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# Effects of Terms of Trade and Its Volatility on Economic Growth in Sub-Saharan Africa

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## *Abstract*

*This paper investigated the effect of terms of trade and its volatility on economic growth in sub-Saharan Africa. The study employed dynamic panel data models of difference and system Generalized Method of Moments (GMM), which could account for biases associated with endogeneity of explanatory variables and problems induced by unobserved country-specific characteristics. The study used both net barter terms of trade and income terms of trade as a measure of terms of trade for the analysis of the entire data for this paper. Using data from 1985 to 2014, the study found that the improvement in both net barter terms of trade and income terms of trade is growth-enhancing, whereas its deterioration is growth-retarding. As the majority of the sample countries are primary commodity exporters, their terms of trade shows deterioration through time and this adversely affects economic growth. Furthermore, the result proved that volatility of net barter terms of trade and income terms of trade has a negative and significant effect on economic growth. Finally, the use of alternative data set contributed to the result being robust.*

**Key Words:** Terms of Trade, volatility, economic growth, Sub-Saharan Africa

**JEL Classification:** F00, F10, F43

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## **1. Introduction**

There are two basic arguments about the effect of specialization on primary products. The first argument is the Prebisch-Singer (PS) hypothesis. This hypothesis, which was developed by Prebisch (1959) and Singer (1950), postulates that the price of primary commodities has a downward trend overtime as compared to the price of manufactured goods. Some of the explanations that have been offered for this decline include productivity differentials between countries, asymmetric market structure, and high income elasticity of demand for manufacturing goods relative to that of primary commodities. One corollary of these findings is that developing countries, to the degree that they export primary commodities and import manufactured goods, will be subject to a secular deterioration in their net barter terms of trade. The second argument is the Harberger-Laursen-Metzler (HLM) effect. This conjecture was offered by Laursen and Metzler (1950) and Harberger (1950). It proclaims that terms of trade (ToT) shock leads to greater instability of national income and aggregate savings. According to their argument, an adverse shock on ToT causes a rise in spending, a decline in savings, and a deficit in current account.

Various studies have consistently identified deterioration of ToT as a determinant of a country's macroeconomic performances. The deterioration of ToT, which is mainly due to a faster rise in import price than export price, worsens the balance of payment and leads to income and welfare losses. Terms of trade shocks also appear to play a role in explaining growth fluctuations although there is no consensus regarding the direction of its effect on growth. However, it is yet unclear whether volatility of ToT appears to play a role in explaining growth fluctuations. If volatility really matters for growth, then any exogenous shock that affects volatility can also affect growth. Therefore, it is important to clearly identify the effect of ToT volatility on growth so as to show the clear-cut direction for various policy interventions whose target is to maintain growth.

Blattman *et al.* (2007); Jacks *et al.* (2011); and Cavalcanti *et al.* (2015) assert that the effects of terms of trade are asymmetric between primary commodity exporting countries and industrialized countries with diversified and broader

export bases. They argue that volatility mattered little for the larger, diversified industrial nations, but it seems to have impacted primary commodity exporting nations adversely.

There are only a few papers on primary commodity exporting regions that try to look into the relationship between ToT volatility and growth. However, none of them convincingly tries to solve endogeneity problems, which are common in the majority of the existing literature on ToT. Some of them employ cross-country ordinary least squared (OLS) regression using average data. This approach neither solves the problem of endogeneity nor shows the true effect of ToT on growth. It completely eliminates the time series nature of the data and will make it difficult to learn about the effect of growth and shock of ToT over time. Others use the fixed effects and IV estimation. Such methods might be feasible as long as instruments used are strong. In addition, the dependent variable (growth/GDP) in almost all cases exhibits dependence. As a result, the lag-dependent variable appears as regressor and this will raise the problem of autocorrelation.

Inspired by all these facts, this paper attempts to shed some light on the issue by making a closer look into primary commodity exporting countries. It mainly investigates the effect of change in the volatility of ToT on economic growth in sub-Saharan Africa (SSA). To overcome all these problems discussed in the exiting literature, this paper uses recent dataset and employs dynamic panel data models of difference and system GMM that account for biases associated with joint endogeneity of explanatory variables and problems induced by unobserved country-specific effects.

This paper has another feature that distinguishes it from other papers done on ToT. Unlike most papers which focus solely on net barter terms of trade (NBTT), this paper uses both NBTT and income terms of trade (ITT) for its entire analysis. There are familiar grounds for fearing that the NBTT<sup>3</sup> will become more unfavourable than ITT<sup>4</sup> as it does not show us whether the country would be better-off or worse-off in terms of exports as the capacity to

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<sup>3</sup>NBTT =  $P_x/P_m$ , where  $P_x$  stands for export prices and  $P_m$  for import prices.

<sup>4</sup>ITT =  $[P_x/P_m]Q_x$ , where  $Q_x$  stands for quantity of exports

import. This is due to the fact that the formulation does not include the variable of the actual amount of exports. If, for example, we increase our export price, the NBTT will undoubtedly increase for a given level of import price. However, an increase in our export price might induce the world demand for our export to decline and we might end up with lower export receipts than ever before. These problems can be resolved by using ITT, which is obtained by weighting the NBTT by quantity of exports. ITT explicitly takes into account the actual export volume and it will also change with the change in the price of exports.

