

UNIVERSITY OF CAPE TOWN

The Effect of Hyperinflation on Asset Poverty in Zimbabwe

By:

Flora M. N. Kurasha¹

Supervisor:

Professor Haroon Bhorat

Abstract

This study focuses on Zimbabwe's hyperinflation which began in March 2007 and reached its peak in July 2008, with an annual inflation rate of 231 million percent. Through a comparative pre-post analysis, the study reveals hyperinflation's effects on the well-being of households. In particular, this is an empirical analysis of the effect of hyperinflation on asset poverty. Hyperinflation theory and empirical studies suggest that hyperinflation exacerbates household consumption poverty, especially in urban areas. In the analysis, asset and access variables from the 2005 (pre-hyperinflation) and 2010 (post-hyperinflation) Zimbabwe Demographic and Health Survey datasets are used to construct an asset index, with the 20th and 40th percentiles as relative poverty lines. Asset-derived poverty headcount and poverty gaps are measured and compared across the two periods. The national asset poverty headcount ratio decreased by 9.07 percent and that of rural households by 13.12 percent. However, urban households experienced an increase of 1,366 percent in asset poverty during the hyperinflation period.

Keywords: Poverty; Inflation; Asset Index; Zimbabwe

¹ Email: florakurasha@gmail.com

Table of Contents

2.1	Introduction	3
2.2	Review of related empirical literature	4
2.3	Methodology	9
2.4	Data	11
2.5	Descriptive overview.....	13
2.6	Changes in the Asset Index during Hyperinflation.....	18
2.7	Asset Poverty Changes during Hyperinflation	19
2.8	Conclusion	26
	Appendix.....	28
	Bibliography	31

List of Tables

Table 1: Private asset ownership summary statistics, rural households	page 13
Table 2: Private asset ownership summary statistics, urban households	page 15
Table 3: Public asset access summary statistics, rural households	page 17
Table 4: Public asset access summary statistics, urban households	page 17
Table 5: Mean asset index by residence type and gender	page 19
Table 6: Mean asset index, by quintile	page 19
Table 7: Poverty headcount shifts	page 21
Table 8: Poverty gap shifts	page 22
Table 9: Zimbabwe's sectoral employment growth trends, 2005 – 2010	page 26
Table A1: Consumption poverty and inequality, 2003	page 28
Table A2: Asset weights	page 29

List of Figures

Figure 1: Cumulative wealth distribution, pre and post hyperinflation	page 23
Figure 2: Cumulative wealth distributions, rural and urban households	page 24
Figure A1: Cumulative wealth distribution, pre and post hyperinflation	page 29
Figure A2: Mobile phone subscriptions, Zimbabwe	page 30

2.1 Introduction

This empirical study seeks to answer the following research question: What was the effect of hyperinflation on asset poverty in Zimbabwe? The hypothesis is that asset poverty increases based on the review of related empirical literature from Latin American countries and Asia. Nonetheless, an objective analysis is conducted and results are explained taking the context of Zimbabwe, into consideration.

This is an analysis of the shifts in asset poverty incidence and severity between Zimbabwe's pre-hyperinflation and post-hyperinflation periods. According to Oliver and Shapiro (1990), assets are the resources that enable households to meet more than basic needs and achieve economic mobility. Examples of assets are savings for college or retirement, investments and real estate. These buffer a household against financial loss and are also a source of economic security and upward mobility. Caner and Wolff (2004) echo this sentiment, stating that assets provide liquidity in times of economic hardship, specifically citing owner-occupied housing as an important part of household wealth. In addition, Rothwell and Robson (2018) say that assets allow for consumption smoothing, increased social engagement and contribute towards social and economic mobility. Given this background, Carter and Barrett (2006) argue that the asset-based approach to poverty analysis sheds light on the levels of persistent structural poverty in a society. Hence the significance of this study in the Zimbabwean context.

The link between inflation and poverty has been previously explored in many contexts with existing literature forming a consensus that consumption poverty increases with inflation (Cardoso, 1992; Powers, 1995; Datt and Ravallion, 1997; Ravallion, 1998; Romer and Romer, 1998; Agenor, 1999; Easterly and Fischer, 2000; Braumann, 2004; Chaudhry and Chaudhry, 2008). These international studies show that inflation erodes the purchasing power of money, resulting in a decrease in consumption and subsequent increase in consumption poverty. Zimbabwe is no exception as its local currency (the Zimbabwean dollar) rapidly lost its value from 1999 to 2008, but especially between March 2007 and December 2008 when the economy experienced hyperinflation². According to Cagan and Lipsey (1978), in such a case of persistent inflation, the composition of households' asset portfolios changes as equity holdings and real cash balances decrease and tangible assets increase. Hyperinflation theory reveals that households hedge against inflation by acquiring more durable goods and real property. Taylor (1974) shows that this hedging mechanism of acquiring assets is a form of saving during times of uncertainty.

² According to Hanke and Kwok (2009), Zimbabwe's monthly inflation rate exceeded 50 percent in March of 2007 and reached 50.54 percent. Technically, this is when hyperinflation began in Zimbabwe, and persisted until December 2008, when it ended due to dollarization.

This chapter therefore contributes to the body of literature which exclusively investigates the inflation-poverty link in Zimbabwe. Previously, Stoeffler (2014) measured the multidimensional poverty index³ (MPI) from 2001 to 2008 and found a 22 percent increase in multidimensional poverty from 2001 to 2007, followed by a 16 percent decrease as the economy recovered post-2008. Laroche et al. (2014) estimate a similar pattern using polychoric principle components analysis and find that poverty rises during hyperinflation.

Household asset and access variables from the ZDHS of 2005 and 2010 are used to generate an index, which measures asset wealth. Asset ownership rates and cumulative density functions are analyzed in order to quantify the changes in asset wealth during the hyperinflation period. These changes in asset wealth give a direct indication of the shifts in asset poverty, which are further assessed using the conventional poverty headcount and poverty measures. The main contribution of this study is the application of ZDHS data to the inflation-poverty research question. In addition, this is one of the few studies that explores this question using a non-monetary poverty measure. However, the glaring limitation in the study is the absence of income or expenditure data which could have been used to benchmark the asset index. The information was not available in the ZDHS datasets. Another limitation of this analysis is that the index only consists of non-financial assets and lacks marketable assets, debt, home equity or liquid wealth as proposed by Haveman and Wolfe (2004) because the data are not available for Zimbabwe. Further research can be done including these variables.

2.2 Review of related empirical literature

The relationship between poverty and inflation is established by many studies; with the majority concluding that inflation is detrimental to economic wellbeing. Each study shows different transmission mechanisms for inflation on poverty. There are four main ways through which inflation affects poverty. First, is imperfect indexation, whereby income rises at a slower rate than prices. Hence the same income that a household received in a previous period would afford them fewer goods in their current consumption basket. The decrease in consumption is synonymous with an increase in poverty. Second is the problem of capital losses. As the middle class start losing the value of their cash income, household assets are liquefied in order to compensate for the diminished cash base and allow for consumption smoothing over time. This loss in capital moves these households further down the wealth distribution. Third, as the value of cash decreases, aggregate money demand follows suit and consumption also decreases. In inflationary times, households demand less money because money holdings lose

³ According to Alkire and Santos (2010, p7), “The MPI is an index of acute multidimensional poverty. It reflects deprivations in very rudimentary services and core human functionings...”

value quickly. As a result, when income is received, it is used to purchase food and assets within a short while. In many cases, employees opt to be paid in kind and not in cash. The fact that there is less money in households implies that consumption is less frequent. The aforementioned channels affect individuals who receive wages but in times of dire economic crisis, similar to Zimbabwe's hyperinflation era, there is a significant loss of jobs as firms fail to pay out wages. The first jobs to be lost are those of unskilled workers, who are usually the poor. This is why Cardoso (1992) views inflation as disproportional tax on real wages. The author uses data from seven Latin American countries (Argentina, Colombia, Costa Rica, Chile, Mexico, Peru and Uruguay) to estimate the relationship between real wages and the log of inflation. Results show that real wages fall by 14 percent when inflation doubles.

Further evidence is found in Powers (1995) who uses the American Consumption Expenditure Surveys from 1960 to 1981 and regresses the consumption-based poverty rate on inflation and the unemployment rate of prime age males. The results show that both inflation and unemployment have significant positive effects on household income poverty levels. Focusing on the inflation coefficient, the author first attributes the effect of inflation to the rise in uncertainty which leads to a decrease in money demand and consumption. Naturally, individuals will not hold cash because of the rapid loss in value. Second, inflation erodes the value of permanent income and decreases consumption because the discount rate applied to future income increases. Third, inflation results in capital losses such that asset values decrease and the middle class can no longer hedge against inflation. The result is that the middle class move to the lower quintile and the incidence of household poverty rises. In most countries, the majority of the households in the bottom quintiles are found in rural areas. Datt and Ravallion (1997) and Ravallion (1998) show a negative correlation between mean rural consumption and the relative price of food. Food inflation is relevant in this case because the majority of the rural consumption basket consists of food. The authors conclude that real consumption in rural India declines when inflation is high. A one percent increase in inflation thus results in a 0.41 percent decrease in average real consumption. The reduction in consumption occurs because nominal wages do not adjust instantaneously as general prices rise – the case of imperfect indexation.

Romer and Romer (1998) add to this literature. They regress the log of the average income of the bottom 20 percent, in each country, for a large sample of countries on the log of inflation. They find a significant negative relationship between the average inflation rate and the income of the poor and a positive relationship between inflation and household income poverty. Consistent with Powers' (1995) results, they find a strong positive relationship between poverty and unemployment. The studies by Romer and Romer (1998) and Powers (1995) suggest that income is the channel through which monetary policy has an impact on the long

run well-being of the poor. Agenor (1999) also finds that in a large sample of countries, inflation has a significant positive effect on poverty and a negative effect on income per capita. Income based poverty falls when there is an increase in the growth of output per capita and the ratios of national subsidies to GDP and government transfers to GDP. Inflation lowers real income, and the poor suffer. Easterly and Fischer (2000) produce more evidence that real income decreases with inflation. This decline in income results in a decline in consumption and thus an increase in income poverty. After analyzing the relationship between the change in the share of the bottom quintile of a country's income distribution on the ten-year national average of CPI, results show that inflation has a significant negative effect on the incomes of the poor. The relationship between the annual percentage change in the income poverty headcount rate and the inflation tax rate⁴ showed that an increase in the inflation tax from zero to hyperinflation increases the income poverty rate and lowers the income share of the bottom quintile by 1.7 percentage points. It is also established that there exists a significant negative relationship between the inflation tax and the real minimum wage.

