS food consumption data is recall rather than concurrent data. This could overstate changes in the index across time if recall periods differ substantially, which is not the case in this study. Nevertheless, the fact should be kept in mind when analyzing the data.

Variations of similarly constructed measures, namely the dietary diversity index and food variety index, have been widely used in the literature and found to be positively correlated with greater intake of nutrients in developing countries (see Hatloy et al. 1998, Steyn et al. 2006, Moursi et al. 2008). Using DHS data from 11 developing countries including Zimbabwe, Arimond & Ruel (2004) found a positive association between the dietary diversity index and HAZ even after controlling for socioeconomic status. They concluded that the index has an effect on HAZ that is independent of wealth. Their results show that changes in the index had the greatest impact on mean HAZ among children in Zimbabwe. This provides a rationale for using this index in this analysis.

Measuring wealth from asset ownership variables

Measuring income or wealth and its inequality requires income or expenditure information which is not available from the DHS data. However, DHS contains information on asset ownership. Following past literature (Vyas & Kumaranayake 2006, McKenzie 2005, Filmer & Pritchett 2001), this information is used to extract a proxy for wealth using principal component analysis (PCA). In this case, the first principal component extracted from asset ownership variables is used to proxy for household wealth. Filmer & Pritchett (2001) used data for Pakistan, Indonesia and Nepal, to show that an asset index derived from PCA produces internally coherent results that are consistent with those based on expenditure data. More support for use of the asset based index is provided by Sahn & Stifel (2003). They find that an asset index derived from PCA is a good predictor of stunting among children.

Assets used to compute this index include durables like television, radio, refrigerator, motorcycle/scooter, oxcart and car. These are combined with housing characteristics like the type of the main floor material, the type of fuel used for cooking, ownership of bed nets, whether the household shares a toilet with other households and number of households the toilet is shared with. From these, two indices are computed. The first asset index is computed with pooled data over the two surveys. This is necessary for computing the McKenzie's (2005) measure of inequality. The pooled index imposes equal weighting of assets in the two periods. However, technology and economic development introduce new assets and change the importance of some of the existing assets. Therefore, a year specific asset index is also computed but using common assets over the two samples. Unless stated, this is the principal index used in the computations of the Kakwani concentration indices of various variables and all the analysis in this paper. Figure 1 shows the distribution of this index over the two periods. A tabulation of asset ownership by asset index quartile presented in table A2 shows the internal coherence of the computed index.

[INSERT FIGURE 1 HERE]

2.2 Empirical estimation

Changes in wealth inequality

Wealth inequality is measured from the asset index. By construction, the asset index has zero mean. Thus analysis of standard inequality measures such as the Theil Index and Gini coefficient is not feasible. Instead, an alternative measure of relative inequality proposed by McKenzie (2005) is used. The relative inequality of subgroup c in comparison to the entire sample's wealth distribution is denoted by I_c. Its computation is given by equation (1), where σ_c is the standard deviation of subgroup c's asset index and λ is the variance of the asset index for the entire sample. McKenzie (2005) shows that I_c satisfies properties of anonymity, scale independence, population independence and the Pigou-Dalton transfer property, the four standard axioms required of measure of inequality.

$$I_c = \frac{\sigma_c}{\lambda} \qquad (1)$$

Using this measure, the relative inequality in 1999 and 2005/6 is computed by first pooling the two data sets to generate a pooled asset index. From this pooled index, the standard deviation of the asset index in the 1999 subsample (i.e. σ_{1999}) and the standard deviation on the asset index in the 2005/06 subsample (i.e. $\sigma_{2005/6}$), are obtained and used to compute I_{1999} and $I_{2005/6}$ respectively. If $I_{2005/6} > I_{1999}$, then inequality is relatively higher in 2005/6 than in 1999.

Changes in food consumption and health inequality

Inequality in health outcomes and food consumption by socioeconomic status is computed using the Kakwani et al. (1997) concentration index. The asset index is used as the welfare variable upon which socioeconomic ranking is based. For a population of size N, the Kakwani concentration index is given by equation (2), where R_j is a child's fractional rank in the socioeconomic distribution, μ is the overall mean of the outcome of interest, f_j and μ_j are the population share and mean outcome for socioeconomic group y_j respectively. The test of significance of the concentration index is based on the standard t-test (see Kakwani et al. 1997). When the outcome is good e.g. food consumption, a positive C implies inequality in favor of higher socioeconomic groups. If the outcome is bad e.g. stunting and underweight, a negative c implies inequality in favor of higher socioeconomic groups.

$$C = \frac{2}{\mu}\sum_j f_{ij}\mu_i R_j - 1 \qquad (2)$$

2.3 Results

The McKenzie index shows an increase in wealth inequality five years into the new policy regime. The index for 1999 is 0.91 and that of 2005/06 is 1.06. Thus wealth inequality in 2005/06 was 16% relatively higher than it was in 1999. Therefore, the shift in policy towards greater government intervention in markets created an environment suitable for widening wealth inequality. This widening difference in command over resources increases differences in access to food and health outcomes by various socioeconomic groups.

Table 1 presents means of food consumption, HAZ and WAZ by asset quartiles. Food consumption declined from an average of 3.41 items in 1999 to 2.24 items in 2005/06. This translates to a 34.1% decline in items consumed. This decline cut across all asset quartiles but it was substantially lower for children in the richest quartile, both in absolute and proportionate terms. Those in the middle quartiles experienced the largest declines. In both samples, children in richer asset quartiles consumed more food items than children in poorer quartiles. Thus the impact of the decline in food consumption should be more severe on the poorer children. These findings are consistent with the observed widening gap in the command over resources between the poor and the rich in 2005/06. Asset quartiles were held at their 1999 values for calculating means for 2005/06 sample. Similar patterns are observed when the 2005/06 asset quartiles are used.

