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Do Demographic and Socioeconomic Characteristics Explain Inequalities in Northeastern Ethiopia? Empirical Results from Household Level Analysis

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Abstract

The trend of inequality in Ethiopia is not promising. The overall national consumption inequality, as measured by the Gini Coefficient, between 1999/00 and 2004/05 is increased from 0.28 to 0.30. The Gini coefficient (0.298) in 2010/11 is also almost similar to that of the 2004/05. Thus, addressing inequality in Ethiopia has been an important component of poverty reduction and hence better livelihood of the society. In turn, the task of addressing inequality would require understanding and analyzing the driving forces of the prevailed inequality in Ethiopia. This study is, therefore, aims to understanding the demographic and socioeconomic characteristics, among others, that make inequality to persist overtime and analyzing the power of each characteristic to explain inequality. The study employed rural household survey questionnaire based on expenditure dataset of the 382 sample households from four study districts using a two stage random sampling method proportionate to size. OLS regression is used to analyze the driving forces of inequality. Results show that the Gini coefficient in northeastern Ethiopia is estimated at 0.247, indicating the existence of consumption expenditure inequality among the sample rural households in the stated areas and this is to some extent lower as compared to the national level Gini coefficient of 0.274 for rural Ethiopia in 2010/11. Regarding the driving forces of inequality, most demographic, socioeconomic and institutional variables entered with expected signs and are significantly explain inequality among households. Policy makers and other concerned bodies therefore must concentrate on measures to enhance demographic, socioeconomic and institutional aspects of the households in favour of reducing inequalities.

Keywords: *Consumption, determinant, Ethiopia, household, inequality, northeastern Ethiopia*

1. Introduction

Over the last few decades, academic and wider public interest in inequality has grown substantially. This is because of the sever effect of inequality to most of the nations worldwide. In this regard, inequality may be worse for growth and thus better livelihood of the people than the disease itself. More generally, inequality – measured in income or expenditure – deprives the poor of the ability to stay healthy and accumulate human capital (Perotti, 1996; Galor and Moav, 2004); generates political and economic instability that reduces investment (Alesina and Perotti, 1996); and impedes the social consensus required to adjust to shocks and sustain growth (Rodrik, 1999). Once there is a common consensus that inequality is harmful to the growth and development of nations, studying the driving forces of inequality is much relevant and important for policy formulations and implementations. According to Litchfield (1999), studies on decomposition of income inequality are desirable for both arithmetic and analytical reasons. It can shed light on the structure and dynamics of income within different socio-economic groups in the economy. Understanding the link between total inequality and socio-economic characteristics, among others can also be useful to economic policy analysts and designers of poverty reduction programmes.

The extent to which the consumption expenditure inequality in region of northeastern Ethiopia, where vulnerability to poverty and inequality is high, can be explained solely by demographic and socio-economic factors is unclear. The former analyses are also limited to some specified areas in the region. In this study, therefore, we seek to overcome these weaknesses by covering wider study areas in the region, as well as, a much broader range of demographic and socioeconomic factors and additionally considering social capital and institutional factors as explanations of inequality in the study areas. In general, this paper analyzes the causes of inequality in northeastern Ethiopia in more detail, by examining the degree to which the contribution of each factor to the inequality. This paper seeks to fill this gap and provide policymakers with a more complete picture

of driving forces of inequality by providing answers the following questions:

1. When demographic, socioeconomic and institutional characteristics are modelled together, does inequality is significantly explained?
2. If demographic, socioeconomic and institutional characteristics matters in determining inequality, how do patterns of inequality differ with these characteristics? What sequence of factors is prevailed in terms of their effect on inequality?

The remainder of this paper is organized as follows: Section 2 describes the theoretical and empirical strategy, in the existing literature, vis-a-vis the situation and determinants of inequality in Ethiopia in general and in northeastern Ethiopia in particular. Section 3 pinpoints the nature of data and methodological issues. Results and discussions are present in section 4 which shows the detailed analysis of inequality determinants. Finally, Section 5 summarizes the findings of this paper.

2. Literature Review: Briefs of Inequality in Ethiopia

Indeed, there is consensus in the literature that inequality can undermine progress in social and economic status of people and causes political and economic instability, and thus that it tends to reduce the pace and durability of growth. Strictly speaking, inequality may be harmful for growth because it deprives the poor of the ability to stay healthy and accumulate human capital (Perotti, 1996; Galor and Moav, 2004). Inequality is therefore relevant to the analysis of poverty as demographic, social and economic characteristics often sources of weak or failed development. In the extreme, vicious cycles of inequality and failed development erupt into internal conflict within or across regions.

