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Consumption Inequality in Botswana: The Decomposition of the Gini Coefficient of Consumer Expenditures

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ABSTRACT

This paper applies the Lerman and Yitzhaki (1985) inequality decomposition approach on food and non-food expenditures on the 2009/10 Botswana Core Welfare Indicator Survey; and the 2015/16 Multi Topic Indicator Survey datasets with an objective to see how overall inequality translates into inequality within each expenditure component. To test for a robustness of our results, we apply a simple bootstrap procedure to obtain the means, standard errors and confidence intervals for the component Gini coefficients estimates. The decomposition analysis results show that overall inequality based on the Gini coefficient of consumption expenditure within the groups has increased between the two periods from 0.498 to 0.533. These results suggest that this rise in overall expenditure inequality is due to the increased burden in the household budget of non-food spending, which tends to be more unequal than food spending. The consumption expenditure is very unequal on non-food items like recreation and hotels; health; education and transport. On one hand, lower Gini coefficients are observed for food; and clothing and footwear; these commodities are considered as necessities among others. This paper finally offers some possible policy measures to curb this consumption expenditure inequality.

Keywords: Inequality - Consumption - Expenditure - Gini Coefficient - and Decomposition

JEL Classification Codes: D6; D63

1. INTRODUCTION

Rising inequality has become a widespread concern for both advanced and emerging economies. Numerous studies¹ on the levels of inequality; its relationship to poverty and growth; and its impact on economic development have been done. Botswana like other African countries is not immune to the public policy concern of rising inequality as both income and consumption inequalities have been on the increase. According to the World Bank (2015) Income Gini Index estimates, Botswana ranks third world's highest unequal country after South Africa and Seychelles. Botswana's national level income inequality declined marginally between 1985/86 and 1993/94 from 0.558 to 0.539 but increased between 1993/94 and 2002/2003 from 0.539 to 0.573, and decreased slightly from 0.645 in 2009/10, to 0.601 in 2015/16. On the other hand, consumption inequality was measured at 0.495 in 2009/10; and increased to 0.522 in 2015/16 (Statistics Botswana: 2015, 2017; World Bank, 2015). With the indication that high and sustained levels of inequality can entail large social costs, and lower poverty reduction efforts gains, it is important to decompose the inequality indices into the various relevant components to advice policy. This allows for identification of which components mostly contributes to household consumption expenditure; and also allows an understanding of how changes in consumption of a particular component will affect overall consumption inequality. The latter is particularly useful to evaluate the effectiveness of social policies like those of education and health to reduce consumption inequality.

Despite the rising inequality in Botswana, less work has been done to decompose both poverty and inequality. Amongst the few available studies is the one done by the International Poverty Centre of UNDP and BIDPA (2005) which used Kakwani's decomposition approach of poverty changes into redistribution and growth. The study found out that the growth component has accounted for more poverty reduction over the entire period. The results further show a significant slowdown in poverty reduction given the level of growth rate between the two periods, however the first period (1985/86 and 1993/94) performed better. More interestingly, despite the good annual economic growth rate during that period, IPC and BIDPA (2005) found out that the Gini index of per capita consumption rose from 58.1 percent in 1985-86 to 64.7 percent in 2002-03. The conclusion drawn is that inequality increased, and the benefits of economic growth in Botswana were not shared equally among population groups, and economic growth benefited the non-poor proportionally more than it did the poor.

1 The 2014 Pew Research Centre Survey found that the gap between the rich and the poor is considered a major challenge by above 60 percent of respondents' world-wide. Ravallion and Chen (2007), found out that if worsening income distribution had been avoided, poverty reduction would have been even more impressive. Other studies show that high inequality can also be a sign of lack of social mobility and opportunity, or a reflection of deep rooted disadvantages facing specific segments of society. For example, the IMF (2015) indicates that widening inequality may have significant implications for growth and macroeconomic stability, as it can concentrate political and decision making power in the hands of a few, which may lead to a suboptimal use of human resources, reduce investments; and contribute to political and economic instability.

Okatch, et al., (2013) on one hand provide an income inequality decomposition analysis by factor components in Botswana using regression based methodology developed by Fields (2003) to determine factors driving income inequality at household level in Botswana. Results of the inequality decomposition indicate that secondary school education, training, Value Added Tax, number of children and number of working adults in the household contribute significantly to inequality in Botswana. In contrast, variables like primary education, age and owning between 1 and 10 head of livestock equalises income inequality.

In addition to the two studies mentioned above, the World Bank (2015) analysed recent trends in the monetary and non-monetary aspects of poverty in Botswana, based on Household Income and Expenditure Survey of 2002/03 and the Botswana Core Welfare Survey of 2009/10. The study examined the drivers of poverty reduction; and sources of inequality by systematically looking at the demographic, labour, and human capital dimensions. The assessment found out that income inequality measured by the Gini coefficient (of per capita consumption), is still high but has fallen significantly, from 64.7 percent in 2002/03 to 60.5 percent in 2009/10; and most of the decline occurred due to welfare improvements in rural areas. The World Bank (2015) also decomposed inequality into within group and between group components to provide a partial explanation for inequality changes. Between-group inequality's share was 14.8 percent by household size and 19.1 percent by the number of children, making those factors the major contributors to total inequality (measured by the Thiel inequality index) in 2009/10. On the other hand, the region and education-level variables play less significant yet still important roles in determining inequality. Regional differences explained 8.3 percent of inequality, and education accounted for 7.8 percent; while gender and labour categories explain less of the disparities, having lower between-group components.