[INSERT TABLE 1 HERE]

Stunting and wasting increased, mirroring changes in food consumption. Mean HAZ and WAZ declined between 1999 and 2005/06 for all levels of wealth. Mean HAZ declined by 16.5% from -1.17 to -1.36 standard deviations from the median of the reference healthy children. Mean

WAZ declined by 13.1% from -0.61 to -0.70. Generally, mean HAZ and WAZ remained higher for children in richer quartiles. The only exception is mean HAZ in the 3rd asset quartile which was lower than mean HAZ in the 2nd quartile in 2005/06. Mean HAZ in this quartile had the largest decline both in absolute terms (decline by 0.32) and relative terms (decline of 29.3%). Mean food consumption for this quartile had the largest absolute decline too. The lowest decline was in mean HAZ of the poorest quartiles. At -1.38 in 1999, the scope for a decline in mean HAZ was relatively lower for the poorest quartiles when compared to the highest quartiles.

Table 2 presents concentration indices, their standard errors, changes in the concentration indices and means for HAZ, WAZ and food consumption between 1999 and 2005/06. In addition, the table presents these statistics for other important determinants of child health outcomes. Reassuringly, the choice of the asset index does not seem to change the estimated concentration index. For easy of interpretation, the concentration index is calculated for the negative of the z- scores of height and weight for age. The reported negative concentration indices for these variables indicate a more than proportionately higher incidence of stunting and underweight among the poor over the two periods. The direction of change is conflicting. Underweight shows an increase in inequality while stunting shows a decline in inequality although inequality remains. The decline in stunting inequality is driven by a larger decline in HAZ in the middle quartiles rather than an increase in HAZ from the bottom. The inequality changes for HAZ and WAZ should thus be interpreted in this context.

[INSERT TABLE 2 HERE]

Food consumption inequality increased as shown by an increase in the concentration index from 0.095 in 1999 to 0.141 in 2005/06, i.e. a 48% change. Both indices are significantly different from zero. Other notable increases in inequality are in access to safe water (0.037), access to sanitation (0.043) and incidence of diarrhea (-0.057). Since diarrhea is a bad outcome, the negative change shows an increase in inequality. Poor households also became larger in size relative to richer households. However, a notable improvement is observed in the level of household head education as more beneficiaries of higher investment in education after independence became family heads. With the exception of diarrhea, changes by 100% or above are generally on variables whose concentration indices are not statistically different from zero. Therefore, nothing much should be read from the relative changes in those concentration indices.

3 Empirical assessment of the impact of changes in food consumption on health outcomes

The changes in HAZ and WAZ mirror changes in food consumption. However due to the presence of confounding effects, the observed declines in HAZ and WAZ may not be wholly attributable to the reduction in the consumption of food. Deterioration in other determinants of health also reduces the mean HAZ and WAZ while improvements have the opposite effect. A multivariate analysis of the determinants of health outcomes in this section sheds more light on the impact of declining food consumption on health outcomes.

3.1 Measuring the impact of food consumption on health outcomes

The impact of a decline in food consumption on health outcomes can be analyzed using the regression in equation (3). H_i is a measure of child *i*'s health outcome, *FVS* is the food index and β_0 is the impact of food consumption on the health outcome. Other determinants of the health outcome are denoted by a $K \times 1$ matrix $\boldsymbol{X}$ while ϵ_i denotes the disturbance term. This regression is based on a standard specification that includes community, household and child specific determinants of health (e.g. Lavy et al. 1996, Ponce et al. 1998, Case et al. 2002).

$$H_i = \alpha + \beta_0 FVS_i + \sum_k \beta_k x_{ki} + \epsilon_i \qquad (3)$$

Community effects include dummies for rural-urban classification, access to sanitation and access to safe water. A household is considered to have access to sanitation if it has either a flush toilet, blair toilet or pit latrine. It has access to safe water if it has access to treated pipe water, boreholes or protected wells. Household variables include household size, the number of under 5 years old children and the household head's age, years of education and gender (female household head takes a value of 1). Child specific variables include age in months, age squared, gender (girl child =1), mother's years of education and breast-feeding duration. Other child specific variables are illness dummies like whether a child had diarrhea, fever or coughed during the previous two weeks and the interaction of the food consumption index and whether the baby was breastfeeding. The size of the child at birth is controlled for, captured by a dummy taking a value of one if the baby was born smaller than average based on the mothers' recall of the size of the child size at birth.

Selection issues

Some child specific variables are only captured for children who live in the same household with their mothers. There is no information on consumption, breast-feeding and illness for children who do not live with their mothers. As noted in Case et al. (2002) and Case, Paxson & Ableidinger (2004), expenditures on healthy food items are lower for children not living with their mothers. This may translate to higher prevalence of stunting and underweight among these children as evidenced by statistically significant lower means of HAZ and WAZ for children not living with their mothers in all but height for age in

2005/06.

To avoid potential selection bias, the regression in equation (3) is estimated using the Heckman selection procedure based on mother presence in a household. A father presence dummy taking a value of one if a father is dead or existence is not known and a value of zero otherwise is constructed and used as the excluded variable. The use of father presence assumes that a father's non-existence influences the likelihood of staying with a relative in two ways. Either both parents of the child are deceased or that single mothers without support of the child's father are forced to leave the household and find work. Furthermore, a father' presence is presumed to affect child nutrition only through provision of resources. Once food consumption is controlled for, father presence should not be significant.