Braumann (2004) hypothesizes that inflation decreases real wages in two ways. First, inflation lowers the value of the capital stock and labour productivity. This is through the erosion of real wages to labour and interest rates on capital. Second, relative prices shift against labor-intensive goods as employees with higher skills are able to retain the purchasing power of their real wages, which is not the case for cheap labor. "The fall in real wages during inflation can also be linked to increasing poverty in Latin America...An examination of recent data showed that the poverty maxima coincided with the inflation maxima" (Braumann, 145). Thus, the author concludes that, a decline in real wages due to inflation increases income poverty. In the same vain, Chaudhry and Chaudhry (2008) assess the effects of food and fuel cost inflation on poverty in Pakistan. They find that a one percent increase in food prices results in a two percent increase in the income poverty gap while a 1 percent increase in energy prices results in a 0.44 percent increase in the poverty gap. Evidently, food prices affect the severity of poverty more than energy prices do. This result is sensible because food is more of a necessity than fuel-driven assets like vehicles, stoves and refrigerators which the poor are less likely to own. The authors determine that a 20 percent increase in food prices results in approximately an 8 percent increase in the national income poverty headcount rate.

⁴ Cardoso (1992) mention that inflation mainly has a negative effect on the poor than the rich. In so doing, inflation is a tax on the poor i.e. the bottom two quintiles. The inflation tax transformation is $f_t = \left[\frac{\pi_t}{1+\pi_t} \right] \left[\frac{h_t}{Y_t} \right]$ where π_t is the inflation rate, Y_t is national income (GDP) and h_t is the average of previous and present monetary balances. Inflation tax depends on the elasticity of demand for real cash balances as well as the amount of cash balances that people want to hold when there is no inflation.

The literature on inflation and poverty cited above generally finds that income or consumption-based poverty rises with inflation. However, other research suggests that inflation is less a determinant of poverty than unemployment. Blank and Blinder (1985) conclude that unemployment has seven times as large an effect on poverty as inflation. They find that a rise in the national unemployment rate affects the disadvantaged (African American women) in the United States more than other groups because they earn less and are concentrated in unskilled labour jobs with relatively high turnover rates. Blinder and Esaki (1978) conclude that inflation has an overall insignificant effect on income poverty, but a 1 percent increase in unemployment results in 0.26 percent - 0.30 percent decrease in the income of the bottom 40 percent of the household income distribution. The share of income lost by the bottom income quintile when unemployment increases is gained by households in the top income quintile. Cutler and Katz (1991) regress the poverty headcount ratio on macroeconomic indicators; they find that in periods of low unemployment, the share of income to the lowest three quintiles rises and the share to the upper two quintiles declines.

While the previous work shows general theory on the relationship between inflation and poverty, literature that analyses the inflation-poverty link in economic crises is reviewed below. Dessaix et al. (2008) conduct an assessment of the cost of alleviating poverty which resulted from the 2005 global increase in food prices in 72 developing countries. The authors find that the number of poor people in urban areas increased significantly in all 72 countries. The estimated cost of recovering these urban households was 1 percent of GDP or more. The authors find that countries with high income inequality, poverty rates and poverty gaps are more vulnerable to food price increases. They find that the increase in the urban poverty deficit is due to the negative effect of food inflation on households' real income. This is more so the case for those who were poor before the price shock. As a result, this should be the target group for cash transfers, not the newly poor.

With a narrower focus, Suryahadi et al. (2000) analyse the changes in poverty during Indonesia's economic crisis of 1997. Their analysis reveals that the entire population experienced a decline in expenditure. However, the bottom quintile was the least affected, with a 7 percent decline in mean real expenditure, while the top quintile suffered a 24 percent decrease. Depending on the food share and prices used, the increase in overall poverty was anywhere between 67 and 83 percentage points. While these are the results that they get with their model, when the authors use the normal FGT poverty measures, they find similar results to Robilliard et al. (2001). A disaggregation by location shows larger increases in poverty for the urban sector than the rural sector. Income from self-employment, both agricultural and non-agricultural, decreased more in the urban sector. The poverty headcount increases were

152 and 57 percent for urban and rural households, respectively. While the poverty gap increased by 183 and 71 percent for urban and rural households, respectively.

Friedman and Levinsohn (2002) add to this literature on the impact of the Indonesian economic crisis on household welfare. Their objective was to assess how price changes affected households. Using pre-crisis household consumption and price change data the authors compute the compensating variation for households. They find that geographic diversity as well as the variation in household consumption levels matter. Results show that the middle-class households were most negatively affected by the price increases. These non-poor households needed to earn 82 percent more in order to return to their pre-crisis consumption levels and the compensating variation for poor households was 77 percent. While this was the case on a national level, the urban households in the bottom 4 deciles needed a 109 percent income boost in order to return to their pre-crisis consumption levels. On the other hand, the compensating variation for rural households was only 70 percent. Evidently, rural households fared better than their urban counterparts during the crisis. However, this changes when the authors factor in self-produced food. Apparently, if rural households had not produced their own food, their compensating variation would rise from 70 to 130 percent. It is therefore safe to conclude that, while all households experienced an increase in poverty during the Indonesian crisis, rural households suffered less because they produced their own food.

Among the studies from Indonesia, the one that employs a relatively similar model to this chapter was conducted by Frankenberg et al. (1999). The authors compare data from before and after the crisis. However, they use the Indonesia Family Life Surveys, which are panel dataset, while this chapter is based on a repeated cross section. The authors assess changes in employment, income, expenditure, education, health status, public and private health facility availability, quality and prices. They find that expenditure declined and food share increased in households' budgets. It is worth noting that less income was spent on meat and protein by middle income households, which is similar to the ZimVAC (2009) finding in chapter 1 above. The share of household budget spent on staple food – rice in Indonesia – increased by 59 percent in urban areas and 29 percent among rural households. In addition, spending on education and healthcare reduced significantly among the poor. Average monthly per capita expenditure declined by 24 percent on a national level; 34 percent for urban households and by 13 percent for rural households. Poverty rose from 11 to 13.8 percent between 1997 and 1998. Interestingly, of the 11 percent who were poor in 1997, only 31 percent remained poor in 1998, while the rest exited poverty. A further probe showed that households that remained poor were typically large in size, with young household heads. So, indeed, the Indonesian crisis resulted in more poverty among households, but more so urban households.

It is therefore established that increases in both inflation and unemployment result in higher income poverty levels. These facts, lead to the conclusion that inflation is likely to lead to a rise in unemployment, which ultimately decreases household income and increases income-based poverty. In this way, urban households can bear the greater burden of inflation. With a particular focus on Zimbabwe, this study is designed to determine if asset poverty follows the same patterns as income-based poverty, in relation to inflation. Unlike the aforementioned studies which focus on the link between inflation and income poverty, this chapter explores the same relationship but replaces income with assets. The main objective is to assess the changes in asset poverty during hyperinflation. To the best of our knowledge, it is the first of its kind in the body of literature on the African continent. A few other studies have been conducted in the United States with the seminal work having been written by Oliver and Shapiro (1990) who show that a household is economically vulnerable if it lacks asset holdings that act as a private safety net during times of economic shocks. Using this theoretical framework, Haveman and Wolfe (2004) state that “a household is asset poor if it does not have sufficient asset holdings to enable it to meet basic needs for a period of three months”. In their study of the relationship between asset poverty and the business cycle in the United States, they find that asset poverty ranges from 22 to 25 percent and that the time pattern of asset poverty does not closely reflect macroeconomic conditions and does not parallel that of income poverty. Subsequent to the recession, asset poverty rose and actually fell during the recession and rose again during the years of growth.

2.3 Methodology

The method to be explained below is for a comparative analysis of asset poverty between the pre and post hyperinflation periods in Zimbabwe. The analysis is done using the ZDHS data. The pre-hyperinflation era is represented by the 2005 dataset, while the 2010 dataset represents the post-hyperinflation period. An asset index is generated for each economic period. The mean asset index, which represents average wealth, is compared across the two economic periods. Changes in the components of the asset index are also computed. In addition, a stochastic test of wealth dominance is conducted, by comparing the cumulative density functions for the asset index between the two periods. The next step is an analysis of asset poverty, which consists of the computation of the FGT 0 and 1⁵ poverty indices and comparing them between the economic eras. All calculations are done at both a national and disaggregated level.

⁵ Foster, J. E., Greer, J., & Thorbecke, E. (1984) “A class of decomposable poverty indices.”

Deriving the asset index

The index is a linear combination of the household assets listed in the data section. Indexation allows for comparability of both asset and access variables in order for the combination to capture a household's wealth level. The Uncentered Principal Components Analysis (UCPCA) methodology of Banerjee (2010) is hereby adopted to create the asset index. This technique is a slight deviation from the Principal Components Analysis (PCA) of Filmer and Pritchett (2001). As Wittenburg and Leibbrandt (2014) explain, the difference is due to the standardization method. The UCPCA, unlike the PCA is not demeaned, but the asset variables are divided by the mean. In so doing, the whole index is located in the positive orthant, as there are no assets with negative coefficient values. This makes sense, as all assets add value to the household. Another advantage of this index is that it can be used to measure inequality. This method precludes the arbitrary application of weights as the resultant weights are based on the asset data. The structural equation of the asset index is:

$$I_i = \omega_1 a_{i1} + \dots + \omega_k a_{ik} \quad (1)$$

Here, I_i is the asset index for households $i=1\dots N$; the a_{ik} 's denotes the $k=1\dots K$ assets and ω 's represents weights⁶. The weights that emerged upon creating the wealth index with the ZDHS data are shown in table A1.2. In essence, these are coefficients showing the relationship between the respective asset and the latent variable – wealth. For an economy like Zimbabwe which, over the past 3 decades, has succumbed to recurrent price distortions, it would not be prudent to use asset prices as weights. UCPCA is the technique employed to derive weights as well as for the construction of the asset index. The common factor which explains most of the variance in asset ownership is wealth (θ_i). The assets are related to wealth in a linear manner:

$$a_{ik} = \rho_k \theta_i + u_{ik} \quad (2)$$

The relationship between the asset and wealth component is computed as a correlation coefficient. Wealth and other common factors (latent variables) are derived from the pattern of correlation between the assets. The common factors, other than wealth, which also determine variation in the assets are contained in the uniqueness element. The correlation matrix is derived from the original asset variables but once the assets are standardized, the result is a covariance matrix and the eigenvalues are used as the weights for the asset index in equation 1. The less common assets receive greater weights.