The studies above mostly focused on studying sources of income inequality; and little was done on the consumption inequality and its decomposition into various components to see how overall inequality translates into inequality within each expenditure component. Without a doubt, there is a concern in the rising consumption inequality in Botswana. The 2015/16 Botswana Multi-Topic Household Indicator Survey indicate an increase from 0.495 in 2009/10 to 0.522, at national level in the consumption Gini Coefficient. At stratum level, the rural and urban areas also recorded increases, from 0.438 to 0.474, and 0.510 to 0.518, respectively. It is easy to argue that family welfare is better measured by consumption rather than income; thus concerns about rising consumption inequality inform significant policy issues, including income tax policy, and immigration. Therefore, the objective of this study is to decompose expenditure Gini coefficient into food and non-food components using the data sets from the 2009/10 Botswana Core Welfare Indicator Survey and the latest 2015/16 Multi Topic Indicator Survey.

This study is found to be relevant as it intends to decompose consumption expenditure Gini coefficient rather than income inequality, as it has been argued in literature² that inequality measures based on income alone are more likely to be biased due to business cycles and the misreporting of income as compared to consumption expenditure. Further, the study uses the most recent data base; and also apply the method introduced by Lerman and Yitzhaki (1985). The method has been used by Garner (1993); and Cami (2017), and has not been applied to Botswana data before. Such an analysis would provide necessary information on the understanding of household welfare and expenditure, by indicating the extent to which the overall inequality in consumption translates into inequality in essential indicators of wellbeing such as food consumption, housing expenditure, expenditure on health, expenditure on education, among others. This information would in turn be useful in understanding the various implications of inequality, such as the impact on investment in human capital through education and health.

The rest of the paper is organised as follows: Section 2 is related to theoretical framework of inequality; while Section 3 describes the inequality decomposition methodology. Section 4 discusses the results. Section 5 concludes the paper.

2.0 THEORETICAL FRAMEWORK

Development frameworks that examine inequality dates back to 1950s, where we see a long history beginning with the growth and distribution literature (Lewis, 1954; Kuznets, 1955). The major concern of these early approaches was the nature of the relationship between economic growth and income distribution. However, by the late 1990s, approaches addressing income inequality were more concerned with the role of inequality for poverty reduction. Recently, the plumb appears to have shifted, with the literature focused on the interplay among growth, inequality and poverty (UNDP, 2014). All these debates have left inequality a long standing issue in development and policy discussions; which shows that inequality matters, therefore this section tries to discuss inequality in its different forms; its measure; and properties.

2.1 DEFINITION OF INEQUALITY

Development Economics defines inequality over the entire population, not just for the population below a certain line like poverty. Inequality measures are often calculated over distributions, for example in forms of income, land, pay/wage, wealth, assets, tax payments and other continuous variables. Income inequality in this context is the extent to which income is distributed unevenly in a group of people; and measurement of income can be on an individual or household basis. Conversely, pay inequality describes the difference between people's pay and this may be within one company or across all pay received in a county. On the other hand, wealth refers to the total amount of assets of an individual or household. This may include financial assets, such as bonds and stocks, property and private

² See Meyer and Sullivan, 2003; 2006 and Krueger and Perri, 2005.

pension rights. Wealth inequality therefore refers to the unequal distribution of assets in a group of people (DW Stand, 2011,). Notably, in many debates on inequality, income or wealth are the most discussed. However, when it comes to economic wellbeing, wealth and income aren't the only important players, consumption is also vital. This paper thus, sums inequality as a state whereby people have different degrees of income or consumption.

2.2 PROPERTIES OF INEQUALITY

Litchfield (1999) emphasises that good inequality measures should satisfy five properties namely anonymity, scale independence, population independence, transfer principle and decomposability. The anonymity axiom requires that an inequality metric does not depend on the labelling of individuals in an economy and, hence, concern should be placed only on the distribution of income. This property distinguishes the concept of inequality from that of fairness. Hence, an inequality measure should not concern itself with what kind of income certain people deserve, but rather on how it's distributed. On the other hand, the scale independence property emphasises that the inequality measure should not be affected by uniform proportional changes in all individuals' income. For example, if every person's income in an economy is doubled (or multiplied by any positive constant), then the overall measure of inequality should not change. The inequality income metric should be independent of the aggregate level of income. On the population independence axiom, it is required that the inequality measure should not be dependent on the size of the population, such that merging two identical distributions should not alter inequality (Shorrocks, 1980). The transfer principle (commonly referred to as the Pigou–Dalton transfer principle) indicates, in its weak form, that if some income is transferred from a rich person to a poor person while still preserving the order of income ranks, then the measured inequality should not increase. However, in its strong form, the measured level of inequality should actually decrease. Cowell (1980; 1981; 1988) also argues that there is need for a coherent relationship between inequality in the whole of society and inequality in its constituent parts; and therefore emphasises that a good inequality measure should be decomposable.

2.3 MEASURES OF INEQUALITY

A number of techniques to measure inequality in a population have notably been developed and tested over time. A popular measure of inequality, is the Gini coefficient, which is discussed below.

The Gini Coefficient

The Gini coefficient is a measure of inequality of a distribution and is defined as a ratio with values between 0 and 1: the numerator is the area between the Lorenz curve³ and

³ Lorenz curve, a cumulative frequency curve that compares the distribution of a specific variable (e.g. income) with the uniform distribution that represents equality.

the uniform distribution line; while the denominator is the area under the uniform distribution line. Based on the Lorenz curve, where y -axis represents the cumulative proportion of income for a given proportion of population, i.e. the income share calculated by taking the cumulated income of a given share of the population, divided by the total income (Y), gives the Lorenz Curve Function as follows,

$$L\left(\frac{Y}{P}\right) = \frac{\sum_{i=1}^K y_i}{Y} \quad (1)$$

where

$K = 1, \dots, n$ is the position of each individual in the income distribution;

P is the total number of individuals in the distribution;

y_i is the income of the i^{th} individual in the distribution

Y is the total income

$\sum_{i=1}^K y_i$ is the cumulated income up to the K^{th} individual, and ranges between 0 for $k = 0$ and Y for $k = n$.