Decomposing the impact of increased food consumption inequality on health inequality

Following a decomposition proposed by Wagstaff et al. (2003), equation 3 can be used to establish the impact of an increase in inequality in food consumption on the change in health inequality. This decomposition uses a multivariate regression framework to isolate changes in health inequality into three major components. These are: a) changes in the degree of inequality of determinants of health, b) changes in the means of these determinants and c) changes in the impacts of these determinants on health outcomes.

Let C be the Kakwani concentration index for the health outcome. Changes in C reflect the changes in health inequality. The decomposition of changes in child health inequality is made from estimates of a linear regression of H_i on a vector of its determinants as in equation 3. The concentration index can be expressed as in equation 4, where C_{FVS} and C_k are the concentration indicies of FVS and variable k respectively, $\overline{FVS}$ and $\bar{x}_k$ are their means, μ is the mean of H_i and GC_ϵ is the generalized concentration index for ϵ_i which can be computed as a residual.

$$C = \frac{\beta_0 \overline{FVS}}{\mu} C_{FVS} + \sum_k \frac{\beta_k \bar{x}_k}{\mu} C_k + \frac{GC_\epsilon}{\mu}; \;\; k = 1, \dots., K \qquad (4)$$

$$dC = \frac{dC}{d\alpha} d\alpha + \frac{dC}{d\beta_0} d\beta_0 + \frac{dC}{d\overline{FVS}} d\overline{FVS} + \frac{dC}{dFVS} dFVS + \sum_k \frac{dC}{d\beta_k} d\beta_k + \sum_k \frac{dC}{d\bar{x}_k} d\bar{x}_k + \sum_k \frac{dC}{dx_k} dx_k + \frac{dGC_\epsilon}{\mu} \qquad (5)$$

The decomposition of changes in the concentration index is derived from the total differentiation of (4) to give (5). Allowing for both the direct impact of α, β_0, β_k, $\overline{FVS}$, $\bar{x}_k$, C_{FVS} and C_k on C and their indirect impact through μ, the total differentiation of C is approximated by (6).

$$dC = -\frac{C}{\mu} d\alpha + \frac{\overline{FVS}}{\mu}(C_{FVS} - C)d\beta_0 + \frac{\beta_0}{\mu}(C_{FVS} - C)d\overline{FVS} + \frac{\beta_0 \overline{FVS}}{\mu} dC_{FVS} \quad + \sum_k \frac{\bar{x}_k}{\mu}(C_k - C)d\beta_k + \sum_k \frac{\beta_k}{\mu}(C_k - C)d\bar{x}_k + \sum_k \frac{\beta_k \bar{x}_k}{\mu} dC_k + \frac{dGC_\epsilon}{\mu} \qquad (6)$$

The second component of (6) shows the impact of a change in the coefficient of food consumption, the third component shows the impact of a change in the mean of food consumption, and the fourth component shows the impact of changes in inequality in food consumption on the overall change in health inequality. This fourth component is the one pivotal in establishing the link between changes in inequality in food consumption and changes in health inequality.

2.3 Results

Results from the regression of HAZ and WAZ on their determinants are shown in table A3. In all regressions, the father alive dummy is a significant predictor of a mother's presence in the household. Mothers of children whose fathers are alive or their existence is known are more likely to be members of their children's households. The father alive dummy was included in OLS regressions of HAZ and WAZ for only children whose mothers are present in their households. Its coefficient lost significance in all regressions once food consumption is controlled for. This confirms the validity of excluding the dummy in the final regressions.

Table 3 presents the impact of food consumption and other selected variables on HAZ and WAZ. The coefficient of the food variety score is positive and significant in all regressions. For HAZ, the coefficient is around 0.06 in both years, implying that a reduction in mean food variety score from the 1999 to the 2005 level reduced mean HAZ by 0.07. This is 37% of the overall decline in mean HAZ. The coefficient of the food variety score in the WAZ regression is 0.046 in 1999 and 0.061 in 2005. Thus the decline in mean food variety score contributed to at least 59% of the decline in the mean of WAZ. The decline in food consumption significantly contributed to worsening health outcomes among children in Zimbabwe.

[INSERT TABLE 3 HERE]

Children suffering from diarrhea have lower HAZ and WAZ on average. The coefficient of diarrhea is negative and significant for WAZ in 2005/06 and HAZ in both years. Diarrhea has an immediate effect on WAZ since it captures short term health shocks hence its significant impact is expected. Its significant impact on HAZ indicates that diarrhea is also capturing long term or recurring illness e.g. illness due to HIV/AIDS. Household head's years of education has a significant positive impact on HAZ and WAZ in all regression expect for HAZ in 2005/06. This implies that higher levels of households head's levels of education in 2005/06 improved health outcomes.

The data show that children living in the same household had an identical food variety score most of the time hence there is a possibility of cluster effects. Heckman regression results with clustered standard errors allowing for intra household correlation give similar results to those presented above (see table A4). The regressions were also estimated using ordinary least squares on those children living with their mothers only, since these are the only children for which food consumption and illness variables are observed. The coefficient of the food variety score remains significant in all four regressions in both the Heckman regressions with clustered variances and the OLS regressions. The conclusion that the decline in food consumption worsened stunting and underweight remains unchanged.

The decline in food consumption was greater among children living in poorer households. Thus their health outcomes were worse off than children in richer households. An application of a decomposition proposed by Wagstaff et. al (2003) (i.e. using equation (6)) to quantify the impact of increased inequality in food consumption on the change in health inequality shows that it contributed to an increase in stunting and underweight inequality by 11.3% and 6.5% respectively. For stunting, the effect of increased food consumption inequality on overall health inequality is equivalent to 33% of the total change in stunting inequality. The negative effects of increased inequality in food consumption wiped out the benefits brought by reduced inequality in the household heads' levels of education, whose effect reduced inequality in stunting and underweight by 8% and 7% of the 1999 concentration index respectively. Thus in addition to worsening nutrition outcomes after the distortions, inequality in these outcomes increased too as the poor became worse off.