The following assumptions are made in the construction of the asset index:

A1 – Households are distributed iid . (3)

A2 – Error zero mean: $E(u_i|\theta_i) = 0$ (4)

⁶ See table A1.3.

$$A3 - \text{Constant variance of error: } V(u_t) = \text{Diag}^{Kx1}\{\sigma_1^2, \dots, \sigma_k^2\} \quad (5)$$

Once the asset index is created, the mean asset index, which represents average wealth, is then compared between the pre-hyperinflation and hyperinflation periods.

Poverty Profile

Thereafter, the asset index is used to measure the asset poverty headcount ratio. Similar to Bhorat et al. (2015), the lower poverty line, which is the mark of extreme poverty, is the 20th percentile of the asset index distribution. The 40th percentile of the distribution is the upper poverty line. Based on these two poverty lines, the pre-hyperinflation and hyperinflation asset poverty headcount and gap are measured. These calculations are done at a national level then decomposed by location (rural or urban) of the household. Poverty is measured for the pooled dataset as well as for each wave and separately for rural and urban households.

The next step is to apply standard tests of wealth dominance in order to compare the asset wealth index distributions over time and assess the direction and magnitude of the change in asset poverty between the pre-hyperinflation and hyperinflation periods.

$$H_0 = D_A^s(x) - D_B^s(x) = 0 \quad (6)$$

Given the cumulative distribution functions of each period's asset index, $F_i(x) = D_i^s(x)$ the null hypothesis, outlined in equation (6) is tested to assess whether there exists a difference in asset wealth over time. If the hypothesis does not hold true, then there is a change in asset wealth over time and the direction matters. An increase in asset wealth implies a decrease in asset poverty, and vice versa. Where the null hypotheses in equation 6 is rejected, yet the signs on all the t-statistics are the same, dominance of order s is declared. Here, s=1, 2, where s=1 is the test for change in the poverty rate, while s=2 is the test for the change in the poverty gap. This test is repeated for the two poverty lines.

2.4 Data

In order to quantify the impact of hyperinflation on household asset wealth and poverty, the ZDHS datasets are used. These data are compiled at regular intervals by the Zimbabwe Central Statistics Office (ZimSTAT), with sponsorship from the United States Agency for International Development (USAID). A preliminary assessment of the asset ownership and poverty rates was conducted using a pooled cross section of nationally representative ZDHS datasets from 2005 and 2010. The 2005 and 2010 ZDHS datasets consist of 9,285 and 9,756 households respectively. Both waves of data are nationally representative, in the respective year. The unit of analysis is the household. The standard DHS survey consists of the household, female and male adult members, children and service availability questionnaires. These cover a wide array

of topics which include demography, fertility, childhood mortality, maternal health, nutrition, AIDS and STDs. For this particular study, only data from the household questionnaire are used. The household samples are stratified over two stages. The first stage is the stratification between urban and rural, with equal probability. The second stage is stratification by land use. The four land use categories are communal land, large scale farming, and small-scale farming and resettlement areas. The primary sampling unit is the enumeration area (EA). The 395 EAs that are sampled throughout the years of analysis were determined in the 1992 population census. The main limitation is that the data does not include income or expenditure information, which would have been ideal benchmarks for the asset index. However, the quality of data is verified, given partly by its wide use in academic studies (See: Sahn and Stifel, 2000 and Alkire and Santos, 2010). In addition, the robustness of this data is checked by the USAID.

Nonetheless, the ZDHS datasets were chosen because of the high quality of detailed information about household characteristics. Among these characteristics are the assets owned by and the public services available to a household. The asset and access variables which are common among all four datasets are used in constructing the asset index. The asset variables are split into five categories. The first group consists of movable long-term assets: radio, television, refrigerator, bicycle, motorized vehicle. The second category has the energy binary variable for whether or not a household has electricity. Third is the dwelling quality category which has variables for floor quality, ranked from lowest to highest as follows: earth, cement, wooden, tiled and carpet flooring. Fourth is the water source category with binary variables ranked from lowest to highest as follows: surface, well, borehole, communal tap and piped water. Fifth is the group of sanitation variables, also ranked from lowest to highest quality, as follows: no toilet, pit, Blair and flush toilet. It is these variables, that are applied to the asset index methodology below. In the poverty analysis, the variables are split into two main categories, namely, public and private assets⁷.

In the analysis below, the 2005 dataset represents the pre-hyperinflation era, while the post-hyperinflation era is represented by the 2010 dataset. Poverty headcount as well as poverty gap rates are compared for the two cross-sections.

⁷ The public assets group consists of electricity, piped water and communal tap. The private assets are radio, television, refrigerator, bicycle, vehicle, borehole water, well water, surface water, earth floor, cement floor, tiled floor, carpet floor, wood floor, flush toilet, Blair toilet pit toilet and no toilet.

2.5 Descriptive overview

In this section, changes in access rates for assets and services during the hyperinflation period are computed. The contrast of the rural and urban settings continues. Tables 1 and 2 show that, prior to hyperinflation, the most common movable asset in both rural and urban areas was the radio. In rural households, this was followed by the bicycle as the dominant mode of private transport. The television and refrigerator ranked low because of the lack of electricity in rural areas, in those early years. In contrast, the radio is the most common asset in urban households, followed by the television and refrigerator. It is interesting to note that, prior to the hyperinflation period, the proportion of households with bicycles in urban areas was 5 percentage points higher than in rural households. However, the proportion of households that owned motorized vehicles (cars and trucks) was significantly higher in urban areas.

Table 1: Private asset ownership summary statistics, rural households

Rural Households	Pre-hyperinflation 2005	Post-hyperinflation 2010	Percentage Change (%)	t	p
Radio	0.33	0.32	-3.99	1.59	0.11
Television	0.10	0.16	52.27	-9.05	0.00
Refrigerator	0.03	0.04	25.13	-2.33	0.02
Bicycle	0.24	0.24	-0.32	0.10	0.92
Vehicle	0.02	0.03	27.30	-2.19	0.03
Borehole Water	0.39	0.39	-0.02	0.01	0.99
Well Water	0.38	0.51	36.46	-15.62	0.00
Surface Water	0.12	0.14	22.24	-4.34	0.00
Earth Floor	0.50	0.44	-11.37	6.36	0.00
Cement Floor	0.50	0.55	10.61	-5.95	0.00
Tiled Floor	0.00	0.00	79.88	-1.27	0.20
Carpet Floor	0.00	0.00	-55.60	2.30	0.02
Wood Floor	0.00	0.01	545.75	-4.92	0.00
Flush Toilet	0.03	0.04	35.12	-3.33	0.00
Blair Toilet	0.33	0.26	-22.94	9.49	0.00
Pit Toilet	0.16	0.28	69.08	-15.45	0.00
No Toilet	0.47	0.42	-9.91	5.26	0.00

Source: Own calculations, Zimbabwe Demographic and Health Surveys

The descriptive analysis shows that urban households experienced a greater decrease in the ownership of private assets. For example, while the number of rural households owning radios decreased by 3.99 percent, the urban counterparts experienced a 36.36 percentage decrease. This decrease in radio ownership is expected, given the growth of the mobile cellular phone subscriptions⁸ in Zimbabwe between 2005 and 2010. These cellular phones came with music

⁸ See figure A2 in appendix.

and media streaming functions which became substitutes to the conventional radios. As for other electricity-based assets, rural households acquired 52.26 percent more televisions, while urban households experienced a much lower increase of 7.42 percent. As the proportion of rural households owning refrigerators increased by 25.12 percent, that of urban households decreased by 3.38 percent. While 0.31 percent of rural households sold their bicycles, 30.21 percent of urban households did the same. As ownership of motorized vehicles (cars and trucks) increased by 27.44 percent for rural households, urban households experienced a decrease of 0.18 percent. The evident reduction in ownership of refrigerators, vehicles and bicycles in urban households is an indication that durable assets were being liquified by middle class households during hyperinflation, most likely to compensate for the lost value of earnings in order to buy basic necessities. This finding corresponds with the ZimVAC (2009) report.

The quality of dwelling was also compromised during this hyperinflation period. The different types of flooring for a household's dwelling represent living standards. The lowest ranked is the earth floor, followed by the cement, tiled, wooden and carpet floors. Between 2005 and 2010, there was a decrease of 11.37 percent in rural households with earth flooring, while these dwellings increased by 774.49 percent among urban households. This is evidence of a greater improvement in living standards among rural households, while that of urban households declined. These earth floors were now covered by cement, tiles or wood. In fact, while the percentage of households with wooden and tiled floors increased across the nation, the increase was greater among rural households. Specifically, 547.92 percent more rural households got their floors covered with wood, yet urban households only witnessed a 27.40 percent increase in this regard. These urban households would be part of the small percentage that acquired assets during the crisis. The increase in rural households with tiled floors was 80.36 percent, while the increase for urban households was only 56.55 percent. The fact that households with carpet flooring have decreased across the country shows that quality of dwelling is declining. However, what is more concerning is that the number of dwellings with earth flooring increased drastically. Evidently, the quality and quantity of private assets among urban households declined more than that of rural households. These comparisons re-emphasize the declining living standards in urban households.

Table 2: Private asset ownership summary statistics, urban households

Urban Households	Pre-hyperinflation 2005	Post-hyperinflation 2010	Percentage Change (%)	t	p
Radio	0.78	0.50	-36.36	24.54	0.00
Television	0.71	0.76	7.42	-4.73	0.00
Refrigerator	0.49	0.47	-3.38	1.33	0.18
Bicycle	0.29	0.20	-30.21	8.17	0.00
Vehicle	0.15	0.15	-0.18	0.03	0.98
Borehole Water	0.01	0.10	816.32	-15.49	0.00
Well Water	0.02	0.06	192.19	-8.25	0.00
Surface Water	0.00	0.01	3852.41	-6.10	0.00
Earth Floor	0.00	0.02	773.12	-6.14	0.00
Cement Floor	0.90	0.88	-1.92	2.17	0.03
Tiled Floor	0.03	0.05	56.55	-3.49	0.00
Carpet Floor	0.05	0.03	-41.67	4.34	0.00
Wood Floor	0.02	0.02	27.38	-1.41	0.16
Flush Toilet	0.94	0.90	-3.90	5.41	0.00
Blair Toilet	0.04	0.03	-25.67	2.17	0.03
Pit Toilet	0.01	0.03	151.66	-5.38	0.00
No Toilet	0.01	0.03	403.32	-7.69	0.00

Source: Own calculations, Zimbabwe Demographic and Health Surveys

The ‘access to water’ variables reflect the deterioration in infrastructure during the hyperinflation period. In terms of quality, the lowest ranked is surface water, followed by well, borehole, communal tap and piped water which is supposedly the least contaminated. Table 1 shows a 22.24 percent increase in surface water usage among rural households, while in table 2, there is a 3,852.41 percent increase in the proportion of urban households using surface water. This corresponds with the ZimVAC (2009) report that the water system in urban areas collapsed during the hyperinflation period. As rural households shift from using the most contaminated water, the reverse is true for urban households. Well water was used by 36.46 percent more rural households and 192.19 percent more urban households during the hyperinflation period. There was a 0.02 percent decrease in the proportion of households that used borehole water in rural areas, as compared to an increase of 816.32 percent in urban areas. These boreholes were substitutes for piped water that was no longer being supplied by municipalities.