## **2. Literature Review**

This paper is not the first to emphasize the consequence of ToT shock on economic growth. There is a large amount of literature that has examined the effects of movements in ToT. The major focus of previous literature has been movements in ToT and its influence on balance of payments. Following the PS thesis, which states that the price of primary commodities has a downward trend overtime as compared to the price of manufactures, various papers including those by Sapsford (1985), Sarkar (1986), Grilli and Yang (1988), Lutz (1999), Hadass and Williamson (2003), and Cashin and McDermott (2002) have found evidence for the existence of secular deterioration. All these studies proclaim that there is a negative linear trend on commodity ToT. Using the co-integration technique, Arize (1996) explores the effect of ToT on balance of trade and finds a significant positive long-term equilibrium relationship between ToT and trade balance. Similarly, Thirlwall (2003) added that the deterioration of ToT, which is mainly due to a faster rise in import price than export price, worsens the balance of payment at a given rate of growth. These findings have important implications for primary commodity exporting countries. The deterioration in ToT, which less developed countries are facing, leads to income and welfare losses (Prebisch, 1959). Furthermore, Kıpıcı (1996) analysed the existence of the HLM hypothesis, which states that when ToT improves, the real income level will rise and, consequently, the improvement in ToT boosts trade balance. Kıpıcı (1996) asserts that the relation between ToT and trade balance depends on the significance of consumption-smoothing and consumption-tilting intentions that are directed by the inter-temporal elasticity of substitutions.

ToT volatility has been found to be a topic of recent literature. It was first spurred by the influential work of Ramey and Ramey (1995), which explains the existence of negative correlation between output volatility and growth. Their finding implies that exogenous shocks that influence volatility can also have an effect on growth. Short-term movements in ToT might be an important source of such volatility. According to Eichengreen (1998), both negative trends and volatility in ToT depressed export revenues and capital inflows for many developing countries.

Mendoza (1997), using the stochastic endogenous growth model, conducted an investigation on the growth effect of ToT uncertainty on a panel of 40 countries between 1970 and 1991. His empirical analysis provides robust evidence that terms of trade variability has a large adverse effect on economic growth. Similarly, for their investigation in sub-Saharan Africa, Bleaney and Greenaway (2001) use a sample of 14 countries from 1980 to 1995 and show that growth is negatively affected by ToT volatility while investment is negatively affected by real exchange rate instability. Recently, Samimi *et al.* (2011) have made a closer look at the effect of ToT volatility on 20 oil-exporting countries. They use data from 1980 to 2005 for their investigation and find the existence of a negative impact of ToT volatility on growth.

Blattman *et al.* (2007) use a similar model with that of Mendoza (1997) to estimate the impact of ToT volatility on income using new panel data for 35 countries from 1870 to 1939. They find volatility to be much more vital for growth than was declining in trend of ToT and accounts for a significant amount of the divergence in incomes among the sample of small and commodity-dependent nations. They added that ToT effects are asymmetric between primary commodity exporting countries and industrialized countries with a diversified and broader export base. They argue that volatility mattered little for the larger, diversified industrial nations, but it seems to have impacted primary commodity exporting nations adversely.

Moreover, Cavalcanti *et al.* (2015) investigate the impact of the level and volatility of the commodity ToT on economic growth. Using a wider sample of 118 countries both annual data from 1970 to 2007 and five-year non-overlapping observations, they find that while commodity ToT growth

enhances real output per capita, volatility exerts a negative impact on economic growth. Following this result, they argue that the negative growth effects of commodity ToT volatility offset the positive impact of commodity booms, and hence, export diversification in countries where primary commodity is abundant contributes to faster growth. Additionally, they share the idea of Blattman *et al.* (2007), which claims the asymmetric effects of ToT volatility between primary commodity exporting countries and industrialized countries.

Using data from 2004 to 2008, Jawaid and Waheed (2011) show the effect of ToT and its volatility on economic growth for a sample of 94 developed and developing countries. Their cross-country ordinary least square estimation indicates a significant positive effect of both ToT and its volatility on economic growth. Their finding for the effects of volatility contradicts with that of Mendoza (1997), Bleaney and Greenaway (2001) and Samimi *et al.* (2011), which proclaim the presence of a significant negative effect of ToT volatility on growth. Although Jawaid and Waheed (2011) claim the robustness of their initial result by performing a sensitivity analysis using different additional variables, sample sizes and various proxies of volatility variable, it would still be difficult to accept it as problems of identification and endogeneity have not yet been resolved. Very importantly, they set a direction for further research describing the need for further investigation on the issue using long time series data.

The problem for almost all the literature on this area is its choice of proxy for ToT. The majority of the literature on the area focuses on NBTT and not much emphasis has been given to ITT. Lutz (1994) uses both NBTT and ITT for his empirical analysis between ToT and economic growth. He uses pooled cross-section and time series data for 91 countries from 1968 to 1988 and finds a significant negative growth effect of ITT volatility. However, the estimated coefficients on the degree of volatility in the NBTT turned out to be either insignificant or positive.

The other problem for most of the literature on ToT, particularly for that which examines cross-country regressions on both primary commodity exporting and industrialized countries, is the issue of endogeneity. Exogeneity

of short-term volatility and long-term growth of ToT is the underlying assumption throughout such literature. However, industrialised countries that export mainly manufactured items and import primary products are not predominantly price takers in the international market. In such cases, the assumption of exogeneity of ToT made on most of the cross-country regressions will be very strong.

However, short-term volatility and even long-term growth of ToT might be exogenous for primary commodity exporting small open economies since these countries are price takers in the international market. Therefore, it might be reasonable to consider ToT as exogenous in this case as SSA countries are mainly primary commodity exporters. More than 80 percent of the exports of sub-Saharan Africa are primary products, and intra-regional trade in the region is low(Keane *et al.* 2010) mainly due to the existence of non-tariff barriers (NTBs). Therefore, the ToT data of individual countries in this region is mainly with the rest of the world. This lower intra-regional trade implies that the ToT of member countries does not highly depend on the capacity and reaction of individual economies in the region; rather, it depends on the capacity and reaction of the rest of the world. As a result, “transfer problem”<sup>5</sup> of ToT is no more an issue in this case.