4 Discussion

Empirical findings from the analysis have established that food consumption declined while stunting and underweight increased across all asset quartiles after the policy changes post 1999. At the same time, inequality in wealth and food consumption increased. In addition, a significant adverse effect of an increase in inequality in food consumption on health inequality has been identified. All this can be explained as outcomes of the widespread distortions that originated from the policy changes.

The policy shift in Zimbabwe put in place market distortions that led to asymmetric access to controlled commodities favoring the wealthy and the well connected (see Chikukwa 2004). In addition, market distortions created exclusive rents. This allowed rent seekers, chiefly the elite (RBZ 2006), to increase their wealth and general command over resources. They were able to maintain or even increase their consumption while everyone else reduced theirs. During the budget speech in November 2002, the Minister of Finance indeed acknowledged that real beneficiaries of price controls were black market dealers while ordinary citizens suffered more. Furthermore, market distortions hastened an economic contraction that disproportionately harmed the ordinary citizen (IMF, 2005, Clemens & Moss 2005) while rent seekers were cushioned from the economic decline. This allowed rent seekers to sustain their levels of consumption when ordinary households were reducing theirs.

Average consumption of food by poorer households was reduced by a greater magnitude compared to richer individuals since a majority of rent seekers and beneficiaries of distortions were the elite. This has been confirmed by findings in section 2 which revealed a lower than average reduction in the consumption of food among the elite. Children in richer households were the least affected. Thus contrary to the touted argument that price controls will make commodities cheaply available for the poor, they limited their access instead. Food consumption is an important determinant of health among children. A reduction in food consumption worsens health outcomes for children as findings in this paper confirm. Therefore, the policy shift towards greater intervention deepened poverty since it led to the decline in food consumption and worsened health outcomes.

An increase in consumption inequality increases health inequality among children. This is supported by empirical evidence from literature on child health inequality in other countries, specifically developing countries. In Vietnam, 10% of the increase in height for age inequality between 1993 and 1998 is accounted for by the increase in consumption inequality (Wagstaff et al. 2003). Moradi & Baten (2005) note that large height differences between the elite and the poor have been observed in Nigeria, Ghana, Togo, Egypt, Haiti and some ethnic groups in Ethiopia. These differences are largely attributed to poorer conditions among the poor. This paper confirms these findings. It finds that mean food consumption is higher for richer children and their health outcomes are better than outcomes for poorer children. Thus by concentrating access to resources and commodities among the wealthy while leaving the poor with minimal resources, market distortions would increase health differences between the poor and the rich.

The measured decline in food consumption, increase in its inequality, its impact and the attribution to market distortions are doubtful in the presence of confounding factors. Such factors include droughts, changing HIV/AIDS trends, demographic trends and sample comparability. The summary statistics presented in table A1 show that the 1999 and 2005/06 samples are comparable. Demographic characteristics of the two samples are comparable except for the higher survival of babies born smaller than average. This and the potential effect of increased disease burden due to AIDS have been controlled for in the regressions. In addition, HIV/AIDS prevalence has been declining (see UNGASS 2008, Mugurungi et al. 2008). This should induce a reduction rather than the observed increase in health inequality due to higher food consumption inequality.

Droughts should not be an issue since the food production trends prior to 2005 mirrored the pre 1999 trends with two severe droughts on either side of 1999 (FAO & WFP 2003, FAO 2004, African Development Bank 2007). This is illustrated in figure 3. The land redistribution led to a significant decline in the production of commercial cash crops like tobacco. Yields in maize production declined too but this was offset by increased acreage. However restrictions in the marketing and movement of grains could have inhibited access to food for some. This implies that market distortions are the underlying cause of reduced food consumption, increased inequality in food consumption and consequently worsening health outcomes.

[INSERT FIGURE 3 HERE]

The above evidence implies that not only did distortions lead to economic contraction in Zimbabwe. They led to worsening of health outcomes too. Increased market intervention in Zimbabwe actually reversed the gains from earlier investments in human capital. Indeed, the results of this analysis have shown that a reduction in food consumption and an increase in its inequality offset the improvement in health outcomes that resulted from previous investments in education. The average household head among the poor in 2005/06 is more educated. However this has not translated to reductions in the deprivation of basic capabilities such a health because the negative effects of market distortions wiped the gains away. This shows that market distortions have far reaching adverse distributional consequences that directly affect intrinsically important aspects of human life. Instead of protecting the poor and reducing inequality, they exacerbate it by hurting the poorest more while benefiting the wealthy.

4 Conclusion

The economic policy regime in Zimbabwe in the last decade was largely interventionist. This was a contrast to efforts towards minimal intervention under the structural adjustment programs implemented in the 1990s. The effects of this policy shift were analyzed using DHS data. Results show that food consumption among children in all wealth subgroup declined along with their mean HAZ and WAZ. The average number of items consumed, mean HAZ and mean WAZ declined. The biggest declines were on outcomes for children living in poor and middle class households while children in richer households were the least affected. The decline in food consumption significantly contributed to the decline in means of HAZ and WAZ respectively. Wealth inequality increased, along with inequality health outcomes and access to food. In sum, welfare deteriorated after the market distortions.

This has an important policy implication. Price controls and market distortions are not an appropriate policy for protecting the poor and enhancing their access to basic commodities. Instead they generate opportunities that are mainly captured by the rich, with disastrous consequences for the poor. Despite the perceived weaknesses, giving market forces a greater role in the economy yields higher welfare than price controls and distortions in general. Where market forces seem to work to the disadvantage of the poor, non-distortionary tools should be explored instead. Such tools include cash transfers and other social safety nets - approaches that are yet to be fully explored in Zimbabwe.