It is apparent to indicate that an income distribution of a finite population of n individuals is an ordered list of incomes (from the lowest to the highest) where each income y_i is attached to a given individual or household i . Analytically it is given by $y = (y_1, y_2, y_3, \dots, y_n)$, where y represents a vector of individual incomes. If household incomes are considered, then to each household income there should also be attached a number w reflecting household size, in order to make meaningful comparisons among income levels: therefore, $y = [(w_1 y_1), (w_2 y_2), (w_3 y_3), \dots, (w_n y_n)]$.

Then based on the Lorenz curve, the Gini coefficient can then be expressed as

$$G = 1 - 2 \int_0^1 \left[\frac{\sum_{i=1}^K y_i}{Y} \right] dy \quad (2)$$

There are other measures of inequality that satisfy the inequality axioms and among these are the widely known Theil's T and L indexes; which both belong to the family of generalized entropy inequality measures. They both allow for inequality within areas (say rural and urban) and between areas (rural-urban income gap) (World Bank, 2015). Further, Atkinson (1970) proposed another class of inequality measures that have been used world-wide; and this class also has a weighting parameter (ϵ) which measures aversion to inequality. Atkinson's class of inequality measure have theoretical properties

similar to those of the extended Gini index. In addition, there is the decile dispersion ratio which is widely used and it presents the ratio of the average consumption of income of the richest 10 percent of the population divided by the average income of the bottom 10 percent. This ratio can also be calculated for other percentiles (for instance, dividing the average consumption of the richest 5 percent – the 95th percentile – by that of the poorest 5 percent – the 5th percentile). The decile ratio is readily interpretable, by expressing the income of the top 10 percent (the rich) as a multiple of that of those in the poorest decile (the poor). However, it ignores information about incomes in the middle of the income distribution, and does not even use information about the distribution of income within the top and bottom deciles. On the other hand, Pearson in his 1896 work, introduced the Coefficient of Variation which provides a measure of dispersion relative to the mean (Theodore. P, M. 1986). This measure of variation, expresses the Standard Deviation as a percentage of the arithmetic mean. Other measures are the deciles and the quantiles dispersion ratios.

Among the above mentioned measures, the Generalised Entropy class (Theil's T and Theil's L), allow one to decompose inequality into the part that is due to inequality within areas (e.g. urban, rural) and the part that is due to differences between areas (e.g. the rural-urban income gap). Yet the Theil index satisfies all the required properties, DeClue (2007) criticises it for lacking a forthright representation and an interpretation that the Gini coefficient has. However, while the Gini coefficient has many desirable properties it cannot easily be decomposed into the part that is due to inequality within areas (for example, urban and rural) and the part that is due to differences between areas (for example, the rural-urban income gap). Nonetheless, an extended Gini coefficient⁴, was introduced by Yitzhaki (1983), and this index accommodates differing aversions to inequality; and allows component inequality decomposition analysis. Other key advantages of the Gini coefficient over alternative inequality measures are: as a statistical measure of variability, the Gini coefficient can handle negative income, a property some other inequality measures do not possess. This is found to be important when dealing with the impact of a change in policy on inequality in income because the income of some households can be negative. Another advantage of the Gini coefficient and related concepts such as the Gini income elasticity is that these measures have statistical properties that are better known than those of other inequality measures. It is thus, feasible to assess whether the impact of a change in policy on income/consumption inequality is statistically significant at the margin (Wodon and Yitzhaki, 2002). The Gini coefficient also has a geometrical representation, thus one can visualize differences in inequality among alternative distributions, as well as the differential impact of various income or consumption sources. The Gini index further has solid theoretical foundations, which is not the case for some other inequality measures- as a normative index, the Gini

4 The extended Gini can reflect different preferences among policymakers (that is, more or less pro-poor) when assessing the extent of inequality and the impact of various programmes and policies on inequality. Specifically, the extended Gini can take into account various social preferences in terms of the weights placed on various parts of the distribution of income or consumption when measuring inequality.

represents the theory of relative deprivation which is a sociological theory explaining the feelings of deprivation among individuals in society; and the Gini coefficient can also be derived as an inequality measure from axioms on social justice (Runciman, 1966; Yitzhaki, 1979 and 1982; Ebert and Moyes, 2000; Wodon and Yitzhaki, 2002; and Shorrocks, 1980 and 1982). Based on the above discussion, this study uses the expenditure Gini coefficient as a measure of inequality.

3.0 METHODOLOGY

Different methods have been developed to decompose inequality. This study however, adopts the Gini decomposition method introduced by Lerman and Yitzhaki (1985); which was later used by Garner (1993); and Cami (2017). This method allows the estimation of bootstrapped standard errors and confidence intervals. The Gini coefficient is treated as an indicator of inequality in the distribution of household expenditures in the population; and, the formula for the Household Expenditure is given as the covariance of the total expenditure (X), the cumulative distribution $[F(X)]$ and the mean of total expenditures (m) and is expressed as follows:

$$G = \frac{2Cov(X, F)}{m} \quad (3)$$

Then following Lerman and Yitzhaki (1984; 1985), consumption expenditure is decomposed in (X) components such that:

$$X = \sum_{k=1}^K (X_k) \quad (4)$$

The components are: food, alcohol and tobacco, clothing and footwear, housing costs, household goods and services, medical health/ health care, transport, communication, recreation and culture, education, restaurants and hotels, and miscellaneous. F_k represents the cumulative distribution of X_k and m_k is the mean. Therefore, the Gini coefficient of the ' K^{th} ' component is calculated as:

$$G_k = \frac{2 \sum_{k=1}^K Cov(X_k, F_k)}{m_k} \quad (5)$$

Then utilising the cumulative distributions and averages of the expenditure components, the Gini coefficient of the Total Expenditures would be expressed as:

$$G = \frac{2 \sum_{k=1}^K Cov(X_k, F)}{m} \quad (6)$$

Using Lerman and Yitzhaki (1985), we combine the equations above then show that the relative Gini coefficient can be decomposed as follows:

$$G = \sum_{k=1}^K \left[\frac{Cov(X_k, F)}{Cov(X_k, F_k)} x \frac{2Cov(X_k, F_k)}{m_k} x \frac{m_k}{m} \right] \quad (7)$$

$$\text{Thus: } G = \sum_{k=1}^K S_k G_k R_k = \sum_{k=1}^K C_k \quad (8)$$

Where, R_k is the correlation between expenditures of the k^{th} component with total expenditures, G_k is the Gini coefficient for each one of the expenditure components and S_k is the contribution to total expenses of the k^{th} component. C_k on the other hand is the product of the three decomposed elements for the k^{th} component. The above equation 8 indicates that any change in the variables R_k , G_k , or S_k will be mirrored by changes of C_k . The higher the value of one of these components, the more C_k increases, and the more the expenditure inequality increases since $G = \sum_{k=1}^K C_k$. In our analysis we also measure the relative effects of inequality by calculating both the *relative expenditure* inequality ($I_k = C_k / G$), and, the *relative marginal effects* ($I_k - S_k$). Lastly, we also calculated the elasticity $\{e = [(R_k \times G_k) / G]\}$ for each component to determine whether it's consumed as a luxury; necessity or inferior good.

4.0 DATA AND RESULTS

4.1 DATA SOURCES

This study requires data sets that provide detailed household economic activity; and the main data source of the household economic activity in Botswana is the Household Income and Expenditure Survey (HIES). Household Income and Expenditure Surveys were conducted every 10 years; in 1985/86, 1993/94 and 2002/03, to provide data on household incomes and expenditures, and computation of Poverty Datum Lines (PDL); and to provide up to date information to update statistics required in monitoring and development planning. The HIES were improved into a Core Welfare Indicator Survey (BCWIS) in 2009/10; and was improved into the Botswana Multi Topic Indicator Survey (BMTIS) in 2015/16. All these surveys were conducted by Statistics Botswana country-wide and they provide a detailed account of consumption expenditures. The BCWIS was conducted between April 2009 and March 2010, and covered additional welfare measures to enable comprehensive understanding of 7,732 households' wellbeing. On one hand, the BMTIS was conducted between November 2015 and October 2016, and covered 7188 households. The indicators covered by these surveys, include, among others, health status, nutrition, food security, participation/exclusion, personal security, access to and satisfaction with services provided in Botswana. Furthermore, it included

households' self-assessment poverty, community, health centre, employment/labour and school modules.

These surveys have two formats of data: aggregated and disaggregated data. The aggregated data is with respect to the various income groups; for example, the average monthly consumption per household in a certain group, and so on. Idrees and Ahmad (2010); argue that this grouping suppresses important information and makes it impossible to explore consumption inequalities within households in the same group of income. Due to this limitation the study is based on the disaggregated micro data from the two surveys. Further, in many surveys that give data on economic activity, many consumption components are measured using household expenditures. However, Cami (2017) indicates that there are significant differences between the two concepts. Occasionally, expenditures exclude consumption that is not based on market transactions. Given the importance of domestic production in developing and transiting countries, this can be a significant difference. Additionally, expenditures refer to the purchase of a certain good or service, while in reality, some goods cannot be consumed immediately or may have permanent benefits (Cami, 2017). For this research, expenditure⁵ inequality is used as a proxy for consumption inequality as the data bases does not give real household consumption data. All the above arguments indicate that the measurement of inequality is sensitive to the resource measured, the data source, the sample weighting, and the unit of analysis. Thus, for both datasets there were many reported zeros for the components which could bring an increase in the Gini coefficient; and also could deflate the total household expenditure. Hence, in order to obtain more accurate values, we truncate and dropped those households that had reported zero total expenditure; and those households that reported only food expenditure and zeros for all other components. This gave us a total of 4,950; and 5,047 observations from the BCWIS and BMTIS datasets, respectively.

4.2 DESCRIPTION OF VARIABLES

Table 1 in Appendix 1 gives the details of the variables used in the study: food and non-food components (education; health, housing, alcohol and tobacco; communication; transport; recreation and culture; restaurants and hotels; clothing and footwear; and miscellaneous). Tables 2 describes the variables' variations.