### **3. Data and Methodology**

#### **3.1 Data**

To examine the effects of ToT growth and volatility on economic growth in SSA, this paper uses annual data covering the period from 1985 to 2014. The investigation covers 35 sub-Saharan African countries out of the total of 49 for which there is full data for the sample period. The data for real percapita gross domestic product, total labour force, NBTT, and ITT is taken from the United Nations Conference on Trade and Development (UNCTAD) statistics database. Additionally, the data for investment share of GDP is from Feenstra, Inklaar, and Timmer (2015), which is the latest version of the Pen World Table (PWT 9.0). Due to absence of data for investment share of GDP, the data used for

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<sup>5</sup>This is a problem that occurs when terms of trade change helps one country and harms another.

this analysis is limited to the period up to 2014. The detailed description of variables used in this paper follows.

As the prime motive of this study is to show the effect of the volatility of ToT, it is crucial to generate volatility ToT for every year under consideration. Numerous studies, including Mendoza (1997), Rodrik (1998), Jansen (2004), Dungey (2004) and Kim (2007), use terms of trade growth rate and the standard deviation of the growth rate. As a result, this paper follows Mendoza (1997), Rodrik (1998), Jansen (2004), Dungey (2004) and Kim (2007) to employ the standard deviation of the growth rate of NBTT and ITT as a measure of volatility. This paper uses a moving window standard deviation in order to generate time-varying standard deviation for every year.

### **3.2 Methodology**

This section introduces the dynamic panel models of difference and system GMM to be applied in this paper. Most empirical works of economic growth from cross-sectional simple regression to the static and dynamic panel data techniques start with the following model:

$$y_{it} = \phi y_{it-1} + \beta' x_{it} + \mu_i + u_{it} \dots \dots \dots (1)$$

*for i = 1,2,3, ..., N and t = 1,2,3, ..., T*

where,  $y_{it}$  is the dependent variable,  $y_{it-1}$  is the lagged dependent variable,  $x_{it}$  is a vector of explanatory variables,  $\mu_i$  is unobserved country-specific characteristics, and  $u_{it}$  is the error term.

Testing for panel unit root is an important step to test if the dependent and independent variables are stationary or not. Therefore, this study first undertakes the Levin–Lin–Chu test and the Im, Pesaran and Shin (IPS) test. Both tests are based on the analysis of the equation:

$$\Delta y_{it} = \lambda_i y_{it-1} + Z'_{it} \gamma_i + u_{it} \dots \dots \dots (2)$$

*for i = 1,2,3, ..., N and t = 1,2,3, ..., T*

where:

$$H_0: \lambda_i = 0 \forall_i$$

$H_A: \lambda_i < 0$  (for Levin–Lin–Chu test)

$H_A: \lambda_i < 0, i = 1, 2, \dots, N_1; \lambda_i = 0, i = N_1 + 1, N_1 + 2, \dots, N$  (for IPS test).

The IPS test extends the Levin–Lin–Chu test framework to allow for heterogeneity in the value of  $\lambda_i$  under the alternative hypothesis. Under the null hypothesis, all series are non-stationary, whereas under the alternative hypothesis, a portion of the series is assumed to be stationary in the case of IPS.

A number of econometric problems may happen from estimating equation (1). The lagged dependent variable,  $y_{it-1}$ , which enters the model as a regressor, gives rise to autocorrelation. Moreover, since causality may run in both directions, regressors in the right hand side are assumed to be endogenous and these regressors may be correlated with the error term. Furthermore, time-invariant country-specific characteristics might be correlated with the explanatory variables.

Using a simple cross-sectional approach and the traditional static panel estimators like fixed effect and random effect settings are inconsistent in such cases. To overcome these problems, this paper uses the Arellano and Bond (1991) difference GMM estimator. The first-differenced lagged dependent variable is instrumented with its past levels. Lagged levels of the endogenous regressors are also used as an instrument. This makes the endogenous variables predetermined, and not correlated, with the disturbance term. The first-differences also remove the country-specific characteristic  $\mu_i$  as it does not vary with time. Assuming that the explanatory variables are weakly exogenous<sup>6</sup> but predetermined, and the error term is not serially correlated, the difference GMM estimator will have the following moment conditions:

$$\begin{aligned} E(y_{it-s}, \Delta u_{it}) &= 0 && \text{for } t = 3, \dots, T \text{ and } s \geq 2 \\ E(x_{it-s}, \Delta u_{it}) &= 0 && \text{for } t = 3, \dots, T \text{ and } s \geq 2 \end{aligned}$$

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<sup>6</sup> Variables are weakly exogenous, i. e. they can be influenced by past and current realizations of the growth rate but not by upcoming realizations of the error term.

Differenced GMM estimator may be exposed to a downward finite-sample bias (Blundell & Bond, 1998). This suggests that some care may be necessary before relying on this technique to estimate autoregressive models for time series data like per capita GDP (Bond, Hoeffler, & Temple, 2001). Therefore, this paper considers one more estimator that has superior finite sample properties and follows Arellano and Bover (1995), Blundell and Bond (1998), and Bond *et al.* (2001) in employing a system GMM estimator. This method includes variables in levels with the lagged differences of the endogenous variables as instruments. Thus, the variables in levels are instrumented with their own first differences. As a result, the additional moment conditions for the regression in levels will be:

$$\begin{aligned} E(\Delta y_{it-s}, \mu_i + u_{it}) &= 0 & \text{for } s = 1, \\ E(\Delta x_{it-s}, \mu_i + u_{it}) &= 0 & \text{for } s = 1 \end{aligned}$$

This paper uses the standard two-step method that controls for heteroskedasticity. The variance for a given moment condition might not be the same across time and this grants for a more flexible variance-covariance structure since the system GMM estimator takes care of the moment conditions as applying to a specific time period.