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Tables and Figures

Table 1. Means of food index, HAZ and WAZ by asset quartiles

	Food Index			HAZ			WAZ		
Asset Range	1999	2005	%Δ	1999	2005	%Δ	1999	2005	%Δ
poorest 25 %	2.76	1.67	-	-1.38	-1.49	-7.79	-0.83	-0.95	-14.46
26 - 50 %	3.15	2.04	-	-1.18	-1.36	-15.25	-0.69	-0.81	-17.39
51 - 75 %	3.55	2.21	-	-1.09	-1.41	-29.36	-0.55	-0.60	-9.09
richest 25%	4.23	3.23	-	-0.97	-1.16	-19.59	-0.32	-0.36	-12.50
All	3.41	2.24	-	-1.17	-1.36	-16.52	-0.61	-0.69	-13.11

Table 2. Variable means and concentration indices

	1999			2005			
Variable	Mean	C index	Std Error[a]	Mean	C index	Std Error[a]	ΔC
Stunting[b]	1.168	-0.072	0.016	1.361	-0.048	0.010	0.024
Underweight[b]	0.608	-0.181	0.021	0.695	-0.193	0.016	-0.012
Food consumption	3.406	0.095	0.006	2.244	0.141	0.007	0.046
Lives in rural area	0.766	-0.220	0.007	0.750	-0.233	0.005	-0.013
Has sanitation	0.633	0.232	0.275	0.601	0.275	0.006	0.043
Has safe water	0.765	0.104	0.005	0.701	0.141	0.005	0.037
No of children	1.747	-0.049	0.005	1.812	-0.050	0.003	-0.002
Household size	6.174	-0.030	0.004	6.155	-0.016	0.003	0.013
Female headed household	0.367	-0.087	0.012	0.348	-0.088	0.010	-0.001
Household head age	42.2	-0.038	0.003	42.34	-0.015	0.003	0.023
Household head	6.458	0.165	0.005	6.852	0.126	0.004	-0.038
Mothers' education	4.431	-0.041	0.005	4.282	-0.043	0.003	-0.002
Age in months	29.613	-0.002	0.005	30.015	-0.002	0.004	0.000
Gender (female=1)	0.496	0.004	0.004	0.499	0.008	0.007	0.004
Was born small	0.160	-0.062	0.024	0.150	-0.068	0.020	-0.006
Breastfeeding duration	15.955	-0.014	0.005	15.310	-0.024	0.005	-0.010
Has diarrhea	0.140	-0.042	0.025	0.131	-0.099	0.021	-0.057
Has fever	0.256	-0.023	0.018	0.084	-0.054	0.027	-0.031
Coughs	0.399	-0.028	0.013	0.224	-0.094	0.015	-0.066

Notes: *a - This is the standard error of the concentration index; b - Based on the negative of HAZ and WAZ*

Table 3. The impact of selected variables on HAZ and WAZ

	HAZ		WAZ	
Variable	1999	2005	1999	2005
Food index	0.0611***	0.0605***	0.0457**	0.0613**
	(0.0226)	(0.0228)	(0.0154)	(0.0173)
Was born small	-0.428***	-0.350***	-0.464***	-0.514***
	(0.0988)	(0.0864)	(0.0667)	(0.0652)
Has diarrhea	-0.277**	-0.219**	-0.119	-0.252***
	(0.109)	(0.0927)	(0.0727)	(0.0696)
Household head's	0.0290**	0.00386	0.0291**	0.0295**
	(0.0125)	(0.0120)	(0.00834	(0.00903

**** p<0.01, ** p<0.05, * p<0.1, Standard errors in parentheses*

Table A1. Descriptive statistics: Composition of DHS samples for 1999 and 2005/6

Variable		**1999**	**2005**
Sample size		3892	5943
Mother is alive		98.48	97.59
Mother not in household		14.52	15.3
Total fertility rate (women aged 15-49 years)		4	3.8
General fertility rate (per 1000)		141	137
Crude birth rate per 100		31	31
Mean age of mothers		27.9	27.7
Infant mortality per 1000 births		59.9	65
Infant mortality among children Born smaller than average (per 1000 births)		118.8	83
Residential composition (%)	urban	23.43	25.03
	rural	76.57	74.97
Gender composition (%)	male	50.41	50.12
	female	49.59	49.88
Household Head Gender (percentage of households)	male	63.28	65.21
	female	36.72	34.79
Composition by residence and age	Urban (0-4 years)	12.9	11.9
	Rural (0-4 years)	14	15.2
	Urban (5-9 years)	10.5	11.0
	Rural (5-9 years)	16.6	15.7
Household head age (percentage of	below 18	0.73	0.3

households)	19-29	24.06	23.08
	30-39	26.86	30.37
	40-49	18.29	14.94
	50-59	13.38	14.83
	60+	16.58	165.48
Relation to household head (proportion of children)	son/daughter	64.72	63.28
	grandchild	26.77	28.06
	other	8.48	8.65
Relation structure (percentage of households)	1 adult	11.87	11.68
	2 adults, opposite sex	34.89	34.69
	2 adults same sex	4.75	5.47
	3+ related adults	42.39	43.72
	unrelated adults	6.09	4.42

Table A2. Housing characteristics and ownership of durable assets by asset index quartiles (in percentages)