On the other hand, table 1 shows a 12.68 percent decrease in the use of piped water among rural households, compared to a 16.50 percent decrease among urban households. Then, in terms of communal tap usage, rural households experienced a decrease of 22.40 percent, while 56.74 percent more urban households used communal taps. In the Zimbabwean context, communal tap water and piped water is treated and mainly provided by the local municipality.

Thus, the overall result is particularly interesting as it shows the shift from municipality / treated water to borehole, well and surface water. This was necessitated by the deteriorating macroeconomic situation in the country which affected municipalities through the shortage in water treatment chemicals and neglect of water treatment plants⁹. As a result, there was a decrease in piped and tap water in urban areas and a greater percentage of these urban households move to using boreholes and wells. Nonetheless, due to the presence of aid organizations that dug boreholes and wells, there is a significant decrease in surface water usage in rural areas. The direct implication is improved water quality among vulnerable households, located in rural Zimbabwe, during the hyperinflationary period. This corresponds with the 29 percent increase in improved water usage among rural household which is cited in ZimVAC (2010).

Sanitation was negatively affected by municipality's poor service delivery of piped and communal tap water. The toilet types represent quality of sanitation. Households with no toilet are ranked the lowest, followed by the ones with pit, Blair and flush toilets. While a pit latrine consists of a hole dug into the ground with a slab and shelter, the Blair toilet is a ventilated improved pit toilet with a chimney which connects the pit to outside air¹⁰. Table 1 shows that though there was a 35.12 percent increase in the usage of flush toilets among rural households, it was associated with a 3.90 percent decrease among urban households in table 2. Usage of Blair toilets decreased by 22.94 and 25.67 percent for rural and urban households, respectively. Pit latrines also became popular across the country as rural households witnessed an increase of 69.08 and urban households experienced an increase of 151.66 percent. The percentage of rural households that reported to have no toilet at all decreased by 9.91 percent over the five-year period. However, the percentage of urban households that reported not to have a toilet facility increased by 403.32 percent. Overall, the use of inferior toilet facilities increased more among urban households. This finding corresponds with the World Bank (2013) statistic, showing that 76 percent of urban households were not connected to the sewer system by the time hyperinflation ended. This sanitation problem was necessitated by the decline in piped water provision in the urban areas during the hyperinflation period.

The first public asset seen in tables 3 and 4 below is electricity. For rural households, there is a 34.81 percent increase in the usage of electricity during the hyperinflation period. This increase is statistically significant, as seen in the table, however, it is important to note that this is a rise from a very low initial usage rate of 9 percent among rural households. The increase is a signal of the rise in rural household income which is most likely due to food and cash crop sales to the urban market. ZimVAC (2010) showed an increase in purchases of clothes, loan repayment

⁹ <http://mg.co.za/article/2004-09-10-sewage-seeps-into-harare-water-supply>

¹⁰ http://www.csir.co.za/Built_environment/santechcentre/docs/Blair_info_sheet.pdf

and other items among rural households, which is a sign of increased disposable income. As a result, the proportion of rural households connected to the electric grid increased. This increase in electricity usage justifies the increase in ownership for refrigerators, televisions and other electrical appliances in rural households.

However, contrary to the situation among rural households, there is a 4.35 percent decrease in electricity usage in urban households. This is justifiable given the regular power cuts which led households to use alternative energy sources such as generators, gas, paraffin and wood. According to Kaseke (2013), “The local generation capacity is constrained by lack of spares, maintenance, vandalism and obsolete equipment. The country has a staggering electricity debt to regional power utilities...” This is reasonable given the macroeconomic meltdown explained in the contextual background above.

Table 3: Public asset access summary statistics, rural households

Rural Households	Pre-hyperinflation 2005	Post-hyperinflation 2010	Percentage Change (%)	t	p
Electricity	0.09	0.12	34.81	-5.62	0.00
Piped Water	0.07	0.06	-12.68	1.94	0.05
Communal Tap	0.05	0.04	-22.40	3.22	0.00

Source: Own calculations, Zimbabwe Demographic and Health Surveys

Table 4: Public asset access summary statistics, urban households

Urban Households	Pre-hyperinflation 2005	Post-hyperinflation 2010	Percentage Change (%)	t	p
Electricity	0.92	0.88	-4.35	5.20	0.00
Piped Water	0.93	0.78	-16.50	17.57	0.00
Communal Tap	0.04	0.06	56.74	-3.91	0.00

Source: Own calculations, Zimbabwe Demographic and Health Surveys

The results of this descriptive exercise show that urban households fared worse than rural households. Urban households were forced to dispose of assets and they suffered poor public service provision as well. Urban households experienced a decrease in electricity usage as well as reductions in the ownership of private assets that require electricity to function. In terms of water and sanitation, there is a marked improvement for rural households. Many of these, move from using surface water to piped water and from having no toilets to using improved forms of sanitation such as flush toilets. The opposite is true for urban households which increase in using borehole, well and surface water and then decrease their use of piped water. The sanitation standards in urban households also decline as there is a significant increase in the number of households who either use pit toilets or do not have toilets at all, during the

hyperinflation period. Access to assets and services on this initial descriptive evidence, thus improved among rural households and declined significantly among urban households.

2.6 Changes in the Asset Index during Hyperinflation

Using the variables above, which are common between the ZDHS datasets, the impact of hyperinflation on asset poverty is measured. For both the pre-hyperinflation and hyperinflation datasets, an asset index is constructed, using the Uncentered Principal Components Analysis described in the methodology above¹¹. The mean asset index is calculated at national and disaggregated levels. This way, average poverty is compared between the two economic periods. In addition, the cumulative distribution functions for the asset index in each period are compared in order to determine the period which is stochastically dominant in terms of asset wealth.

When the mean of the asset index, is compared between the two eras, the result is a decrease in asset poverty. As seen in table 5, below, on a national level, the pre-hyperinflation asset index average is 1.09 and it rises to 1.66 during the hyperinflation era. This signifies a 52.57 percent increase in national average asset wealth, which implies a decrease in asset poverty for the average Zimbabwean household. However, upon disaggregation, it is evident that the significant increase is only found among rural households that experience a 233.59 percent increase in average asset wealth. Though the average wealth for rural households increases, it is lower than the national average, both before and after hyperinflation. Urban households do not experience a statistically significant change in the asset index.

Table 5: Mean asset index by residence type and gender

Household Type	Pre-hyperinflation 2005	Post-hyperinflation 2010	Percentage Change (%)	t	p
National	1.09	1.66	52.57	-3.86	0.00
Rural	0.24	0.80	233.59	-5.02	0.00
Urban	2.81	3.31	17.89	-1.33	0.18
Rural-Female	0.19	0.34	83.71	-1.47	0.14
Urban-Female	3.02	3.14	3.84	-0.18	0.86
Rural-Male	0.28	1.19	327.29	-5.04	0.00
Urban-Male	2.72	3.45	26.75	-1.53	0.13

Source: Own calculations, Zimbabwe Demographic and Health Surveys

Table 5 shows that, on a national level, there was a statistically significant increase in average asset wealth as measured by the mean asset index. This means that, for the average

¹¹ See table A1.2 for index weights.

household, asset poverty decreased during the hyperinflation period. This is because rural households constitute the majority as they are 65 percent of Zimbabwe's population. Therefore, they influence the result, especially considering the fact that the change in asset poverty that occurred among urban households was not statistically significant.

Table 6: Mean asset index, by quintile

Quintile	Pre-hyperinflation (2005)	Post-hyperinflation (2010)	Percentage Change (%)	t- statistic	p-value
1	0.022 (0.000)	0.022 (0.000)	2.68	-3.69	0.00
2	0.054 (0.001)	0.057 (0.001)	4.29	-4.06	0.00
3	0.141 (0.001)	0.146 (0.001)	3.51	-3.40	0.00
4	0.373 (0.002)	0.371 (0.002)	-0.45	0.67	0.51
5	4.912 (0.442)	7.458 (0.545)	51.83	-3.59	0.00
Aggregate	1.085 (0.089)	1.655 (0.116)	52.57	-3.86	0.00

Source: Own calculations, Zimbabwe Demographic and Health Surveys. Notes: Standard Errors in parentheses.

The results in the quintile analysis in table 6 above correspond with previous findings. Evidently, asset poverty for the average household decreased in four quintiles, with the greatest change being in the fifth quintile. Households between the 60th and 80th percentile witnessed an increase in asset poverty. This fourth quintile consists of 70 percent urban households, and explained, these experienced an increase in asset poverty. Though the results for the last two table show the expected directional changes, it is worth noting that they refer to the average household. The following section give results for the full asset index distribution.

2.7 Asset Poverty Changes during Hyperinflation

The asset index is further used to calculate poverty incidence and severity rates, then a comparison is made between the pre-hyperinflation and post-hyperinflation periods. Ultimately, this section shows the impact that hyperinflation had on asset poverty levels. Following Easterly and Fisher (2000), asset poverty is measured at a given relative poverty lines. The extremely poor households are those that fall below the 20th percentile, while the 40th percentile is the upper poverty line.

Table 8, below, shows changes in the incidence of asset poverty. On a national level, 20.41 percent of the population were extremely poor and 41.46 percent were below the upper poverty line. These numbers decrease by 9.07 and 2.20 percent, respectively, during the hyperinflation period. Both shifts are statistically significant. Considering that approximately 98 percent of the households in the bottom 40 percent are located in rural Zimbabwe, the decrease in asset poverty on a national level is justifiable since rural asset holdings increased.