**Table 1: Description of variables**

S.No.	Variable	Type	Name	Description
1	PGDP	Dependent variable	Per capita gross domestic product	It is per capita gross domestic product converted to international dollars using purchasing power parity rates. Data are in constant 2005 international dollars.
2	INV	Explanatory variable	Investment	Investment share of GDP per capita at constant 2005 U.S. dollars. It is used as a proxy for capital due to lack of data for capital stock in the region.
3	LAB	Explanatory variable	Labour force	Total labour force expressed in thousands
4	GNBTT	Explanatory variable	Growth of net barter terms of trade	Growth rate of net barter terms of trade
5	GITT	Explanatory variable	Growth of income terms of trade	Growth rate of income terms of trade
6	VNBTT	Explanatory variable	Volatility of net barter terms of trade(1)	Obtained by using the moving window standard deviation of net barter terms of trade growth rate
7	VITT	Explanatory variable	Volatility of income terms of trade(1)	Obtained by using the moving window standard deviation of income terms of trade growth rate
6	V2NBTT	Explanatory variable	Volatility of net barter terms of trade(2)	By decomposing net barter terms of trade movements into trend and volatility using the HP filter with a smoothing parameter of 100.
7	V2ITT	Explanatory variable	Volatility of income terms of trade(2)	By decomposing income terms of trade movements into trend and volatility using the HP filter with a smoothing parameter of 100.

Since the validity of the instruments has an effect on the consistency of the GMM estimator, this paper considers two specification tests. The first test is the Sargan test, the test of over-identifying restrictions, which tests the overall validity of instruments. The second test examines the hypothesis that the error term is not serially correlated.

Finally, the robustness of the result is checked using different dataset, by taking different proxies for volatility of ToT. This paper follows Basu and McLeod (1991), Blattman *et al.* (2007), Williamson (2008) and Furth (2010) to employ the Hodrick-Prescott (HP) filter to decompose ToT movements into trend and volatility.

## **4. Results and Discussion**

### **4.1 Descriptive Statistics**

**Table 2: Summary statistics of growth and volatility of NBTT and ITT**

<b>Variable</b>		<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>	<b>Observations</b>
<b>Growth of</b>	Overall	0.5389	14.26	-	101.62	N=1050
	Between		2.32	-4.06	7.46	n=35
	Within		14.07	-	94.7	T=30
<b>Volatility of</b>	Overall	16.99	17.72	0	111.91	N=1050
	Between		10.48	2.23	46.67	n=35
	Within		14.39	-	90.98	T=30
<b>Growth of</b>	Overall	7.65	35.1	-	432.58	N=1050
	Between		5.49	0.17	25.12	n=35
	Within		34.68	-	415.11	T=30
<b>Volatility of</b>	Overall	43.93	57.91	0.7	806.44	N=1050
	Between		27.03	8.11	141.38	n=35
	Within		51.41	-	708.99	T=30

Source: Estimation result

NBTT growth varied between -62 and 102 percent while ITT growth varied between -76 and 433percent. Volatility of NBTT varied between 0 and 112 while volatility of ITT varied between 0.69 and 806. Average growth of

NBTT and ITT for each country in the sample varied between -4 and 7, and 0.17 and 25, respectively.

The reported standard deviations indicate that variations in the NBTT growth, ITT growth, NBTT volatility, and ITT volatility during the sample period across countries are significantly different from that observed within a country over time. The larger figure of the within standard deviation shows the greater variability of variables.

#### 4.2 Panel Unit Root Test

Table 3 presents the results of the Levin–Lin–Chu and IPS panel unit root tests. The optimum lag is selected using Akaike Information Criteria (AIC).

**Table 3: Panel Unit Root Test**

Variable	Deterministic	Levin–Lin–Chu		Im, Pesaran and Shin	
		Level	First difference	Level	First difference
Per capita GDP	Constant	2.9425	-13.8089*	4.6255	-15.9101*
	Constant + trend	-2.2721**	-15.0190*	2.0538	-16.5125*
Investment	Constant	-2.8997*	-26.9680*	-2.2523**	-26.0836*
	Constant + trend	-7.0414*	-23.6852*	-4.7110*	-23.6868*
Labour force	Constant	8.9063	-4.7815*	17.3976	-6.7297*
	Constant + trend	-6.7398*	-8.6190*	2.2773	-8.6065*
Growth of NBTT	Constant	-21.4451*	-35.3951*	-23.3977*	-37.8914*
	Constant + trend	-17.9194*	-29.2945*	-20.9178*	-34.0163*
Growth of ITT	Constant	-24.8054*	-33.8864*	-24.5374*	-35.1063*
	Constant + trend	-22.0127*	-28.5403*	-22.4899*	-31.8348*
Volatility of NBTT	Constant	-4.9623*	-16.3938*	-4.7141*	-15.5816*
	Constant + trend	-6.0310*	-14.4247*	-3.5521*	-12.8791*
Volatility of ITT	Constant	-18.0839*	-16.9352*	-11.5167*	-16.3625*
	Constant + trend	-15.9530*	-13.2355*	-9.4949*	-12.4610*

\* 1% levels of significance

\*\* 5% levels of significance

Source: Estimation result

The result shows that the null hypothesis of a panel unit root in the level of the series is rejected for all variables except for Per capita GDP and LAB. Both types of tests (with and without trend) significantly prove that the majority of the series strongly reject the null hypothesis that all series contain a unit root. Hence, there is no strong evidence that all the series are integrated of orders one.