	1999				2005/06			
Variable	Poorest	Second	Middle	Richest	Poorest	Second	Middle	Richest
Car or truck	0.00	0.00	1.01	23.56	0.00	0.29	3.84	21.59
Telephone	0.00	0.00	0.32	22.04	0.00	0.00	1.13	32.15
Refrigerator	0.00	0.00	0.76	48.32	0.00	0.00	3.84	69.10
Bicycle	9.09	23.18	31.12	22.86	13.53	21.86	35.01	33.49
Motorcycle	0.00	0.00	0.44	2.28	0.00	0.34	1.4	2.90
Radio	11.93	24.22	71.55	90.75	0.00	24.35	77.02	92.99
Share toilet	49.75	46.26	61.43	53.33	31.98	39.28	44.26	31.51
Earth floor	100.00	25.54	2.73	0.13	100.00	26.10	4.66	1.33
Cement floor	0.00	74.46	96.63	78.39	0.00	73.90	94.30	86.09
Ceramic tiles	0.00	0.00	0.06	3.74	0.00	0.00	0.72	7.11
Carpeted floor	0.00	0.00	0.51	14.32	0.00	0.00	0.72	7.11

Table A3. Results: Determinants of HAZ and WAZ

	1999		2005		1999		2005	
VARIABLES	HAZ	selection	HAZ	selection	WAZ	selection	WAZ	selection
Rural household	0.0930	0.184**	-0.224**	0.0593	-0.101	0.174**	-0.156**	0.0866
	(0.110)	(0.0814)	(0.0978)	(0.0764)	(0.0693)	(0.0850)	(0.0711)	(0.0779)
Sanitation	0.123	0.0124	-0.0106	-0.118*	0.0664	0.0519	0.149***	-0.108*
	(0.0928)	(0.0649)	(0.0776)	(0.0608)	(0.0593)	(0.0679)	(0.0569)	(0.0621)
Has safe water	0.0981	0.0315	-0.131*	-0.0738	0.0656	0.0258	-0.0036	-0.0307
	(0.0996)	(0.0699)	(0.0782)	(0.0622)	(0.0639)	(0.0732)	(0.0574)	(0.0634)
No. of children	-0.0889	-0.0621	-0.0811	0.387***	-0.181**	-0.0410	-0.234***	0.451***
	(0.137)	(0.0931)	(0.122)	(0.0912)	(0.0900)	(0.0987)	(0.0895)	(0.0931)
No. of children squared	-0.0058	0.0001	-0.00115	-0.072***	0.0339*	-0.0084	0.0299*	-0.0858***
	(0.0281)	(0.0186)	(0.0243)	(0.0179)	(0.0188)	(0.0201)	(0.0179)	(0.0182)
Household size	0.0094	0.0194	0.0033	0.0225*	-0.0134	0.0326**	0.0107	0.0288**
	(0.0197)	(0.0134)	(0.0175)	(0.0129)	(0.0127)	(0.0142)	(0.0127)	(0.0129)
Household head sex	-0.256***	-0.341***	-0.127*	-0.340***	-0.0950*	-0.372***	0.000312	-0.368***
	(0.0866)	(0.0601)	(0.0730)	(0.0560)	(0.0560)	(0.0627)	(0.0538)	(0.0569)
Household head age	-0.0194	-0.069***	-0.027**	-0.0975***	0.0165	-0.076***	-0.0056	-0.0979***
	(0.0162)	(0.0113)	(0.0131)	(0.0097)	(0.0104)	(0.0118)	(0.00974)	(0.00992)
Household head age squared	$8.5x10^{-5}$	0.0004***	0.0001	0.0006***	-0.0002**	0.0004***	$-1.0 x10^{-5}$	0.0006***
	(0.0002)	(0.0001)	(0.0001)	($9.2x10^{-5}$)	(0.0001)	(0.0001)	($9.6 x10^{-5}$)	($9.5 x10^{-5}$)
Household head education	0.0291**		0.0039		0.0291***		0.0295***	
	(0.0125)		(0.0120)		(0.0083)		(0.0090)	
Mother's education	0.0265		0.0111		0.0090		0.0076	
	(0.0177)		(0.0164)		(0.0121)		(0.0123)	
Age in months	-0.132***	-0.094***	-0.148***	-0.104***	-0.054***	-0.093***	-0.0761***	-0.103***
	(0.0123)	(0.0096)	(0.0102)	(0.0084)	(0.0080)	(0.0098)	(0.0076)	(0.0085)
Age squared	0.0026***	0.0010***	0.0018***	0.0010***	0.0006***	0.0010***	0.0009***	0.0010***
	(0.0002)	(0.0001)	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Gender	0.258***		0.206***		0.201***		0.142***	
	(0.0709)		(0.0623)		(0.0479)		(0.0469)	
Was born small	-0.428***		-0.350***		-0.464***		-0.514***	
	(0.0998)		(0.0864)		(0.0667)		(0.0652)	
Breastfeeding	0.0024		0.0145**		-0.0094*		0.0018	

	(0.0074)		(0.0059)		(0.0048)		(0.0044)	
Food*Breastfeeding	0.0009		-0.103***		-0.0084		-0.0368*	
	(0.0263)		(0.0274)		(0.0172)		(0.0202)	
Food Variety Score	0.0611***		0.0605***		0.0457***		0.0613***	
	(0.0226)		(0.0228)		(0.0154)		(0.0173)	
Has diarrhea	-0.277**		-0.219**		-0.119		-0.252***	
	(0.109)		(0.0927)		(0.0727)		(0.0696)	
Coughs	-0.0288		-0.0556		-0.0362		0.0174	
	(0.0795)		(0.0783)		(0.0536)		(0.0592)	
Father is alive		0.409***		0.479***		0.508***		0.487***
		(0.0854)		(0.0800)		(0.0956)		(0.0861)
Mother is alive		0.645***		1.014***		0.640***		1.022***
		(0.113)		(0.103)		(0.113)		(0.103)
Constant	0.425	3.813***	1.308***	4.013***	-0.0228	3.916***	0.467*	3.948***
	(0.449)	(0.357)	(0.374)	(0.327)	(0.292)	(0.376)	(0.277)	(0.332)
Lambda	1.667		1.340		0.775		0.783	
	(0.062)		(0.076)		(0.085)		(0.079)	
rho	0.837		0.743		0.613		0.587	
	(0.021)		(0.034)		(0.059)		(0.053)	