5 These are consumption expenditures of households on goods and services recorded over a period of 30 days during the survey period, excluding expenditure on capital formation and investment/savings; insurance; income tax; loan repayments and cash transfers

Table 2: Description of Variables

2009/10 BCWIS						
Expenditure Component	Obs	Weight	Mean	Std. Dev.	Min	Max
Total Expenditure	4,950	350928	4,410.16	10,086.35	1,100.43	568,091.10
Food	4,950	350928	724.80	750.81	0.00	22,578.45
Education	4,950	350928	241.64	851.13	0.00	15395.75
Health	4,950	350928	16.74	265.97	0.00	7,600.00
Housing	4,950	350928	567.88	1,551.33	0.00	42,764.15
Alcohol and Tobacco	4,950	350928	347.78	617.55	0.00	18,216.00
Communication	4,950	350928	233.38	441.08	0.00	10,185.08
Transport	4,950	350928	969.97	5,229.20	0.00	288,638.90
Recreation and Culture	4,950	350928	213.71	1,018.88	0.00	34,525.00
Restaurant and Hotels	4,950	350928	133.45	2,147.56	0.00	140,000.00
Household Goods and Services	4,950	350928	378.38	1,992.14	0.00	107,638.10
Clothes and Footwear	4,950	350928	328.87	724.48	0.00	42,666.67
Miscellaneous	4,950	350,928	394.76	1,875.19	0.00	74,549.88

2015/16 BMTIS**Expenditure Component**

Total Expenditure	5,047	441106	5060.32	12378.20	1000.31	475218.30
Food	5,047	441106	529.48	316.84	308.06	5480.00
Education	5,047	441106	241.64	851.13	0.00	15395.75
Health	5,047	441106	180.69	841.85	0.00	28290.33
Housing	5,047	441106	928.50	9372.32	0.00	438219.30
Alcohol and Tobacco	5,047	441106	928.50	9372.32	0.00	438219.30
Communication	5,047	441106	359.22	849.07	0.00	28000.00
Transport	5,047	441106	1256.18	5049.78	0.00	192000.00
Recreation and Culture	5,047	441106	149.34	464.43	0.00	11113.33
Restaurant and Hotels	5,047	441106	194.31	505.97	0.00	12006.67
Household Goods and Services	5,047	441106	261.51	1067.29	0.00	43057.75
Clothes and Footwear	5,047	441106	311.91	550.30	0.00	14081.51
Miscellaneous	5,047	441106	468.63	1046.28	0.00	23205.00

4.3 DECOMPOSITION ANALYSIS

The expenditure inequality effects by budget component are presented in Table 3 and 4.

Table 3: 2009/10 Inequality Effects by Budget Component

Component	Contribution of Total Inequality (C_k)	Expenditure Share (S_k)	Component Gini (G_k)	Correlation with Rank of Total Expenditure (R_k)	Share Expenditure Inequality (I_k)	Relative Expenditure Inequality (I_k/S_k)	Relative Marginal Effect ($I_k - S_k$)	Expenditure Elasticity ($e = R_k * G_k / G$)
Food	0.039	0.165	0.421	0.557	0.076	0.462	-0.089	0.472
Alcohol and Tobacco	0.010	0.081	0.732	0.172	0.020	0.248	-0.061	0.253
Clothes and Footwear	0.027	0.076	0.623	0.577	0.054	0.708	-0.022	1.180
Housing	0.047	0.122	0.733	0.519	0.091	0.748	-0.031	0.764
Household Goods and Services	0.050	0.085	0.793	0.740	0.098	1.154	0.013	1.180
Health	0.001	0.002	0.987	0.473	0.002	0.889	0.000	0.939
Transport	0.180	0.227	0.884	0.895	0.354	1.559	0.127	1.592
Communication	0.022	0.053	0.675	0.619	0.044	0.824	-0.009	0.841
Recreation and Culture	0.034	0.049	0.904	0.773	0.067	1.374	0.018	1.404
Education	0.003	0.006	0.983	0.595	0.007	1.161	0.001	1.177
Restaurant and Hotels	0.028	0.030	0.992	0.940	0.055	1.836	0.025	1.874
Miscellaneous	0.057	0.089	0.808	0.794	0.113	1.262	0.023	1.289
Total	0.498	1.00	0.498				0.00	

Author's Calculations from the 2009/10 Botswana Core Welfare Indicator Survey Data

Table 4: 2015/16 Inequality Effects by Budget Component

Component	Contribution of Total Inequality (C_k)	Expenditure Share (S_k)	Component Gini (G_k)	Correlation with Rank of Total Expenditure (R_k)	Share Expenditure Inequality (I_k)	Relative Expenditure Inequality (I_k/S_k)	Relative Marginal Effect ($I_k - S_k$)	Expenditure Elasticity ($e = R_k * G_k / G$)
Food	0.005	0.108	0.224	0.227	0.010	0.096	-0.098	0.095
Alcohol and Tobacco	0.013	0.037	0.880	0.391	0.024	0.646	-0.013	0.644
Clothes and Footwear	0.025	0.061	0.652	0.630	0.047	0.770	-0.014	0.770
Housing	0.146	0.192	0.864	0.879	0.274	1.425	0.082	1.425
Household Goods and Services	0.029	0.050	0.831	0.705	0.055	1.099	0.005	1.100
Health	0.021	0.034	0.864	0.699	0.039	1.132	0.005	1.132
Transport	0.161	0.239	0.770	0.875	0.302	1.264	0.063	1.264
Communication	0.031	0.072	0.631	0.678	0.058	0.803	-0.014	0.803
Recreation and Culture	0.018	0.030	0.862	0.699	0.033	1.132	0.004	1.130
Education	0.026	0.045	0.871	0.662	0.048	1.081	0.004	1.081
Restaurant and Hotels	0.017	0.038	0.796	0.585	0.033	0.875	-0.005	0.874
Miscellaneous	0.042	0.096	0.749	0.577	0.078	0.810	-0.018	0.810
Total	0.533	1.000	0.533				0.000	

Author's Calculations from the 2015/16 Botswana Multi Topic Indicator Survey

Total Consumption Expenditure Gini Coefficient

The total of column 1 of Tables 3 and 4 gives the overall Gini based on total consumption expenditure at 0.498 in 2009/10 and 0.533 in 2015/16. This increase deepens policy concerns on inequality in Botswana because consumption expenditure here measures how much people spend on food, shelter, transportation, and other goods and services which provides a more accurate picture of their circumstances and wellbeing⁶.