### **4.3 Empirical Results**

This section presents the difference and system GMM estimation results of the effect of growth and volatility of NBTT and ITT. As clearly stated in earlier sections, the study uses NBTT and ITT interchangeably throughout this paper. The study uses variables in levels; then, the difference and system GMM estimator take the first differences in the regression. Therefore, coefficients reported hereafter belong to the first differences rather than levels of variables.

#### **4.3.1 *Net Barter Terms of Trade and Economic Growth***

Table 4 presents difference GMM regression results using NBTT. It contains two regression results, i.e. regression [1a] using all 35 sample countries and regression [1b] using 34 countries, excluding South Africa from the sample. Although South Africa is found in SSA, it is relatively industrialised and a middle-income country as compared to other sample countries. Hence, the study excluded South Africa in the second regression so as to see the difference on the result.

However, in both regressions, using all 35 countries and excluding South Africa, it is clearly observed that the coefficient for the growth of NBTT is positive and highly significant. This implies that improvements in ToT are growth-sustaining while deterioration in ToT becomes growth-retarding. As the majority of sample countries are primary commodity exporters, their ToT shows deterioration through time and this adversely affects economic growth. On the other hand, the coefficient of NBTT volatility is negative and highly significant.

**Table 4: Difference GMM regression result using NBTT**

Estimation Method	Differenced GMM	
Period	1985-2014	
Volatility measure	Standard Deviation of NBTT	
Dependent variable:	[1a]	[1b]
Percapita GDP	All Sample countries	Excluding South Africa
<i>Independent Variables</i>		
Lagged percapita GDP	0.9481* (0.0011)	0.9467* (0.0011)
Investment	1.1117* (0.1066)	1.0337* (0.0851)
Labour force	0.0153* (0.0005)	0.0085* (0.0005)
Growth of NBTT	0.3367* (0.0067)	0.3486* (0.0067)
Volatility of NBTT	-0.1786* (0.0363)	-0.2187* (0.0405)
Number of countries	35	34
<i>Specification Tests (p-values)</i>		
Sargantest	0.6203	0.6684
<i>Serial Correlation</i>		
First-order	0.0679	0.0656
Second-order	0.2836	0.2787

Figures presented in brackets are standard errors

Symbols \*, \*\*, and \*\*\* represent significance at 1%, 5% and 10%, respectively.

Source: Estimation result

Since differenced GMM may be subject to a large downward finite-sample bias, the study used system GMM estimator that has better finite sample properties. Table 5 presents system GMM regression results using NBTT. It contains two regression results, i.e. regression [2a] using all 35 sample countries and regression [2b] using 34 countries, excluding South Africa from the sample.

**Table 5: System GMM regression result using NBTT**

Estimation Method	System GMM	
Period	1985-2014	
Volatility measure	Standard Deviation of NBTT	
Dependent variable:	[2a]	[2b]
Per capita GDP	All Sample countries	Excluding South Africa
<i>Independent Variables</i>		
Lagged per capita GDP	0.9767* (0.0011)	0.9785* (0.0016)
Investment	5.1035* (0.0898)	4.8957* (0.0982)
Labour force	0.0027* (0.0008)	-0.0017* (0.0003)
Growth of NBTT	0.3196* (0.0166)	0.2722* (0.0276)
Volatility of NBTT	-0.5515* (0.0399)	-0.5067* (0.0347)
Number of countries	35	34
<i>Specification Tests (p-values)</i>		
Sargan test	0.5854	0.6332
<i>Serial Correlation</i>		
First-order	0.0398	0.0561
Second-order	0.2774	0.2744

Figures presented in brackets are standard errors.

Symbols \*, \*\*, and \*\*\* represent significance at 1%, 5% and 10%, respectively.

Source: Estimation result

In both regressions, it is observed that the coefficient for the growth of NBTT is positive and highly significant. However, the coefficient of NBTT volatility is growth-retarding and highly significant.

Although the coefficients of growth of NBTT are of comparable magnitude in both estimators' regressions, volatility of NBTT exhibit large differences in their coefficients. While the coefficient for volatility of NBTT in difference GMM regression is -0.1786, it changes to -0.5515 in the case of system GMM regression. Therefore, it is evident that while an improvement of NBTT is growth-enhancing, deterioration of NBTT decelerates growth. Similarly,

volatility of NBTT slows down growth for the full sample. This finding is in line with results of recent studies such as Samimi *et al.* (2011), Furth (2012), and Cavalcanti *et al.* (2012).

#### 4.3.2 Income Terms of Trade and Economic Growth

**Table 6: Difference GMM regression result using ITT**

Estimation Method	Differenced GMM	
Period	1985-2014	
Volatility measure	Standard Deviation of ITT	
Dependent variable:	[3a]	[3b]
Percapita GDP	All Sample countries	Excluding South Africa
<i>Independent Variables</i>		
Lagged percapita GDP	0.9480* (0.0012)	0.9457* (0.0014)
Investment	1.1702* (0.0977)	1.0761* (0.0836)
Labour force	0.0153* (0.0004)	0.0079* (0.0007)
Growth of ITT	0.2671* (0.0068)	0.2531* (0.0104)
Volatility of ITT	-0.0891* (0.0085)	-0.1179* (0.0165)
Number of countries	35	34
Specification Tests ( <i>p-values</i> )		
Sargan test	0.6235	0.6905
Serial Correlation		
First-order	0.0638	0.0503
Second-order	0.2849	0.2805

Figures presented in brackets are standard errors.