*** p<0.01, ** p<0.05, * p<0.1

Table A4. Results with clustered standard errors: Determinants of HAZ and WAZ

	HAZ		**WAZ**	
VARIABLES	**1999**	**2005**	**1999**	**2005**
Rural	0.0930	-0.2241**	-0.1014	-0.1561**
	(0.1150)	(0.1038)	(0.0718)	(0.0780)
Sanitation	0.1226	-0.0106	0.0664	0.1491**
	(0.1022)	(0.0820)	(0.0641)	(0.0614)
Safe water	0.0981	-0.1313	0.0656	-0.0036
	(0.1112)	(0.0824)	(0.0695)	(0.0617)
No. of children	-0.0889	-0.0811	-0.1808*	-0.2339***
	(0.1572)	(0.1293)	(0.0991)	(0.0893)
No. of children squared	-0.0058	-0.0011	0.0339	0.0299
	(0.0337)	(0.0259)	(0.0209)	(0.0182)
Household size	0.0094	0.0033	-0.0134	0.0107
	(0.0197)	(0.0179)	(0.0135)	(0.0137)
Household head gender	-0.2556***	-0.1273	-0.0950	0.0003
	(0.0944)	(0.0780)	(0.0598)	(0.0587)
Household head age	-0.0194	-0.0270*	0.0165	-0.0056
	(0.0174)	(0.0146)	(0.0107)	(0.0104)
Household head age2	0.0001	0.0001	-0.0002**	-0.0000
	(0.0002)	(0.0001)	(0.0001)	(0.0001)

Household head education	0.0291**	0.0039	0.0291***	0.0295***
	(0.0131)	(0.0121)	(0.0092)	(0.0094)
Mothers' education	0.0265	0.0111	0.0090	0.0076
	(0.0194)	(0.0173)	(0.0127)	(0.0137)
Age in months	-0.1322***	-0.1477***	-0.0545***	-0.0761***
	(0.0144)	(0.0118)	(0.0088)	(0.0075)
Age squared	0.0016***	0.0018***	0.0006***	0.0009***
	(0.0002)	(0.0002)	(0.0001)	(0.0001)
Gender	0.2578***	0.2065***	0.2006***	0.1423***
	(0.0700)	(0.0628)	(0.0480)	(0.0475)
Was born small	-0.4282***	-0.3505***	-0.4638***	-0.5135***
	(0.0945)	(0.0867)	(0.0689)	(0.0670)
Breastfeeding duration	0.0024	0.0145*	-0.0094	0.0018
	(0.0106)	(0.0074)	(0.0059)	(0.0043)
Food*Breastfeeding	0.0009	-0.1025***	-0.0084	-0.0368*
	(0.0297)	(0.0303)	(0.0175)	(0.0205)
Food consumption index	0.0611***	0.0605**	0.0457***	0.0613***
	(0.0235)	(0.0251)	(0.0155)	(0.0173)
Has diarrhea	-0.2774**	-0.2195**	-0.1193	-0.2517***
	(0.1095)	(0.0933)	(0.0745)	(0.0728)
Has fever	0.0536	-0.0043	-0.2285***	-0.2355**
	(0.0950)	(0.1141)	(0.0606)	(0.0940)
Coughs	-0.0288	-0.0556	-0.0362	0.0174
	(0.0805)	(0.0756)	(0.0541)	(0.0588)
Constant	0.6804	1.4355***	0.0722	0.4662
	(0.4968)	(0.4114)	(0.3167)	(0.2994)
lambda	0.6804	1.4355***	0.0722	0.4662
	(0.4968)	(0.4114)	(0.3167)	(0.2994)
rho	0.6804	1.4355***	0.0722	0.4662
	(0.4968)	(0.4114)	(0.3167)	(0.2994)
Observations	2945	3723	3043	3876

NB: Selection equations are not presented in the table, robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Figure 1. The distribution of the asset indices over the two samples