Component Gini Coefficient

Column 3 of Tables 3 and 4 shows the expenditure Gini coefficients of each component. Component Gini for the two periods are high in non-food items like restaurants and hotels; health; education; transport; and recreation and culture; which implies that there is high probability that these components are highly unequally distributed compared to other components. In 2009/10, restaurants and hotels assumes the highest Gini of 0.992, which goes down significantly in 2015/16 to 0.796. A bit lower Gini coefficients are observed for food; clothing and footwear; and communication for the two periods; these are commodities that households consider as necessities and households cannot live without. The relatively low food's Gini indicates that food expenditures are fairly equally distributed among the population. The results also show that food has been replaced by non-food items in the two periods; and are confirmed by the reported expenditures in the two periods. The expenditure data reported in 2009/10, confirms a change in order of importance, with transport, food and housing being allocated the highest shares of 20.7, 17.7 and 13.6 percent of the consumption expenditure budget in cities/towns only, in urban villages and rural areas households increased their share allocated to transport at lesser magnitude such that food remained the most important commodity. Likewise, in 2015/16, at national level, households allocated significant proportions of their consumption expenditure to transport, at 23.9 percent, followed by housing costs and food at 17.8 percent and 12.8 percent respectively. In cities/towns, households allocated 22.2 percent of their consumption expenditure to transport, followed by housing costs at 19.7 percent and miscellaneous items at 9.7 percent. For urban villages, the largest of consumption expenditure was allocated to transport at 25.0 percent, followed by housing costs and food at 18.8 percent and 12.8 percent respectively. In rural areas, the largest share of consumption expenditure was allocated to transport at 24.7 percent followed by food at 21.4 percent and housing costs at 12.4 percent. Evidently food was replaced by transport and transport consumables like fuel in the order of importance. This satisfies the Engel's Law, which indicates that as households' incomes improve, the budget allocation shifts such that the budget allocated to food becomes smaller as households spend more on "luxury" goods.

6 Consumption is the sole end and purpose of all production and the welfare of the producer ought to be attended to, only so far as it may be necessary for promoting that of the consumer. [Adam Smith, *The Wealth of Nations*, 1937 Modern Library edition, p. 625]

Contribution to Total Consumption Expenditure Inequality

Column 1 of Tables 3 and 4 represents the contribution of each component to the total inequality. As per the results during the two periods transport dominates the contribution to the total consumption expenditure Gini. However, these results also show that in 2009/10 amongst those components with lower component Gini coefficients (G_k) like food and housing contribute more to the total consumption expenditure Gini; while health; education; recreation and culture; restaurants and hotels contribute less to the total consumption expenditure Gini coefficient regardless of having high component Gini coefficients. These results suggest that regardless of low component Gini total value, commodities like food and housing cannot be overlooked as there are very important and are a better indicator of inclusive inequality.

Expenditure Elasticity

Column 8 in both Tables 3 and 4 gives expenditure elasticity figures, and when all elasticity figures are positive it indicates that all the expenditure components are normal goods (Garner, 1993). As per the results restaurants and hotels; recreation and culture; transport; miscellaneous; households' goods and services; and education have high expenditure elasticities. Specifically, in 2009/10 highest elasticity values (>1) are observed for restaurants and hotels; recreation and culture; transport; miscellaneous; education; household goods and services; and clothing and foot wear. This indicates that an increase in expenditure for these components will significantly increase the expenditure consumption Gini coefficient. On the other hand, alcohol and tobacco; food; housing; and health show relatively low elasticities (<1) as compared to other commodities. This indicates that these commodities are considered as necessities.

In 2015/16, the same pattern is observed with transport (e increased); restaurants and hotels; recreation and culture; miscellaneous; education; household goods and services having elasticity values greater than 1. However, expenditure elasticity for health and housing increased. For the same period low expenditure elasticities for food (decreased); alcohol and tobacco; and clothing and footwear are observed. As for policy, there is need for caution on addictive substances as elasticity also reveals whether firms can pass higher costs that they incur on to consumers; and addictive substances like alcohol and cigarettes tend to fall into this category. For example, the demand for cigarettes is relatively inelastic among regular smokers who are somewhat addicted; and economic research suggests that increasing the price of cigarettes leads to a reduction in the quantity of cigarettes smoked by adults. Therefore, if Government increases taxes on companies that make cigarettes, the supply of cigarettes will decrease and prices will increase; and as these happens taxes are mainly passed along to consumers in the form of higher prices. These higher taxes on cigarettes will raise tax revenue for the government, but they will not much affect the quantity of smoking.

Relative Marginal Effects

We also calculated the relative marginal effect and the results are shown by column 7 of Tables 3 and 4. A positive marginal effect coefficient indicates that an increase in expenditure for the component will increase the inequality in consumption expenditure. This implies that any increase in the expenditures for transport; recreation and culture; restaurants and hotels; household goods and services; miscellaneous; housing; education and health will increase the Gini consumption inequality. However, a rise in the expenditures of food; alcohol and tobacco; clothing and footwear; and communication will bring a decrease in the Gini of consumption expenditure.