Symbols \*, \*\*, and \*\*\* represent significance at 1%, 5% and 10%, respectively.

Source: Estimation result

Table 6 presents difference GMM regression results using ITT. The result, similar to the case of NBTT, shows that improvement in ITT is growth-sustaining while deterioration and volatility of ITT is growth-retarding.

The system GMM regression result presented in Table 4.6 also shows a similar direction although there is some difference on the magnitude of the coefficients of growth and volatility of ITT. The coefficient for growth of ITT in difference GMM regression is 0.2671, but it goes up to 0.3596 in the system GMM regression. When we see the coefficient of volatility of ITT, it has changed from -0.0891 to -0.1525. Therefore, the result confirms the importance of an underlying improvement in ITT in driving economic growth. Moreover, it is evident that deterioration in ITT and its volatility is an impediment for economic growth.

At the beginning of this paper, it was noted that there are familiar grounds for fearing that the NBTT will become more unfavourable than ITT for the analysis of the effect of ToT on economic growth. However, the result does not reveal notable difference on both types of ToT as shown in Lutz (1994). Lutz (1994) used both NBTT and ITT for his empirical analysis and found a significant negative growth effect of ITT volatility. Nevertheless, his estimated coefficients on the degree of volatility in the NBTT turned out to be positive but insignificant.

However, this paper confirms negative and significant growth effect of both NBTT and ITT volatility. Additionally, the result confirms that the improvement in both NBTT and ITT has a positive and significant effect on economic growth while deterioration in both NBTT and ITT has a negative and significant effect. Even though there is similarity on the direction of the effects of growth and volatility of ToT on economic growth, there is a significant difference on the magnitude of the coefficients of ToT volatility when the study uses NBTT and ITT differently. In the difference GMM regressions, regressions [1a] and [3a], the coefficient for volatility changes by half when the study uses NBTT instead of ITT. Similarly, system GMM regression result shows that the difference in coefficients of NBTT and ITT is more than three-fold. Overall, volatility of ITT has a smaller effect on economic growth as compared to that of NBTT.

In all regressions, the control variables are statistically significant and have the expected sign except for the change in lagged percapita GDP in all regressions and for the change in labour force in regression [2b] and [4b]. Therefore,

income convergence is either very slow or non-existent across sample countries since the coefficient of lagged dependent variable is positive and significant. Finally, in almost all regressions, the second-order serial correlation and the Sargan test statistics are beyond the conventional significance levels.

**Table 7: System GMM regression result using ITT**

Estimation Method	System GMM	
Period	1985-2014	
Volatility measure	Standard Deviation of ITT	
Dependent variable:	[4a]	[4b]
Percapita GDP	All Sample countries	Excluding South Africa
<i>Independent Variables</i>		
Lagged percapita GDP	0.9745* (0.0009)	0.9745* (0.0012)
Investment	5.3538* (0.0895)	5.1912* (0.1189)
Labour force	0.0021* (0.0004)	-0.0018* (0.0006)
Growth of ITT	0.3596* (0.0114)	0.3336* (0.0100)
Volatility of ITT	-0.1525* (0.0140)	-0.1334* (0.0158)
Number of countries	35	34
<i>Specification Tests (p-values)</i>		
Sargantest	0.5332	0.6039
<i>Serial Correlation</i>		
First-order	0.0381	0.0520
Second-order	0.2782	0.2754

Figures presented in brackets are standard errors.

Symbols \*, \*\*, and \*\*\* represent significance at 1%, 5% and 10%, respectively.

Source: Estimation result

#### **4.4 Robustness Checks**

The robustness of the result is checked using different dataset, by taking different proxies for volatility of ToT. It is mainly to make sure that the findings are not driven by the method in which volatility of ToT is measured. Instead of using the moving window standard deviation of ToT growth rate, in this section, the study follows Basu and McLeod (1991), Blattman *et al.* (2007), Williamson (2008), and Furth (2010) to employ the Hodrick-Prescott (HP) filter to decompose ToT movements into trend and volatility.

Table 8 presents difference and system GMM regression results using NBTT. It contains two regression results, i.e. regression [5a] for difference GMM and regression [5b] for system GMM. In both regression results, the coefficient for growth of NBTT was found to be positive and statistically significant. This finding fits with the initial results from regression [1a] and [2a] in which the coefficient for the growth of NBTT is positive and significant.

The difference GMM regression result [5a] shows that volatility of NBTT has an insignificant effect. However, regression [5b] clearly shows volatility of NBTT has a negative and significant effect on economic growth. As a result, it is better to rely on the result of system GMM as differenced GMM may be subject to finite-sample bias. Therefore, it seems safe to conclude that our result is robust and volatility of NBTT harms economic growth.

**Table 8: Regression result using NBTT**

Estimation Method	Difference and System GMM	
Period	1985-2014	
Volatility measure	Hodrick-Prescott (HP) filter	
Dependent variable:	[5a]	[5b]
Percapita GDP	Difference GMM	System GMM
<i>Independent Variables</i>		
Lagged percapita GDP	0.9482* (0.0004)	0.9766* (0.0014)
Investment	1.1585* (0.0746)	5.2685* (0.0847)
Labour force	0.0153* (0.0004)	0.0015* (0.0003)
Growth of NBTT	0.3276* (0.0134)	0.3050* (0.0207)
Volatility of NBTT	-0.0432 (0.0610)	-0.3914* (0.0708)
Number of countries	35	35
<i>Specification Tests (p-values)</i>		
Sargantest	0.5884	0.4695
<i>Serial Correlation</i>		
First-order	0.0617	0.0471
Second-order	0.2832	0.2755

Figures presented in brackets are standard errors.