Regarding the situation of inequality in Ethiopia, according to MoFED (2012) trends in consumption inequality as measured by the Gini Coefficient in 2010 for urban areas become 0.37 and rural 0.27. Similar to the previous years, inequality is higher in urban areas than in rural areas. However, rural inequality marginally increased, while urban inequality declined substantially leaving the national Gini coefficient unchanged. In this context, the trend in overall national Gini coefficient between 1999/2000 and 2004/05 is increased from 0.28 to 0.304. For urban areas the increases in the Gini coefficient are substantial while the Gini coefficient for rural areas has not changed at all indicating that the overall increase in income inequality is due to the increase in urban areas. Coming to the results of this study it is not easy to make a difference on the inequality of rural households in northeastern Ethiopia relative to the inequality of rural households at national level. The Gini coefficient in northeastern Ethiopia is estimated at 0.247, indicating the existence of expenditure inequality among the sample rural households in northeastern Ethiopia and this is to some extent lower as compared to the national level Gini coefficient of 0.274 for rural Ethiopia in 2010/11 (MoFED, 2012).[1]

3. Data and Methodology

This study has presented the driving forces of inequality in northeastern Ethiopia based on the data obtained from the household survey. The data employed in this study was derived from our survey questionnaire administered to rural sample households in the four study weredas in the two zones namely Dessie zuriya and Kalu (south Wollo) and Gubalafto and Harbu (north Wollo) in northeastern Ehiopia. Out of the woreda administrations in the two zones, two woreda administrations have been selected in each zone purposively to represent different agro-ecological, economic and social diversities within each zone. Finally, a total of 400 sample households were chosen from the four weredas using a two stage random sampling method.

In the first stage, ten study sites also called kebelles were selected randomly from the four weredas.2 In the second stage 400 sample households are randomly drawn from a complete list of respective selected kebelles in conformity to proportionate to size random sampling procedure. The survey questionnaire data from the sample households was collected through interviewing the selected households. The survey is based on income and expenditure dataset of the sample households in which household expenditure is considered as an adequate measure of inequality in developing countries as it is better able to capture household's consumption capabilities (Grootaert, 1986). In addition, data on the demographic, socio-economic and institutional characteristics of the sample households are collected so as to measure the extent of poverty in terms of economic, social and institutional dimensions.

Once the nature of data and method of sampling are identified, an OLS regression is used to analyze the

[1] Inequality in the study areas is also measured in a wide range of inequality measures: deciles distribution, deciles dispersion ratio, Gini coefficient and the generalized entropy class of inequality measures. Based on the results from deciles distribution of overall consumption, the consumption of the richest 10 percent of households is about five times that of the poorest 10 percent of households. The deciles ratio in terms of mean per capita expenditure is 4.91 implying that the expenditure of the richest 10 percent households is almost five times that of those in the poorest deciles. Concerning the general entropy measures of inequality, per capita expenditure inequality is relatively higher at the bottom of the distribution (0.106) followed closely by at the top of the distribution (0.101) and across all ranges of expenditures (0.098). For more detailed statistics see appendix table 7.1

[2] Zone is the main administrative unit next to national regional governments in Ethiopia, which is equivalent to district in the country. While woreda is the next administrative unit and is equivalent to administrative sub-district in the county, kebelle is the smallest administrative unit.

determinants of household inequalities. In order to see how much inequality is accounted for by each explanatory variable Fields (2002) proposes the semi log income or consumption function[3]. Following Fields (2002), we have analyzed the determinants of inequality using the consumption expenditure per adult equivalent for each household as our dependent variable. Thus, when discussing a multivariate analysis of determinants of income or consumption inequality modelling household consumption that shows a multivariate association between income inequality and other explanatory variables is proposed (Appleton, 1995). The specification of such model, the standard semi log income function, could be given as:

$$\ln C_i = \alpha + \beta X_i + U_i \qquad (3.1)$$

Where C_i stands for consumption expenditure per adult equivalent of household i, X_i is vector of explanatory variables, and U_i is a random disturbance term, which is assumed to be normally, independently and identically distributed with mean 0 and variance σ^2.