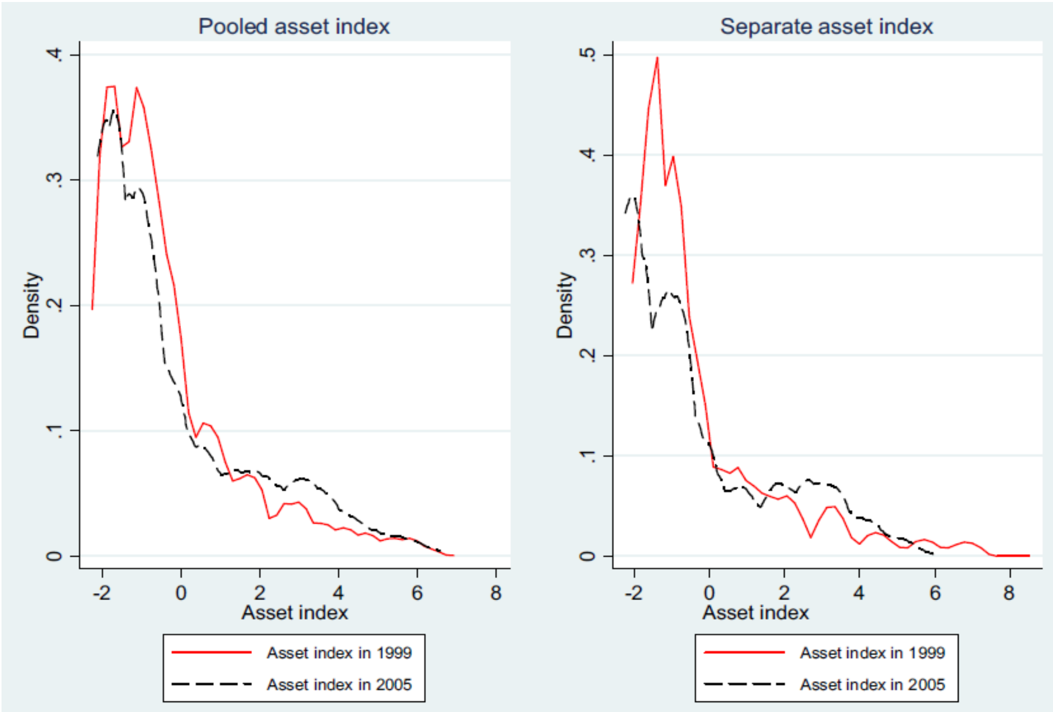


Figure 2. The distribution of the food indices over the two samples

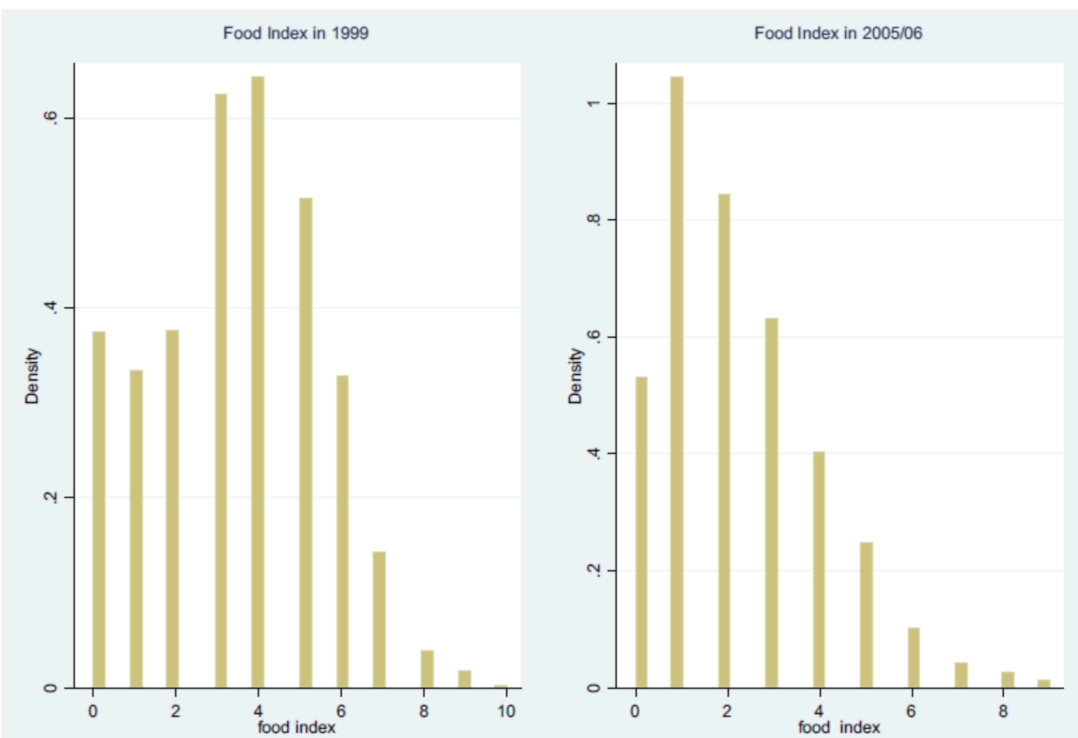
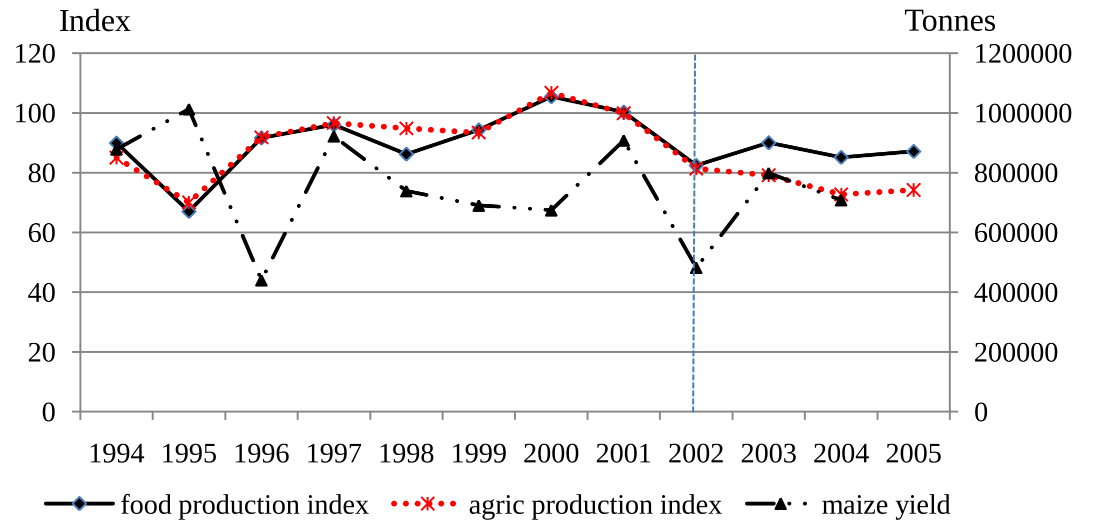


Figure 3. Trends in agriculture production in Zimbabwe: 1994 - 2005



Source: FAO/WFP , (various) and AfDB, 2007