Symbols \*, \*\*, and \*\*\* represent significance at 1%, 5% and 10%, respectively.

Source: Estimation result

Additionally, as this study did for NBTT, the robustness of the result for ITT is checked using a similar procedure. Table 9 presents difference and system GMM regression results using ITT.

Table 9 contains two regression results, i.e. regression [6a] for difference GMM and regression [6b] for system GMM. In both regression results, the coefficient for the growth of ITT was found to be positive and statistically significant. Regarding volatility of ITT, its coefficient was found to be negative and significant in regression [6b]. This finding fits with the initial results in which volatility of ITT has a negative significant effect on economic growth.

In addition, the study tried to include growth and volatility of NBTT and ITT separately in all regressions so as to see if this affects the results. In all cases, neither the sign nor the significance of coefficients of growth and volatility of NBTT and ITT has changed.

**Table 9: Regression result using ITT**

Estimation Method	Difference and System GMM	
Period	1985-2014	
Volatility measure	Hodrick-Prescott (HP) filter	
Dependent variable:	[6a]	[6b]
Percapita GDP	Difference GMM	System GMM
<i>Independent Variables</i>		
Lagged percapita GDP	0.9486* (0.0009)	0.9745* (0.0008)
Investment	1.1522* (0.0535)	5.3011* (0.0682)
Labour force	0.0156* (0.0002)	0.0018* (0.0004)
Growth of ITT	0.2624* (0.0099)	0.3373* (0.0105)
Volatility of ITT	-0.0194 (0.0160)	-0.1312* (0.0276)
Number of countries	35	35
<i>Specification Tests (p-values)</i>		
Sargantest	0.5023	0.4258
<i>Serial Correlation</i>		
First-order	0.0672	0.0423
Second-order	0.2843	0.2781

Figures presented in brackets are standard errors.

Symbols \*, \*\*, and \*\*\* represent significance at 1%, 5% and 10%, respectively.

Source: Estimation result

In all regressions, the control variables are statistically significant and have the expected sign except for the change in lagged percapita GDP in all regressions. Therefore, similar to the initial findings, income convergence is either very slow or non-existent across sample countries since the coefficient of lagged dependent variable is positive and significant. Finally, in all regressions, the

second-order serial correlation and Sargan test statistics are beyond the conventional significance levels. Hence, the findings obtained using different volatility measures confirm the robustness of the results reported in Section 4.3.1 and 4.3.2 and provide evidence for a positive effect of an improvement in ToT and a negative effect of both deterioration and volatility of ToT on economic growth.

## **5. Conclusion**

This study investigated the effect of ToT growth and volatility on economic growth in sub-Saharan Africa. The study employed dynamic panel data models of difference and system GMM that could account for biases associated with endogeneity of explanatory variables and problems induced by unobserved country-specific characteristics. The study used both net barter terms of trade and income terms of trade as measures of ToT for the analysis of this paper. In order to measure volatility of ToT, the study used the moving window standard deviation of ToT growth rate.

The regression result of difference and system GMM estimators shows that the growth of both NBTT and ITT has positive and significant coefficients. This implies that improvement in ToT is growth-enhancing whereas deterioration in ToT is growth-retarding. Furthermore, the result proved that volatility of NBTT and ITT has a negative and significant effect on economic growth. To make sure that the findings are not driven by the method with which volatility of ToT is measured, the study employed HP filter to measure volatility of ToT instead of using the moving window standard deviation of ToT growth rate. Finally, this result was found to be robust using the aforementioned alternative volatility measure as well.

This result suggests that countries can promote their growth using interventions that enhance and improve their ToT over time. In addition, this finding confirms that ToT volatility matters for economic growth. As a result, any exogenous shock that affects ToT volatility can also affect growth. Therefore, it is possible to sustain growth through various policy interventions that target reducing ToT volatility.

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## **Appendix**

### **List of Countries Included in the Study**

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Benin	Chad	Senegal	Mali	Gambia
Botswana	Comoros	Ghana	Mauritania	South Africa
Burkina Faso	Togo	Sudan	Mauritius	Guinea-Bissau
Burundi	Congo, Rep.	Kenya	Zambia	Swaziland
Cameroon	Cote d'Ivoire	Lesotho	Niger	Congo, Dem. Rep.
Cape Verde	Ethiopia	Madagascar	Nigeria	Mozambique
Zimbabwe	Gabon	Malawi	Rwanda	Central African Republic

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### **List of Countries Excluded from the Study**

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Angola	Liberia	Somalia
Djibouti	Namibia	South Sudan
Equatorial Guinea	Sao Tome and Principe	Uganda
Eritrea	Seychelles	Western Sahara
Guinea	Sierra Leone	

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# Impacts of Small-Scale Irrigation Technology on the Nutritional Wellbeing of Children in the Amhara National Region of Ethiopia