4. Results and Discussions

It can be noted that the dependent variable of the model is the natural logarithm of consumption expenditure per adult equivalence. It is important to note that the main reason for using the log of consumption expenditure per adult equivalence is to impose a constant percentage effect of explanatory variables on expenditure per adult.[4] Since the regression uses log of per adult consumption as the dependent variable, the estimated coefficients can be interpreted as partial effects measured in percentage terms. Before the final estimation was done and taken for discussion, data exploration is an important step. To this end, we made data exploration through testing important classical linear regression assumptions. See the test results on appendix tables 7.2, 7.3 & 7.4 and appendix figure 7.1.[5]

The resulting estimates of the relationship between log of per adult consumption and a set of key variables using OLS regression with robust standard errors are presented in Table 4.1. The statistics of the overall model indicate the OLS regression is a good fit, with R-squared 0.378 and it is statistically significant, with p-value 0.000. Most variables entered with expected signs and are significant to determine inequality among households. According to the estimated results, holding other variables constant, male-headship has a significant positive impact on the welfare status of households, as measured by household consumption per adult equivalent. Being male headed household boosts expenditure by approximately 9.6 percent relative to female headed household. This suggested that male headed households are better off as compared to female headed ones and hence sex of household head become an important determinant of inequality.

The second important predictor of household consumption is marital status of household head. Married household head increases the household's living standard relative to single household head (i.e. unmarried, widowed, separated or divorced). Being married increases expenditure by 18.8 percent than otherwise so that being married head is better off as compared to single ones. Education of the household head has a positive effect on expenditure per adult equivalent but the effect is insignificant to explain expenditure inequality among households. The age and age squared of the head does not have a significant power to explain the living standard of the households. The insignificance of the age variable may be due to the fact that other family members who are in the productive age group may take care of the living standard of the elderly household heads. Age of household head has an inverse U-shaped relationship with welfare. At an early age, expenditure increases with age but at a later age, inequality expenditure decreases with age.

This implies that welfare increases with age but it slightly decreases at low and high age brackets. In other words, the negative effect of age square variable suggests that as age increases welfare first increases and then decreases (inverted U) which in turn imply increasing return to age of the household head. This may partially be explained by the fact that in rural areas people work more in earlier and later parts of their lives and a typical rural person starts productive work at younger age and works even during relatively old age. Although age and its square variables have as such effect on welfare, they do not emerge to be a determinant of inequality in the rural areas of northeastern Ethiopia as they are not statistically

[3] See Fields (2002) for the mathematical manipulations of the derivation that follows.

[4] As an alternative to probit or logit models, many studies use logarithm of underlying per adult expenditure as the dependent variable. Such a model can be statistically more efficient than the logit or probit models because it utilizes more available information on expenditures and it best explains the welfare status of the households. Moreover, the logarithm of consumption is used because its distribution more closely approximates the normal distribution than does the distribution of the consumption levels. In other words, this assumption implies that households' consumption level follows a lognormal distribution.

[5] The multicolinearity test using Variance Inflation Factor (VIF) in appendix table 7.2 indicates that multicollinearity problem is not observed. With the exception of VIF for the variables such as age, age squared, mean age and mean age squared which is high as expected, multicollinearity is not as such a serious problem in our data. Indeed, heteroscedasticity problem is inherent in our data. We made heteroscedasticity corrected robust regression when each of the estimations was carried out. The normality and specification error tests are also carried out (for details see appendix tables 7.3 & 7.4 and appendix figure 7.1).

Table 4.1 OLS estimates for determinants of inequality (n=382)

Variables	Coefficient	Robust standard errors	t-values
Male headed household	0.096	0.065	1.47**
Married household head	0.188	0.078	2.41**
Education of household head	0.008	0.007	1.13
Household head age	0.008	0.009	0.79
Household head age square	-0.001	0.001	-0.56
Mean age of household	-0.006	0.004	-1.80*
Adult equivalent household size	-0.193	0.073	-2.66***
Household size squared	0.006	0.007	0.89
Female male ratio	0.029	0.019	1.49
Dummy for zone	-0.019	0.048	0.42
Dummy for access to credit	0.055	0.039	1.40
Dummy for access to irrigation	0.066	0.039	1.67*
Dummy for remittance	0.007	0.060	0.12
Per capita land (timad)	0.154	0.067	2.32**
TLU per adult	0.101	0.035	2.86***
Social capital	0.054	0.019	2.93***
Distance to market (km)	-0.003	0.004	-0.76
Dummy for Dega	0.077	0.063	1.23
Dummy for Kolla	0.103	0.055	1.87*
Constant	8.204	0.301	27.26***
Model Summary:			
F(19, 362) = 14.52		R-squared = 0.378	
Prob > F = 0.000		Root MSE = 0.371	

* Significant at 10% ; ** Significant at 5%; *** Significant at 1%

significant. On the other hand, the mean age of the household is found to be negative and significant at 10% but the coefficient is minimal. The coefficient implies that for every additional years of age, welfare reduced by 0.6 percent.