What is more interesting is the high incidence of poverty in rural households. While there was a 13.12 percent decrease in extreme asset poverty among rural households, the headcount rate of 31.08 percent is high and statistically significant. When using the upper poverty line, 62.81 percent of the rural households are deprived of private assets and public services. Post-hyperinflation the asset poverty rate using the upper poverty line decreases to 59.17 percent. Even though asset poverty declined, it is still high among rural households and poverty reduction efforts need to be targeted towards rural households, particularly the provision of public assets.

What is worrisome is the fact that asset poverty ranges are not changing since the early 1990s. Booyens et al., (2008) also measured asset poverty using the ZDHS datasets of 1988, 1994 and 1999. After pooling the data for all three years to create the asset index and applying the 40th percentile as a poverty line, the authors found that rural asset poverty for Zimbabwe was 37.1 percent and 0.4 percent for urban households. Though their variables were slightly difference and the index formation method was the Multiple Correspondence Analysis, they state that water and sanitation standards declined in Zimbabwe, hence this study finds much higher rates of asset poverty in the 2005 and 2010 datasets.

Urban extreme asset poverty levels are lower than 2 percent from 2005 to 2010. Nonetheless, the increase of 1,365.69 percent is large and statistically significant. When using the upper poverty line, urban asset poverty increased by 351.83 percent from 0.87 percent to 3.95 percent. Yet another statistically significant increase. Such magnitudes of increase are extreme, yet not surprising in the hyperinflationary environment where annual inflation reached 231 million percent in July 2008. As shown in the descriptive analysis of variables, this shift in urban asset poverty can be attributed to two factors. First is the selling of private household assets in order to buy food. Second is the sudden and extensive deterioration of public infrastructure which negatively affected the provision of clean water, electricity and good quality sanitation.

Table 7: Asset poverty headcount shifts

	Pre-hyperinflation (2005)	Post-hyperinflation (2010)	<i>Percentage Change (%)</i>
Poverty Headcount Rate (%)			
National			
20 th	20.41	18.56	-9.07 (5.0768)
40 th	41.46	40.55	-2.20 (2.0842)
Rural			
20 th	31.08	27.00	-13.12 (5.4229)
40 th	62.81	59.17	-5.80 (2.1154)
Urban			
20 th	0.13	1.98	1,365.69 (-4.9124)
40 th	0.87	3.95	351.83 (-4.0005)

Notes: Extreme asset poverty line is the 20th percentile. Upper asset poverty line is the 40th percentile.

T-statistics in parentheses. Adding land to the assets does not change the results.

Other than changes in incidence, the changes in the depth of asset poverty are also worth noting. Table 8 below shows the changes in asset poverty gap. Between the pre-hyperinflation and post-hyperinflation periods, there is a decrease in the severity of asset poverty on a national level. The extreme asset poverty gap decreased by 15.38 percent and when using the upper poverty line, asset poverty gap decreases by 8.10 percent. Rural households also experience a decline in the severity of asset poverty between 2005 and 2010. Yet again though, for the poor in urban areas of Zimbabwe, the severity of poverty increased by 1,490.33 and 712 percent for the bottom 2 quintiles. This further proves the fact that the urban households were most negatively affected by macroeconomic meltdown.

Table 8: Asset poverty gap shifts

	Pre-hyperinflation (2005)	Post-hyperinflation (2010)	Percentage Change (%)
Poverty Gap			
National			
20 th	5.95	5.03	-15.38
40 th	22.81	20.96	-8.10
Rural			
20 th	9.06	7.38	-18.61
40 th	34.67	30.55	-11.89
Urban			
20 th	0.03	0.43	1,490.33
40 th	0.26	2.12	712.00

Source: Own calculations, Zimbabwe Demographic and Health Surveys

In this erratic hyperinflationary environment, which was characterized by significant instability, the range for asset wealth was wide, with a very large gap between the low and high ranked wealth holders¹². The CDFs for the logged asset index further substantiate the findings from the poverty analysis above. The CDF in figure 5, below shows that asset poverty among Zimbabwean households decreased during the hyperinflationary period. This is seen by the rightward shift of the CDF for the logged asset index distribution. This particular diagram shows the shift that occurred for households in the top percentile, during hyperinflation. Focus was drawn to this part of the distribution in order to give a clearer visual depiction of the change. Nonetheless, in the CDF for the full distribution, found in the appendix¹³, it is evident that the CDFs cross at 84 percent of the cumulative proportion, which shows that households in the top 20 percent of the asset index distribution witnessed a decrease in asset wealth. This confirms the aforementioned findings that households in the top 20 percent, which are mainly urban households experience an increase in asset poverty.

¹² The pooled asset index ranged from a minimum value of 0.0022 to a maximum value of 105.7119, with a mean of 1.3769. It is therefore necessary to log this skewed distribution with high variance, in order to compute sensible Cumulative Density Functions (CDFs). The mean for the pooled logged asset index is -1.9019.

¹³ See figure A1

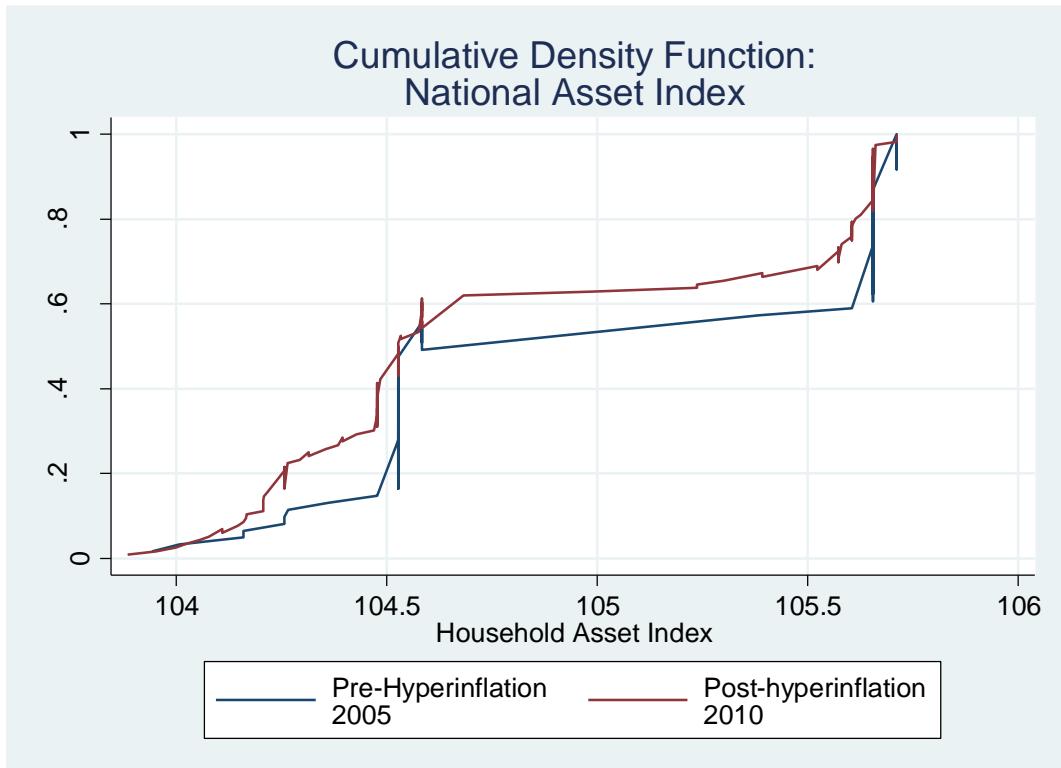


Figure 1: Cumulative wealth distribution, pre and post hyperinflation

Source: Own calculations, Zimbabwe Demographic and Health Surveys, 2005 – 2010

Figure 2a shows that asset poverty decreased for rural households, which is accurate given that the ownership rates for most assets in rural households increased. On the other hand, figure 2b depicts that asset poverty increased for urban households. This is the expected result, given the decline in asset ownership rates among urban households. The asset index cumulative distribution moved to the right for rural households and to the left for urban households. These findings are coherent with the poverty headcount results above.

It is worth noting the crossing of the CDFs for urban households which is seen in the top decile shows that asset poverty decreased for the wealthiest urban households. This is another finding which corresponds with the quantile analysis above which showed that the share of asset holdings increased by 6.67 percent for households in the top decile in Zimbabwe. All the CDFs have shown invariant non-parametric evidence of the shifts in asset poverty. The conclusion is that there was an increase in asset poverty in urban households, while rural households witnessed a decrease.