4.4 BOOTSTRAP RESULTS

Since we are working with moderated samples of 4950 and 5047 respectively, which can probably affect our results, we need to ascertain our results with a robustness approach, which in this case is the simple bootstrap. By so doing we compute the means, standard errors and confidence intervals for the Gini coefficients calculated above, (Mills and Zandvakili, 1997). The bootstrap results are given in Table 5 (BCWIS, 2009/10) and Table 6 (BMTIS, 2015/16). Column 2 (Observed) in Tables 5 and 6 gives the percentage change which corresponds to column 7 (relative marginal effect) in Tables 3 and 4; while columns 3 and 4 shows the bias and standard errors of the expenditure components, respectively. On one hand, column 5 of Tables 5 and 6 indicates the confidence interval within which the marginal effect lies. The difference between the marginal effect in Tables 3 and 4 and the observed change in Tables 5 and 6, is very minimal and almost non-existent which generally indicates that the results are reliable and significant.

Table 5: Bootstrap Results: 2009/10

Bootstrap statistics		Number of obs = 4950 Replications = 1000			[95% Conf. Interval]		
Variable	Reps	Observed	Bias	Std. Err.			
Food	1000	-0.089	0.000	0.002	-0.093	-0.084	(N)
					-0.093	-0.084	(P)
					-0.093	-0.084	(BC)
Alcohol and Tobacco	1000	-0.061	0.000	0.003	-0.066	-0.056	(N)
					-0.066	-0.056	(P)
					-0.066	-0.056	(BC)
Clothes and Footwear	1000	-0.022	-0.000	0.002	-0.025	-0.019	(N)
					-0.025	-0.019	(P)
					-0.025	-0.019	(BC)
Housing	1000	-0.031	0.000	0.005	-0.040	-0.022	(N)
					-0.039	-0.021	(P)
					-0.039	-0.022	(BC)
Households Goods and Services	1000	0.013	0.000	0.006	0.001	0.026	(N)
					0.002	0.027	(P)
					0.002	0.027	(BC)
Health	1000	-0.000	0.000	0.000	-0.001	0.001	(N)
					-0.001	0.001	(P)
					-0.001	0.001	(BC)
Transport	1000	0.127	-0.000	0.007	0.113	0.140	(N)
					0.114	0.140	(P)
					0.114	0.141	(BC)
Communication	1000	-0.009	0.000	0.001	-0.012	-0.007	(N)
					-0.012	-0.007	(P)
					-0.012	-0.007	(BC)
Recreation and Culture	1000	0.018	0.000	0.003	0.012	0.025	(N)
					0.012	0.025	(P)
					0.012	0.025	(BC)
Education	1000	0.001	0.000	0.001	-0.001	0.003	(N)
					-0.001	0.003	(P)
					-0.001	0.003	(BC)
Restaurants and Hotels	1000	0.025	-0.000	0.005	0.015	0.035	(N)
					0.016	0.035	(P)
					0.016	0.035	(BC)
Miscellaneous	1000	0.023	-0.000	0.004	0.016	0.031	(N)
					0.017	0.031	(P)
					0.017	0.031	(BC)

Author's calculations from the BCWIS of 2009/10 (Note: N = Normal; P = Percentile and BC = Bias-Corrected)

Table 6: Bootstrap Results: 2015/16

Bootstrap statistics				Number of Obs = 5091 Replications = 1000			
Variable	Reps	Observed	Bias	Std. Err.	[95% Conf. Interval]		
Food	1000	-0.097	0.000	0.003	-0.104	-0.091	(N)
					0.104	-0.091	(P)
					0.103	-0.091	(BC)
Alcohol and Tobacco	1000	-0.013	0.000	0.002	-0.016	-0.010	(N)
					0.016	-0.010	(P)
					0.016	-0.009	(BC)
Clothes and Footwear	1000	-0.014	0.000	0.001	-0.016	-0.012	(N)
					0.016	-0.011	(P)
					0.016	-0.012	(BC)
Housing	1000	0.082	-0.002	0.015	0.052	0.112	(N)
					0.051	0.111	(P)
					0.055	0.114	(BC)
Households Goods and Services	1000	0.005	0.000	0.002	0.000	0.010	(N)
					0.001	0.010	(P)
					0.001	0.010	(BC)
Health	1000	0.004	0.000	0.002	0.001	0.008	(N)
					0.002	0.009	(P)
					0.001	0.009	(BC)
Transport	1000	0.063	0.001	0.011	0.042	0.084	(N)
					0.042	0.085	(P)
					0.041	0.083	(BC)
Communication	1000	-0.014	0.000	0.002	-0.018	-0.011	(N)
					0.017	-0.010	(P)
					0.017	-0.010	(BC)
Recreation and Culture	1000	0.004	0.000	0.001	0.001	0.006	(N)
					0.002	0.006	(P)
					0.002	0.006	(BC)
Education	1000	0.004	0.000	0.002	0.000	0.008	(N)
					0.000	0.008	(P)
					0.000	0.008	(BC)
Restaurants and Hotels	1000	-0.005	0.000	0.001	-0.007	-0.003	(N)
					0.007	-0.002	(P)
					0.007	-0.003	(BC)
Miscellaneous	1000	-0.018	0.000	0.003	-0.023	-0.013	(N)
					0.023	-0.013	(P)
					0.023	-0.013	(BC)

Author's calculations from the BMTIS of 2015/16 (Note: N = Normal; P = Percentile and BC = Bias-Corrected)

5.0 CONCLUDING REMARKS AND POLICY IMPLICATIONS

Botswana ranks the world's third highest unequal country after South Africa and Seychelles. With the indication that high and sustained levels of inequality can entail large social costs; and lower poverty reduction efforts gains, this paper decomposes the consumption expenditure Gini by categories of goods and services to provide more information on inequality to advice policy.