The strongest determinant of inequality is household size and thus it has the largest impact on consumption per adult equivalent. The coefficients for this variable is statistically significant and quite large; expenditure increased by approximately 19 percent for every additional member of a family. However, the quadratic effect of household size (household size squared) seems to be insignificant implying that the economies of scale at household level has positive impact on expenditure per adult but it does not have significant contribution to the expenditure inequality among the households. A common finding in the literature (see, for instance, Lipton and Ravallion 1995, and Lanjouw and Ravallion 1995), is also critically linked to the issue of economies of household size in consumption. Another demographic variable to be of concern is female-male ratio. The estimated parameters for female-male ratio reveal a very significant negative relationship between household size and consumption expenditure per adult equivalent but it is not statistically significant. Similarly, the location variable in terms of zone is statistically significant in determining inequality. This implies that there is no significant welfare variation between south and north Wollo.

Access to irrigation is another strong factor positively associated with welfare and it is statistically significant at 10%. Other things held constant, a household's welfare increases by 6.6 percent if the household gets access to irrigation. As a result, access to irrigation can be considered as an important determinant of consumption expenditure inequality. Access to credit and remittance has positive impact on welfare and they increase expenditure by 5.5 and 0.7 percent respectively, although they are not found to be statistically significant.

Not surprisingly, agricultural asset base turns out to be important explain the living standards and thus inequality in rural households. Thus, we found that land and livestock owned have a significant positive effect on expenditure per adult of the household in rural areas. In terms of their effect, one more unit per capita land and TLU per adult ownership increases expenditure per adult equivalent approximately by 15 and 10 percent respectively. Social capital in terms of number of social institutions a household is a member of is statistically significant at 1%. Being a member of more social institutions gives better welfare condition relative to being a member of lower number of social institutions. This could be due to the fact that the more the number of social institutions a household is a member of the more the probability that the household gets social supports from the community at large.

As far as the remaining community level characteristics are concerned, distance to the market is insignificant. However, with reference to agro climatic condition, Kolla is statistically significant at 1%, while Dega does not. The estimated parameters of the climate variables suggest that rural households those reside in Kolla and Dega increases welfare by slightly more than 10

and slightly less than 8 percent respectively compared to those households reside in Woina dega. Thus inequality seems to be higher between Kolla and woina dega as compared to that of between Dega and woina dega.

5. Conclusion and Recommendations

Regarding the analysis of factors explaining inequality, measured as consumption per adult equivalent, in northeastern Ethiopia, a number of specific conclusions can be drawn from the OLS regression results. But the following major conclusions stand out important. Demographic characteristics (male headship and married household head), asset ownership (per capita land and TLU per adult), access to irrigation, social capital and kola climatic condition were positively and significantly explain inequality. This implies that these variables tend to increases living standard difference among households. On the other hand, demographic variables, notably adult equivalent household size and mean age of household were found to have a significant negative impact on consumption per adult equivalent of the households, suggesting that their increase improve living standard difference among households. In sum, household size was found to have the strongest power to explain the living standards and thus inequality with having the largest and significant impact on consumption per adult equivalent. The household size, as the most important determinant of inequality, is also followed by other important determinants such as TLU per adult and social capital.

Concerning to recommendations, out of various determinants of inequality identified and considered in this study household size was found to be the most important factor to explain inequality. Roderiguez and Smith (1994, cited in Getaneh, 1999) pointed out that educated households are likely to have fewer children. Thus, the first policy implication of this paper is that expansion of education and intensification of family planning programme at grass root level are amongst areas deserving prime attention to mitigate problem of large family size as a means and then the problem of inequality for an end result. This requires the provision of modern birth control methods from health centers around the woredas. In addition continual community level awareness on reducing family size should be created.

Constrained accesses to productive resources were identified as significant determinant of inequality among households. A strategy of targeting the constraints in separate and giving same level of attention for all constraints is unlikely to be effective in tackling the issue of inequality in a meaningful way. Instead, considering all constraints at a time and clear prioritisation of the constraints is needed for intervention to address inequality in the northeastern Ethiopia. For example, since households with inequality lack livestock, land-constrained, and unable to participate in social institutions, then policies should be designed in the way to address each specific constraint simultaneously with prioritisation by enhancing ownership of or access to these assets for the very poorest households.