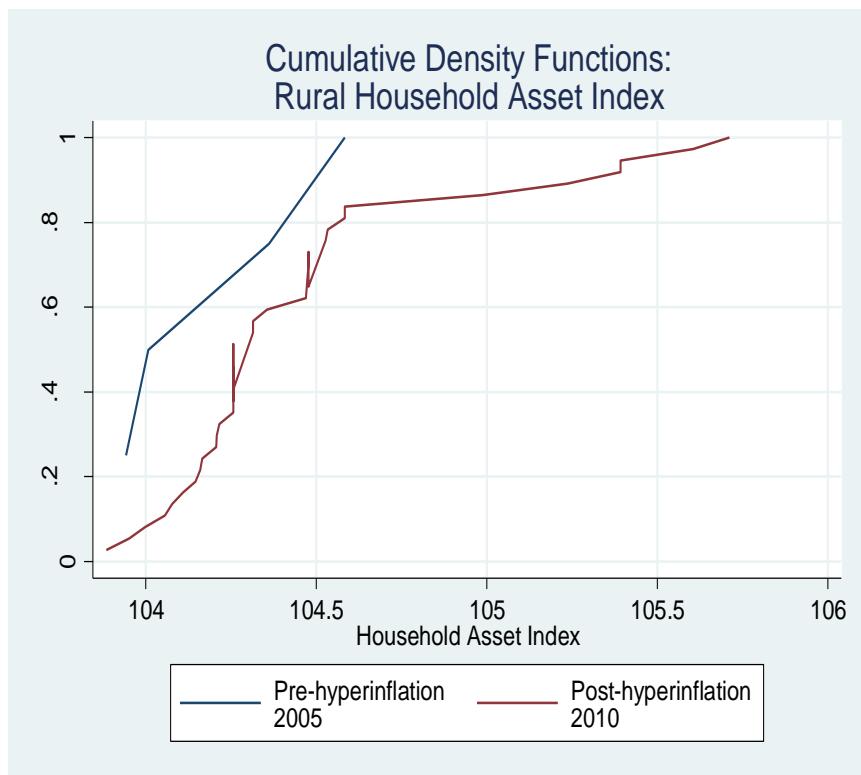


Figure 2a: Cumulative wealth distributions, rural households

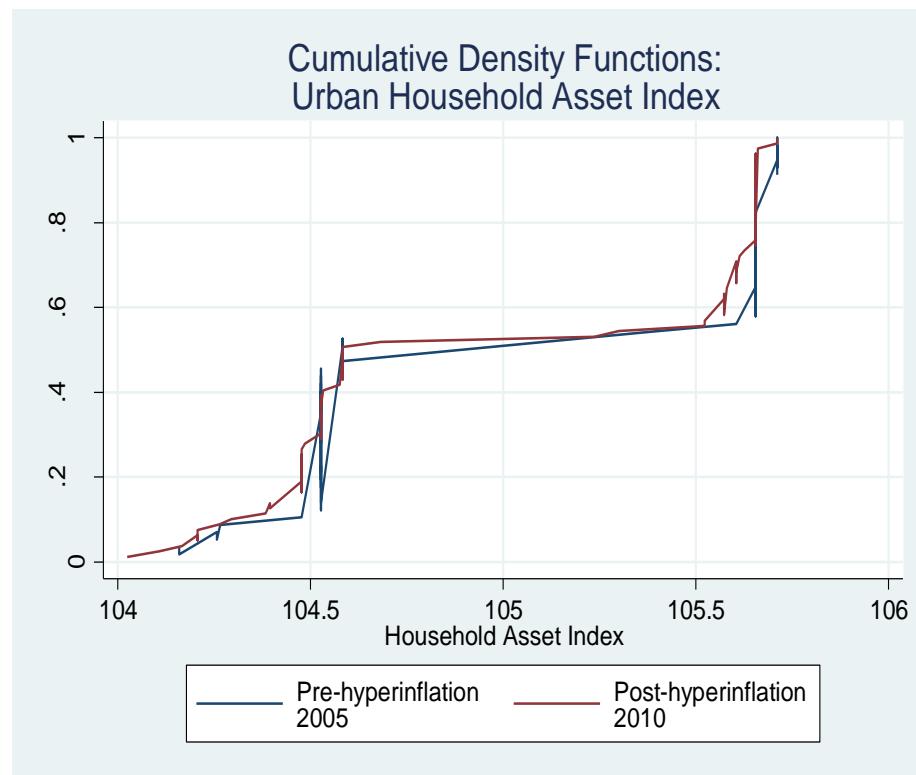


Figure 2b: Cumulative wealth distributions, urban households

Source: Own calculations, Zimbabwe Demographic and Health Surveys, 2005 – 2010

The results from the descriptive analysis, poverty headcount and gap analyses as well as the CDF non-parametric analysis all point to the fact that asset poverty increased among urban households, while it decreased for rural households. The main drivers for the changes in rural households were the connection to electricity, the improvement in dwelling quality as well as increased access to improved water sources. ZimVAC (2010) attributes these changes to the increase in income that occurred among rural households. Rural households received income in the form of cash and assets from food and cash crop sales as well as casual labour on farms. As a result, assets increased among rural households and asset poverty decreased.

These findings resonate with Brimmer (1971) who shows that in a similar inflationary environment, during the Vietnam war, rural households in the United States of America witnessed significant outmigration. As a result, the households that remained in the rural farming communities made more income from agriculture, as food constituted the main share of household budgets across the country. This theory applies to the Zimbabwean context which was marked by extensive outmigration during the economic crisis. According to UNICEF (2013), the crude net migration rate for Zimbabwe between 2005 and 2010 was -12.41 percent. This implies that emigrants were a greater number than immigrants. The estimated number of emigrants between 1999 and 2010 was 4 million. The exact number that left the rural areas is difficult to quantify as a great majority entered neighboring countries illegally. Nonetheless, ZimVAC (2007) shows that most internal migration happened as households in urban and communal lands, who constituted 37 and 31 percent of internal migrants, moved into rural areas in search of farming land. These households transferred their private assets from the urban to the rural setting. They most likely purchased more assets from the proceeds of their agricultural output.

In addition, remittances from the international emigrants would have contributed to the accumulation of assets. Unfortunately, there is no accurate record of the remittances that have flowed into Zimbabwe over the years. However, ZimSTAT (2012) shows that remittances contributed 5.3 percent to total annual household income. The value of official remittances recorded was US\$319 million per year. A closer look at the rural areas, shows that the average annual cash transfers amounted to US\$454 per household. These proceeds were from relatives that had migrated to urban areas within Zimbabwe as well as to other countries abroad.

While the remittances also benefitted the urban households, there was an even greater problem apart from migration. Unemployment levels increased significantly during the hyperinflation period and the majority Zimbabwe's formal sector labour force is found in urban

areas. Table 9, below, shows the changes in employment levels in the various sectors in the formal economy. It is apparent that all sectors witnessed negative growth in the years between 2005 and 2010. The unemployment emanated from capital flight as well as general closure of local businesses which were unable to cope with the fluctuating prices. Household income was therefore affected by both hyperinflation and unemployment. As a result, private asset ownership and usage decreased among urban households. This in addition to the decline in infrastructure which negatively affected the delivery of water and electricity to urban households.

Table 9: Zimbabwe's sectoral employment growth trends, 2005 - 2010

Economic Sector	Employment Growth Rate (%)					
	Pre-hyperinflation		Hyperinflation		Post-hyperinflation	
	2005	2006	2007	2008	2009	2010
Agriculture	9.43	-4.36	-1.27	-2.82	-2.37	6.76
Mining	2.45	-6.56	-1.55	-2.81	-2.61	5.65
Manufacturing	-9.93	2.56	11.67	0.00	14.93	12.34
Electricity & Water	-47.90	-6.93	0.47	-0.93	7.94	-9.52
Construction	128.16	-2.89	-4.47	-3.55	-1.47	3.13
Financial Services	-35.24	-3.87	-0.24	-2.20	-3.50	4.67
Distribution	-47.55	-2.36	-0.40	-2.83	13.75	18.32
Transport & Communication	-13.36	5.82	7.37	3.12	2.91	11.41
Public Administration	19.85	2.35	-4.66	-7.46	-1.30	7.20
Education	32.43	-1.42	19.02	-0.73	3.17	11.35
Private Domestic Services	-33.85	-8.35	-1.82	1.24	1.63	1.60
Total	4.50	-26.01	24.10	-18.97	33.07	72.90

Source: Unpublished Central Statistics Office (ZimSTAT) statistics

2.8 Conclusion

Zimbabwe's hyperinflation which occurred from March 2007 to December of 2008 was a real negative economic shock, which affected household well-being. The analysis in this chapter is conducted using data from the Zimbabwe Demographic and Health Surveys. In particular, the 2005 dataset is used to represent the pre-hyperinflation period, while the 2010 dataset is used to represent the post-hyperinflation period. This study is therefore a pre-post analysis of the changes that occurred in asset ownership, asset poverty incidence and asset poverty severity.

The analysis shows that overall, there was a decline in asset poverty in Zimbabwe. This decrease in asset poverty was mainly driven by the increase in asset ownership rates among rural households, who constitute 65 percent of the population. On the contrary, asset poverty

increased for urban households. This was true for both female and male headed urban households. The results hold true with both the lower and upper poverty lines.

Tests of statistical significance reveal that private assets decreased during the hyperinflation period, for most households in Zimbabwe. This was more evident among urban households, which confirms the theory purported in literature that middle class households sell assets in order to compensate for the lost value of earnings due to inflation. The proceeds from the sale of assets are often used to purchase basic necessities, which allows for consumption smoothing. This would apply to the movable private assets such as electric appliances and cars. Another contributing factor to the decline in the quantity of private assets was unemployment. This resulted in a decrease in income among urban households and subsequently a decrease in assets. The ZDHS reports of 2005 and 2010 show a decrease in employment across the nation. In 2005, only 44 percent of women were employed, while 70 percent of men were employed. Both rates decrease in 2010, as there are 37 percent of women and 61 percent of men employed. The rate of urban women who were employed decreased by 72 percent, from 43 to 12 percent during the hyperinflation period. This increase in unemployment implies that less income was available to purchase assets and improve the standard of living during the hyperinflation period. Indeed, the loss of jobs and salary reductions were some of the major complaints of the urban dwellers as reported in ZimVAC (2009).

A different class of private assets – inferior water sources and toilet systems – increased among urban households. This indicates a decline in the provision of clean water by local government. Indeed, the data show that piped water provision decreased significantly during hyperinflation. Not only did urban households suffer from poor provision of clean water, but the electricity supply, and in turn usage, also declined significantly during the hyperinflation period. This signified a deterioration in national infrastructure.

While this was occurring in the urban setting, ownership rates for private assets in rural households were increasing. Nonetheless, it is worth noting that the asset ownership rates for rural households were originally very low. In particular, rural households experienced an increase in the usage of electricity and electric appliances. As previously mentioned in the analysis, this increase is most likely due to increased income from food and cash crop sales for those rural households that remained to capture the economic gains of the agricultural activities after many had migrated away. The remaining households benefited and were able to acquire more assets. Remittances from the emigrants to remaining households also contributed positively to asset ownership. In addition, there was a transfer of assets as urban households migrated to rural farm lands. It is therefore safe to conclude that in Zimbabwe asset poverty decreased for the majority of households, found in rural areas and increased for urban households. Hyperinflation had different effects, dependent on location.

Appendix

Table A1: Consumption Poverty and Inequality in Zimbabwe, 2003.