The consumption expenditure Gini coefficient is estimated at 0.498 in 2009/10; and 0.533 in 2015/16. Necessities like food; housing and clothing and footwear contribute more to the overall inequality; and at the same time show low levels of elasticity to expenditure changes. What this means for policy is that maybe there is need to cut taxes; (or by exempting them from the tax base) on necessities like food or basic products and services in order to increase their expenditures. By decreasing taxes, the government affects households' level of disposable income, leaving households with more money. Tax modifications policy action has been applied in countries like the United States where numerous commodities were exempted from tax, as a mechanism to provide relief on households spending. The commodities include food for home consumption, utilities for heating and cooling, and prescription drugs and medical services (Case and Ebel, 1989; ACIR, 1990; Garner, 1993). On the other hand, luxury commodities have high expenditure elasticities; and positive marginal effects. Therefore, an increase in the taxes of luxury commodities (that have positive marginal effects) like transport; and recreation and culture may help in decreasing consumption inequality; as a tax increase will decrease disposable income, thus low expenditure on those luxury goods. Over all, this finding indicates that to reduce the consumption expenditure inequalities, it is essential to improve tax progressivity.

Beside the tax policy consideration, there is also need to consider an increase in public investment in priority sectors like education, health, and housing to give vulnerable groups like the youth and the poor more opportunities, to tackle existing inequality and to prevent further increases. For example, differences in early education and education quality may have contributed to the persistent inequality across generations, and therefore an increased investment in early childhood can increase economic mobility and eventually a decrease in the consumption inequality. Undeniably, several countries such as China and India (Salidjanova, 2013) are implementing strategies that raise the income of low-income households. These strategies are aimed at boosting minimum wages to at least 40 percent of average salaries, loosen controls on lending and deposit rates and; and increase spending on education and affordable housing.

There is also need to encourage policies that effectively increase building assets for working families, because policies and programmes that encourage higher savings rates and lower the cost of building assets for working and middle class households can provide better economic security for struggling and or vulnerable families. In the United States,

for example there has been a set-up of programmes that automatically enrol workers in retirement plans and provide a savings credit or a federal match for retirement savings accounts to help lower-income households build wealth (Haas Institute, 2014). Further in some countries policies that improve access to fair, low-cost financial services and home ownership have been considered as pathways to building wealth, thus reducing inequality.

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7.0 APPENDICES

Appendix 1: Classification of Household Consumption Items

Table 1: Description of Components

Type of Consumption Expenditure	Description of Components
Food	Includes bread, cereals and grains; meat; fish and sea food; milk, cheese and eggs; oils and fats; fruits; vegetables; sugar, jam honey, chocolate, and confectionery; food products like spices, salt, herbs and others
Alcohol and Tobacco	Include spirits; wine; beer; cigarettes; cigars; pipe tobacco; snuff; etc.
Clothing and Footwear	Includes clothing materials; garments; cleaning and repair and hire of clothing; shoes and other foot wear; repair and hire of footwear.
Housing	rentals (normally include payment for the use of the land on which the property stands, the dwelling occupied, the fixtures and fittings for heating, plumbing, lighting, etc., and, in the case of a dwelling let furnished, the furniture. Rentals also include payment for the use of a garage to provide parking in connection with the dwelling. The garage does not have to be physically contiguous to the dwelling; nor does it have to be leased from the same landlord.
Household Goods and Services	Includes household water supply; electricity; refuse collection; sewage collection; gas; liquid fuels; solid fuels; heat energy; and other services relating to the dwelling e.g. gardening and cleaning. Also include goods such as furniture and furnishings; carpets and other floor coverings; repair of furniture, furnishings; and floor coverage; household textiles; household appliances; repair of household appliances; glassware; Tableware and utensils; tools and equipment for house and garden; goods and services for routine household maintenance
Health Care	Includes medical products, appliances and equipment (pharmaceutical products; other medical products like thermometers; therapeutic appliances and equipment; outpatient medical services; dental services; paramedical services; and hospital services.
Transport	Includes motor cars; motor cycles; bicycles; animal drawn vehicles (Includes animals required to draw the vehicles and related equipment (yokes, collars, harnesses, bridles, reins, etc., but excludes: horses and ponies, horse- or pony drawn vehicles and related equipment purchased for recreational purposes). Transport also includes spare parts and accessories for personal transport; fuels and lubricants for personal transport; maintenance and repair of personal transport equipment; other services in respect of personal transport equipment; passenger transport by railway; passenger transport by road; passenger transport by air; passenger transport by sea and inland waterway; and any other purchased transport services.

Communication	Includes postal services; telephone and telefax equipment (Purchases of telephones, radio-telephones, telefax machines, telephone-answering machines and telephone loudspeakers); telephone and telefax services (installation and subscription costs of personal telephone equipment, telephone calls from a private line or from a public line, telephone calls from hotels, café's, restaurants and the like, telegraphy, telex and telefax services, information transmission services, internet connection services hire of telephones, telefax machines, telephone-answering machines and, telephone loudspeakers).
Recreation and Culture	Includes Equipment for the reception, recording and reproduction of sound and pictures; Photographic and cinematographic equipment and optical instruments; Information processing equipment; Recording media; Repair of audio-visual, photographic and information processing equipment; Musical instruments and major durables for indoor recreation; Maintenance and repair of other major durables for recreation and culture; Games, toys and hobbies; Equipment for sport, camping and open-air recreation; cultural services; holiday packages; etc.
Education	Includes pre-primary and primary education; secondary education; post-secondary non-tertiary education; tertiary education; and education not definable by the above mentioned levels
Restaurants and Hotels	Includes catering services provided by restaurants and cafes; and work canteens; accommodation services.
Miscellaneous	Includes Other expenses like gifts; remittances; hairdressing and personal grooming establishments; electric appliances for personal care; jewellery; clocks and watches; and charity

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