With regard to agricultural assets, notably TLU per adult and land per capita, were found to be significant determinants of households' inequality. Livestock rearing should be encouraged through facilitating credit access for the purchase of livestock and enhancing livestock productivity by improving the management practice and use of improved breeds and forage species. Similarly, land ownership and usage could be getting better through boost land productivity by adopting agricultural inputs as well as productive farming technologies and implement policies to redistribute assets. Given the limited supply of land, it could be compensated to some extent by providing incentive and support to farmers to grow high-value crops with the use of land saving technologies like agricultural inputs and high yielding varieties to boost crop production through increasing the return per unit area. The existing realities and the experience of farmers is a living witness on the strong poverty and inequality reducing impact of agricultural inputs. In general, policy makers therefore must concentrate on measures to increase agricultural productivity through targeted efforts such as distribution of improved seed varieties and better extension services delivery.

Access to irrigation, as a significant determinant of inequality, should also be treated through encouraging better water management and reduce dependence on rain-fed agriculture. Similarly, social capital is extremely important in explaining inequality of the households in northeastern Ethiopia. Building on this role of social capital on household inequality, we were then able to provide some policy implications in order to maximize the positive impact of social capital on consumption expenditure. Accordingly, first and for most the positive impact would be maximized by incorporating local institutions in the main development strategy and implementation of the regional state in particular and the country in general. Thus, public policies need to focus on investing in social capital to promote increment of social networks among households. Since social capital helps to improve welfare levels such investment in social capital deserves to be part of poverty alleviation programs. It is therefore necessary to build the capacity of social associations and to make integration between the local government institutions and local social associations.

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7. Appendix

Table 7.1 Estimates of Inequality Estimates of Inequality

Inequality measures	Estimates
Per capita expenditure	
Deciles (ETB)*: First (poorest)	1683.33
Tenth (richest)	8343.57
Total	4196.77
Deciles dispersion ratio	4.91
Gini coefficient	0.247
GE(0)	0.101
GE(1)	0.098
GE(2)	0.106

*ETB refers to Ethiopian Birr, i.e., legal currency of Ethiopia

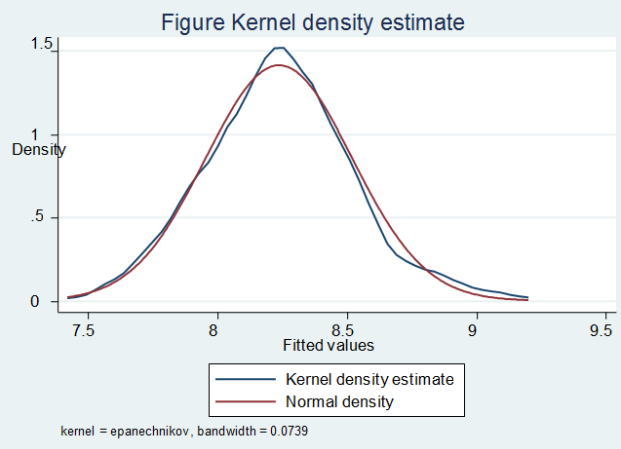

Table 7.2 Multicollinearity test of Variance Inflation Factor (VIF)

Variable	VIF	1/VIF
Household head age squared	36.98	0.027040
Household head age	35.91	0.027847
Adult equivalent household size	34.41	0.029059
household size squared	30.05	0.033282
Mean age of household	2.92	0.342000
Per capita land	2.17	0.460199
Male headed household	2.00	0.499514
Married household head	1.75	0.572373
Dummy for Dega	1.54	0.651226
TLU per adult equivalent	1.47	0.680725
Dummy for zone	1.42	0.705459
Education of household head	1.31	0.765735
Social capital	1.30	0.771917
Dummy for Kolla	1.21	0.823908
Distance to market	1.17	0.854290
Access to irrigation	1.17	0.858362
Female-male ratiio	1.14	0.873902
Dummy for remittance	1.09	0.920948
Access to credit	1.05	0.948574
Mean VIF	8.42	

Table 7.3 Skewness/Kurtosis tests for Normality test

Variable	------- joint ------ Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	Prob>chi2
resid	0.078	0.236	4.52	0.1046

Table 7.4 Specification error test for omitted variables

Ramsey RESET test using powers of the fitted values of lnexpae
Ho: model has no omitted variables
F(3, 359) = 4.41
Prob > F = 0.1046