Level	Gini Coefficient	GE(0) Theil L	GE(1) – Theil T	GE(2)	Poverty Line (US\$)	Poverty Headcount Ratio	Poverty Gap
National	0.6236	0.7280	0.9320	4.8840	54.62	63.02	33.90
Rural	0.6026	0.5172	0.7209	6.5390	35.58	78.49	44.26
Urban	0.5617	0.5654	0.7311	2.6081	99.01	26.96	9.76
Male Headed	0.6289	0.7476	0.9540	5.1940	54.62	60.25	32.16
Female Headed	0.6026	0.6665	0.8471	3.4828	54.62	68.48	37.33
Provincial Decomposition							
Bulawayo	0.5434	0.5410	0.5480	2.6430	92.69	56.88	27.08
Manicaland	0.5534	0.5420	0.7100	3.0590	39.78	63.06	30.16
Mashonaland Central	0.5390	0.5298	0.5995	1.4887	28.46	50.44	22.74
Mashonaland East	0.5475	0.5387	0.6447	1.9972	38.91	61.01	29.32
Mashonaland West	0.5223	0.4733	0.6016	1.9115	46.18	59.46	26.31
Matebeleland North	0.6226	0.7289	1.1263	10.7546	36.18	68.84	34.40
Matebeleland South	0.5180	0.4834	0.6169	2.0995	48.61	64.45	30.25
Midlands	0.5120	0.4592	0.5045	0.9277	48.77	65.20	32.07
Masvingo	0.6212	0.7159	1.1482	21.1450	35.22	68.54	35.80
Harare	0.5770	0.5967	0.7790	2.5980	115.43	50.97	22.31

Source: Unpublished PASS data

Table A2. Asset index weights

Asset Index weights	Pre-hyperinflation 2005	Post-hyperinflation 2010
Private Assets		
Radio	0.0155	0.0292
Television	0.0244	0.0425
Refrigerator	0.0368	0.0677
Bicycle	0.0073	0.0219
Vehicle	0.0549	0.0973
Borehole Water	0.0017	0.0082
Well Water	0.0008	0.0048
Surface Water	0.0003	0.0093
Earth Floor	0.0002	0.0014
Cement Floor	0.0019	0.0059
Tiled Floor	0.0166	0.0506
Carpet Floor	0.0082	0.9739
Wood Floor	0.9965	0.1595
Flush Toilet	0.0227	0.0458
Blair Toilet	0.0021	0.0077
Pit Toilet	0.0005	0.0040
No Toilet	0.0009	0.0020
Public Assets		
Electricity	0.0213	0.0419
Piped Water	0.0215	0.0427
Communal Tap	0.0035	0.0178

Notes: All asset variables are dummies.

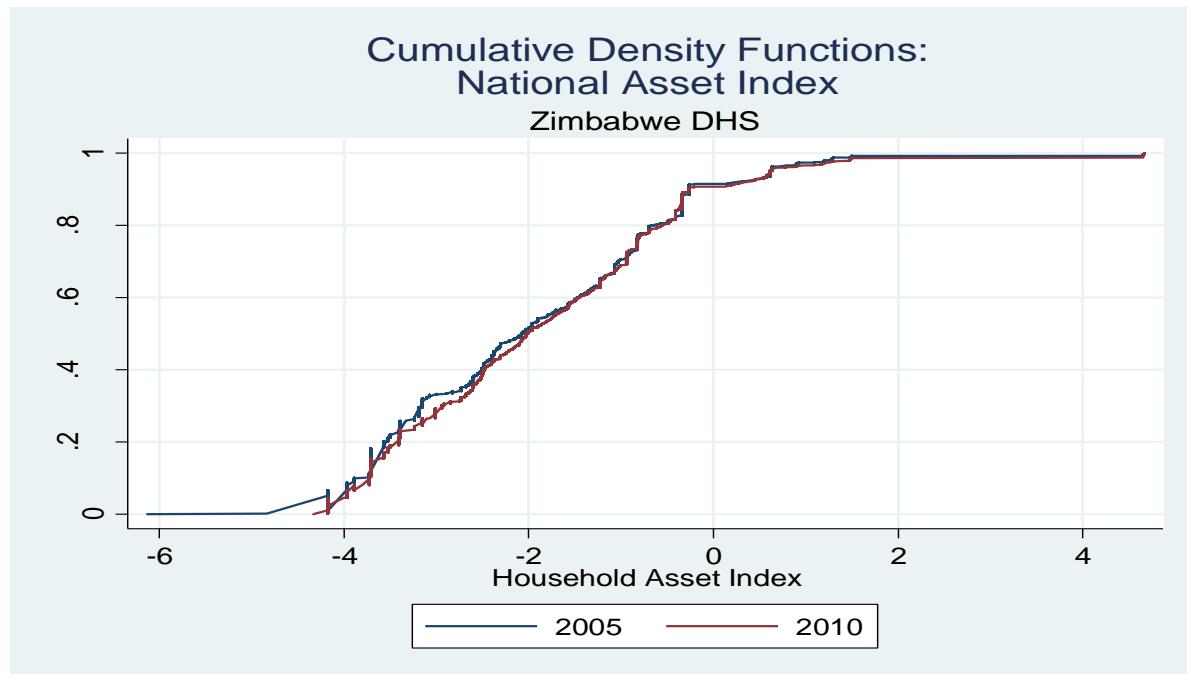


Figure A1: Cumulative wealth distribution, pre and post hyperinflation

Source: Own calculations, Zimbabwe Demographic and Health Surveys, 2005 – 2010

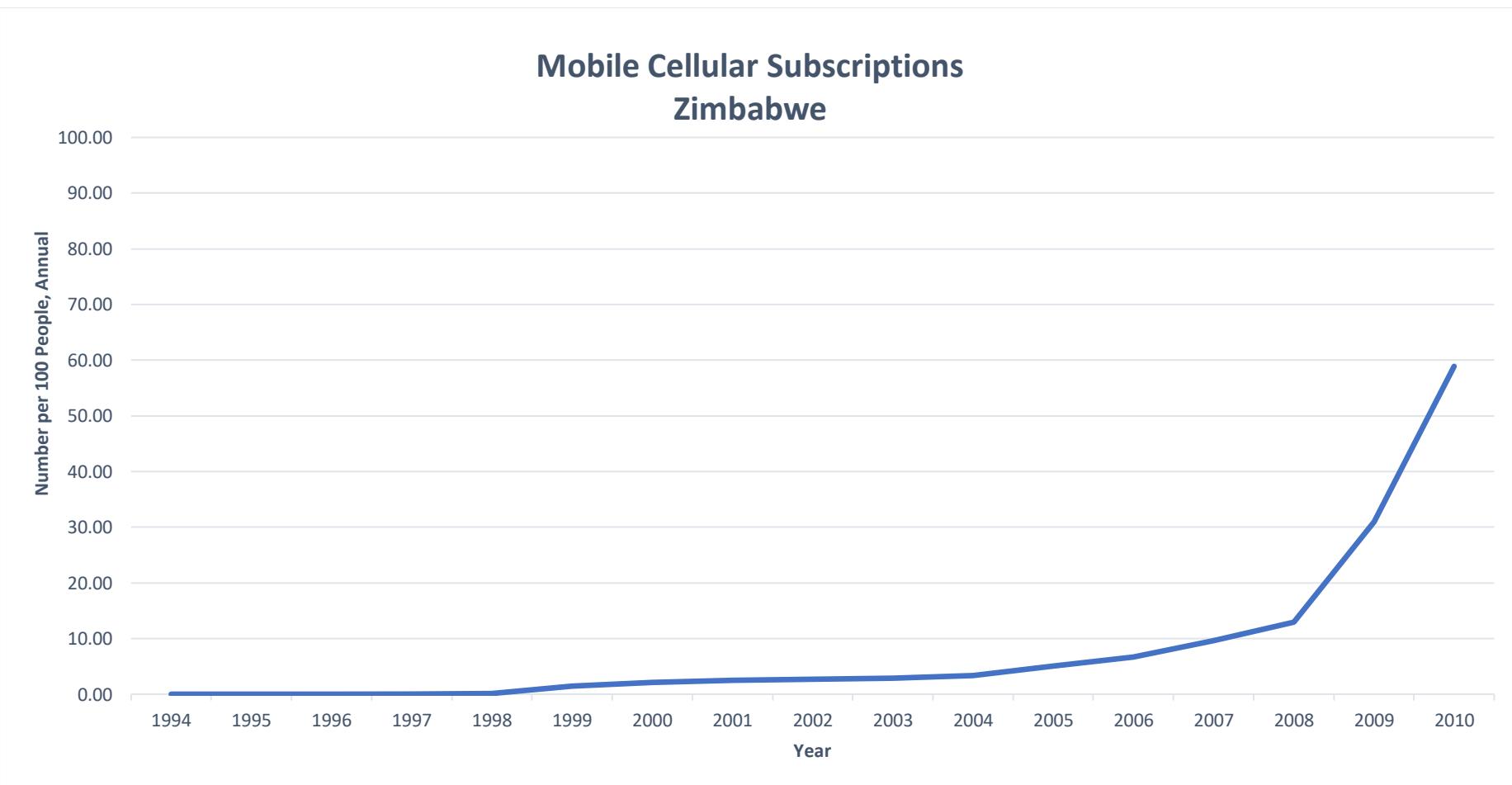


Figure A2: Mobile phone subscriptions, Zimbabwe

Source: Federal Reserve Bank of St. Louis <https://fred.stlouisfed.org/series/ITCELSETSP2ZWE>

Bibliography

Agenor, P. R. (1999). "Stabilization policies, poverty and the labour market: Analytical Issues and Empirical Evidence." *Collaborative Research Project*, CR-2-3. Washington, DC: The World Bank. Accessed June 2015.

<http://citeseerx.ist.psu.edu/viewdoc/download;jsessionid=AF3E3F6013187C070A213CB0914FFA05?doi=10.1.1.198.2352&rep=rep1&type=pdf>

Alkire, S. and Santos, M.E. (2010). "Acute Multidimensional Poverty: A New Index for Developing Countries." *OPHI Working Papers* 38. Accessed February 2015.

<http://www.ophi.org.uk/wp-content/uploads/ophi-wp38.pdf>

Banerjee A. K. (2010). "A multidimensional Gini index". Mathematical Social Sciences, Volume 60, 87 - 93. Institute of Development Studies, Kolkata, India.

Bhorat, H., Stanwix, B. and Yu, D. (2015). "Nonincome Welfare and Inclusive Growth in South Africa." Africa Growth Initiative at Brookings: Working Paper 18. Accessed March 2015.

http://www.brookings.edu/~/media/Research/Files/Papers/2015/03/nonincome-welfare-growth-south-africa-bhorat-stanwix-yu/South-Africa-WP_Web.pdf

Blank, R. M. and Blinder, A. S. (1985). "Macroeconomics, Income Distribution and Poverty." *NBER Working Paper* 1567. Accessed June 2015. <http://www.nber.org/papers/w1567.pdf>

Blinder, A. S. and Esaki, H. Y. (1978). "Macroeconomic Activity and Income Distribution in the Postwar United States." *The Review of Economics and Statistics*, Vol. 60, 604-609. Accessed October 2016 https://www.jstor.org/stable/1924254?seq=1#page_scan_tab_contents

Boysen, F., Van Der Berg, S., Burger, R., Von Maltitz, M., and Du Rand, G. (2008). "Using an asset index to assess trends in poverty in seven Sub-Saharan African countries." *World Development*, 36(6), 1113-1130. Accessed January 2019.

<https://www.sciencedirect.com/science/article/pii/S0305750X08000466>

Braumann, B. (2004). "High Inflation and Real Wages." *IMF Staff Papers*, Vol 51(1): 123-146. Accessed July 2015. <https://www.imf.org/External/Pubs/FT/staffp/2004/01/pdf/braumann.pdf>

Cagan, P., and Lipsey, R. E. (1978). "The financial effects of inflation."

Caner, A., and Wolff, E. N. (2004). "Asset poverty in the United States, 1984–99: Evidence from the panel study of income dynamics." *Review of Income and Wealth*, 50(4), 493-518. Accessed August 2018

<https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.0034-6586.2004.00137.x>

Cardoso, E. (1992). "Inflation and Poverty." *NBER, Working Paper* 4006. Accessed July 2015.

<http://www.nber.org/papers/w4006.pdf>

Carter, M. R., and Barrett, C. B. (2006). "The economics of poverty traps and persistent poverty: An asset-based approach." *The Journal of Development Studies*, 42(2), 178-199. Accessed August 2018

<https://www.tandfonline.com/doi/pdf/10.1080/00220380500405261?needAccess=true>

Chaudhry, T. T. and Chaudhry, A. A. (2008). "The Effects of Rising Food and Fuel Costs on Poverty in Pakistan." *The Lahore Journal of Economics*, Special Edition: 117 – 138. Accessed July 2015.

<file:///C:/Users/KRSFLO001/Downloads/SSRN-id1510063.pdf>

Chipika, J. and Malaba, J. (2011). "Research on the impact of the introduction of the multicurrency system / dollarization on selected rural communities in Zimbabwe."

Cutler, D. M. and Katz, L. F. (1991). "Macroeconomic Performance and the Disadvantaged." *Brookings Papers on Economic Activity*, Vol. 2, pp 1 - 74. Brookings Institute, USA. Accessed October 2016 https://www.brookings.edu/wp-content/uploads/1991/06/1991b_bpea_cutler_katz_card_hall.pdf

Datt, G. and Ravallion, M. (1997). "Why Have Some Indian States Performed Better Than Others at Reducing Rural Poverty?" *Food Consumption and Nutrition Division, Discussion Paper* 26. Accessed June 2015. <http://ageconsearch.umn.edu/bitstream/42664/2/dp26.pdf>

Demographic and Health Surveys. (1994 – 2010). "Zimbabwe Standard DHS." United States Agency for International Development. Accessed May 2015.

<http://dhsprogram.com/data/available-datasets.cfm>

Dessus, S., Herrera, S., and De Hoyos, R. (2008). "The impact of food inflation on urban poverty and its monetary cost: some back-of-the-envelope calculations." *Agricultural Economics*, 39, 417-429. Accessed January 2019

<https://onlinelibrary.wiley.com/doi/full/10.1111/j.1574-0862.2008.00348.x>

Easterly, W. and Fisher, S. (2000). "Inflation and the Poor." *Policy Research Working Paper* 2335. Accessed June 2015. <http://www.jstor.org/stable/pdf/2673879.pdf>

Filmer, D., and Pritchett, L. H. (2001). "Estimating wealth effect without expenditure data – or tears: an application to educational enrollments in states of India". *Demography* 38: 115–32.

Frankenberg, E., Thomas, D., and Beegle, K. (1999). "The real costs of Indonesia's economic crisis: Preliminary findings from the Indonesia Family Life Surveys (pp. 99-04)." Santa Monica: Rand. Accessed January 2019

https://www.unicef.org/socialpolicy/files/The_real_cost_of_Indonesias_Economic_Crisis.pdf

Friedman, J., and Levinsohn, J. (2002). "The distributional impacts of Indonesia's financial crisis on household welfare: A "rapid response" methodology." *The World Bank Economic Review*, 16(3), 397-423. Accessed January 2019 <https://www.jstor.org/stable/pdf/3990193.pdf>

Hanke, S. H., and Kwok, A. K. (2009). "On the measurement of Zimbabwe's hyperinflation." *Cato Journal* Vol. 29, pp 353 - 364. Cato Institute, USA. Accessed May 2017

<https://object.cato.org/sites/cato.org/files/serials/files/cato-journal/2009/5/cj29n2-8.pdf>

Haveman, R. and Wolff, E. N. (2004). "The concept and measurement of asset poverty: Levels, trends and composition for the U.S., 1983 – 2001." *Journal of Economic Inequality*, Vol 2: 145 – 169. Accessed February 2016.

<http://www.ssc.wisc.edu/irpweb/initiatives/trainedu/igrfp/readings05/haveman-wolff.pdf>

Huang, J., Jin, M., Deng, S., Guo, B., Zou, L., and Sherraden, M. (2013). "Asset poverty in urban China: A study using the 2002 Chinese household income project." *Journal of Social Policy*, 42(4), 763-781. Accessed August 2018 https://www.cambridge.org/core/services/aop-cambridge-core/content/view/B8D00D72F1680101ED4603485EB1FC71/S0047279413000470a.pdf/asset_poverty_in_urban_china_a_study_using_the_2002_chinese_household_income_project.pdf

Kaseke, N. (2013). "Emergence of Electricity Crisis in Zimbabwe, Reform Response and Cost Implications." *Journal of Business Management and Social Sciences Research*, Vol 2: 1 – 15. Accessed August 2016. <http://www.borjournals.com/a/index.php/jbmssr/article/view/279/851>

Larochelle, C., Alwang, J., and Taruvinga, N. (2014). "Inter-temporal Changes in Well-being during Conditions of Hyperinflation: Evidence from Zimbabwe". *Journal of African Economics*, Vol 23:225 – 256. Accessed on July 2015.

<http://jae.oxfordjournals.org/content/23/2/225.full.pdf+html>

Malaba, J. (2006). "Poverty measurement and gender: Zimbabwe's experience." United Nations, New York. Accessed July 2015.

<http://unstats.un.org/unsd/demographic/meetings/egm/genderstats06/DOC%202014.2%20Zimbabwe.pdf>

Oliver, M. L., and Shapiro, T. M. (1990). "Wealth of a Nation: A Reassessment of Asset Inequality in America Shows At Least One Third of Households Are Asset-poor." *American Journal of Economics and Sociology*, 49(2), 129-151. Accessed August 2018

<https://www.jstor.org/stable/pdf/3487427.pdf>

Oliver, M. L., and Shapiro, T. M. (1995). "Black wealth/white wealth."

Powers, E. T. (1995). "Inflation, Unemployment and Poverty Revisited." *Economic Review* Cleveland, OH: Federal Reserve Bank of Cleveland. Quarter 3 1995:2-13. Accessed July 2015.
<file:///C:/Users/KRSFLO001/Downloads/er%201995q3%20inflation%20unemployment%20and%20poverty%20revisited%20pdf.pdf>

Ravallion, M. (1998). "Reform, Food Prices and Poverty in India." *Economic and Political Weekly*, Vol. 33: 29--36. Accessed June 2015. <http://www.jstor.org/stable/pdf/4406265.pdf>

Robilliard, A. S., Bourguignon, F., and Robinson, S. (2001). "Crisis and income distribution: A micro-macro model for Indonesia." In ESRC Development Economics/International Economics Conference. Nottingham University. Accessed January 2019

<https://pdfs.semanticscholar.org/723a/dbc4bd633307769bf30d8a9842a4d843334f.pdf>

Romer, C. D. and Romer, D. H. (1998). "Monetary Policy and the Well Being of the Poor." *NBER, Working Paper* 6793. Accessed July 2015. <http://www.nber.org/papers/w6793.pdf>

Rothwell, D., and Robson, J. (2018). "The prevalence and composition of asset poverty in Canada: 1999, 2005, and 2012." *International Journal of Social Welfare*, 27(1), 17-27. Accessed August 2018 <https://onlinelibrary.wiley.com/doi/pdf/10.1111/ijsw.12275>

Sahn, D. E. and Stifel, D. C. (2000). "Poverty Comparisons over Time and Across Countries in Africa". *World Development*, Vol 28: 2123 – 2155. Accessed May 2015.
<http://ac.els-cdn.com/S0305750X00000759/1-s2.0-S0305750X00000759-main.pdf? tid=e96192f4-d8b8-11e5-a6cc-00000aab0f01&acdnat=1456072620 f3de151b231c227543f6d27cbf52bb44>

Sherraden, M. (2005). "Inclusion in the American dream: Assets, poverty, and public policy." Oxford University Press.

Stoeffler, Q. (2014). "Multidimensional Poverty in Crisis: Lessons from Zimbabwe". *The Journal of Development Studies*, Vol 52: 428-446. Accessed February 2015.
http://quentinstoeffler.weebly.com/uploads/4/0/2/6/40265181/multidimensional_poverty_jds2015.pdf

Suryahadi, A., Sumarto, S., and Suharso, Y. (2000). "The Evolution of Poverty during the Crisis in Indonesia, 1996 to 1999." The World Bank. Accessed January 2019
<https://213.154.74.164/invenio/record/12519/files/asep.pdf>

Taylor, J. (1974). "Unemployment and wage inflation with special reference to Britain and the USA."

UNICEF (2013). "Migration Profiles: Zimbabwe". Accessed November 2018
<https://esa.un.org/miggmgprofiles/indicators/files/Zimbabwe.pdf>

World Bank (2013). "The future of sanitation in Harare and other cities: Perspectives on possible pathways to recovery." The Zimbabwe Water Forum. Policy Note 4.0.

ZimSTAT, (2012). "Poverty Income Consumption and Expenditure Survey 2011/12", Zimbabwe National Statistics Agency. Harare, Zimbabwe: ZIMSTAT.

ZimVAC (2007). "Zimbabwe Food Security and Nutrition Assessment." Food and Nutrition Council, Harare, Zimbabwe.

ZimVAC (2009). "Urban Food Security Assessment: January 2009 National Report." Food and Nutrition Council, Harare, Zimbabwe.

ZimVAC (2010). "Rural Livelihoods Assessment: May 2010 Report." Food and Nutrition Council, Harare, Zimbabwe.