Belainew Belete<sup>1</sup> and Surafel Melak<sup>2</sup>

## *Abstract*

*It is agreed that adopting irrigation technology improves production, productivity, income, and access to food for farm households. However, evidence on nutritional outcomes of small-scale irrigation technologies is quite scant. The existing studies focus on the productivity and poverty effect of irrigation. Thus, this study examines the impact of adoption of small-scale irrigation technologies on child nutritional wellbeing of farm households where nutritional wellbeing is measured through anthropometric indicators. Data were collected from 130 sample households drawn from Dangila and Bahir Dar Zuria wereda's<sup>3</sup>. The Propensity Score Matching (PSM) method was employed to identify comparable technology adopting and non-adopting sample households. The study found malnutrition to be severe in the study area. Both chronic and acute malnutrition problems were found to be wider for girls, for children aged below 2 years of age, and for non-adopters of the technology. Results of the average treatment effect on treated participants suggest that adoption of small-scale irrigation technologies has a positive impact on improving the adopters' short-term nutritional status but its impact on children being chronically malnourished and underweight is insignificant. This study concludes that children of small-scale irrigation technology adopting households have significantly lower acute malnutrition status than those of non-adopting households even after controlling for the potential heterogeneity. Targeting diffusion of small-scale irrigation technology with early nutrition-specific intervention for long-term nutritional improvement is vital to secure child nutritional wellbeing.*

**JEL Classification:** Q16, I31, C21, D02, C91, I39

**Keywords:** Child Nutrition, Impact Analysis, Propensity Score Matching, Small-Scale Irrigation Technology.

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<sup>3</sup> *Woreda* is the lowest administrative organ of the regional state.

## **1. Introduction**

Rain-fed agriculture is the mainstay of livelihood of households in Ethiopia though it is subject to erratic climate problems (Ayele, 2011; Hagos *et al.*, 2009; Yami & Snyder, 2012). Such climate variability is a threat to agricultural production and productivity which expose households to production risks, and lack of adequate and nutritious food (Domenech and Ringler, 2013; Foltz, Gars and Zaitchik, 2013). In areas where rainfall is limited and resources are underemployed, irrigation potentially reduces vulnerability to climatic variability and improves productivity and product diversity (Namara *et al.*, 2011; Getacher, Mesfin and Gebre-egziabher, 2013a). Hence, adoption of irrigation technology enables farmers to adapt and strengthen their resilience in climate vulnerable regions, diversify their diet, and increase the nutritional content of foods through bio and post-harvest fortification (Ayele, 2011; FAO, 2011; Hagos *et al.*, 2009; Namara, Upadhyay, & Nagar, 2005).

According to Hagos *et al.* (2009) and Wehabrebi (2014), improving agricultural efficiency through adopting irrigation technology is a foundation for improving rural households' food security in Ethiopia. Besides, irrigation application with appropriate technology enables Indian farmers to produce diversified and high-value crops, which enable them to improve their nutritional and welfare status (Namara, Upadhyay and Nagar, 2005; Adeoti, 2008; Hagos *et al.*, 2009; Munongo and Shallone, 2010). However, irrigation technology adoption is challenged by technical, economic and institutional factors (Kulkarni, 2011; Getacher *et al.*, 2013b).

Although irrigation plays an enormous role in alleviating poverty and food insecurity in developing countries like Ethiopia, it is still traditional, small scale and at subsistence level with limited access to technology and institutional services (Kulkarni, 2011; Namara *et al.*, 2011; Tekana and Oladele, 2011).

Agricultural intervention leads to a shift in food production, production variability, dietary diversity, labour productivity, and a change in the role of

women (Hagos *et al.*, 2009; Namara *et al.*, 2005). The way these changes take place has impacts on the nutritional status of households (Domenech and Ringler, 2013). But the impact on different members of the households and community such as beneficiaries, non beneficiaries, children and women differs. Measuring and identifying the differences is critical for the redesign and implementation of effective irrigation interventions to optimize the nutritional wellbeing of the households and the community.

Policy makers, program managers and other stakeholders have mainly focused on inputs and immediate outcomes (distribution and use of resources) of the intervention by putting aside the anticipated goals of improving the well-being of households and society (Bhattarai & Hussain, 2002; Gertler *et al.*, 2011; Lance *et al.*, 2014). In developing countries, where resources are scarce and each dollar spent is aimed at maximizing its role in poverty reduction and improving wellbeing, impact evaluation is vital to identify what does and doesn't work to improve wellbeing and reduce poverty (Baker, 2000; Gertler *et al.*, 2011).

Nowadays, a few studies have investigated the impact of irrigation on nutrition, which is an engine for economic sustainability. A study by Domenech & Ringler (2013) in eastern Ghana and Namara *et al.* (2011) in the South of the Saharan Africa show that irrigation improves nutritional status of households. Likewise, the installation of micro irrigation technologies in India has helped farmers to produce more diverse and higher quality crops, which enable them to improve their nutritional status (Domènech, 2015a). However, Malapit *et al.* (2013) in Nepal found that irrigation has a dichotomous effect on nutrition outcome. Nutrition is improved as a result of food improvement but health impacts of chemical application (pesticides and insecticides) in irrigation agriculture reduces nutritional wellbeing. Moreover, irrigation technology improves the nutritional outcome of farm households through improving the quality and quantity of food, but sometimes it reduces the nutritional status of households because of mono-cropping and unsafe water.

Macharia & Muroki (2005), Peiris & Wijesinghe (2010), and Steiner-Asiedu *et al.* (2012) found that those children whose mothers actively participated in agricultural activities have low nutritional status, but women's involvement in

income-generating irrigation activities and their control of income from irrigation has greater impact on increasing the child nutritional status of the households (Malapit *et al.*, 2013). Women's disempowerment in agricultural activities results in high malnutrition problems (being underweight, stunted and wasted) of their children (Domenech and Ringler, 2013; Malapit *et al.*, 2013). Thus, the impact of irrigation technology on nutritional status is not clear since its impact on nutrition is realised through product diversification and empowerment of women.

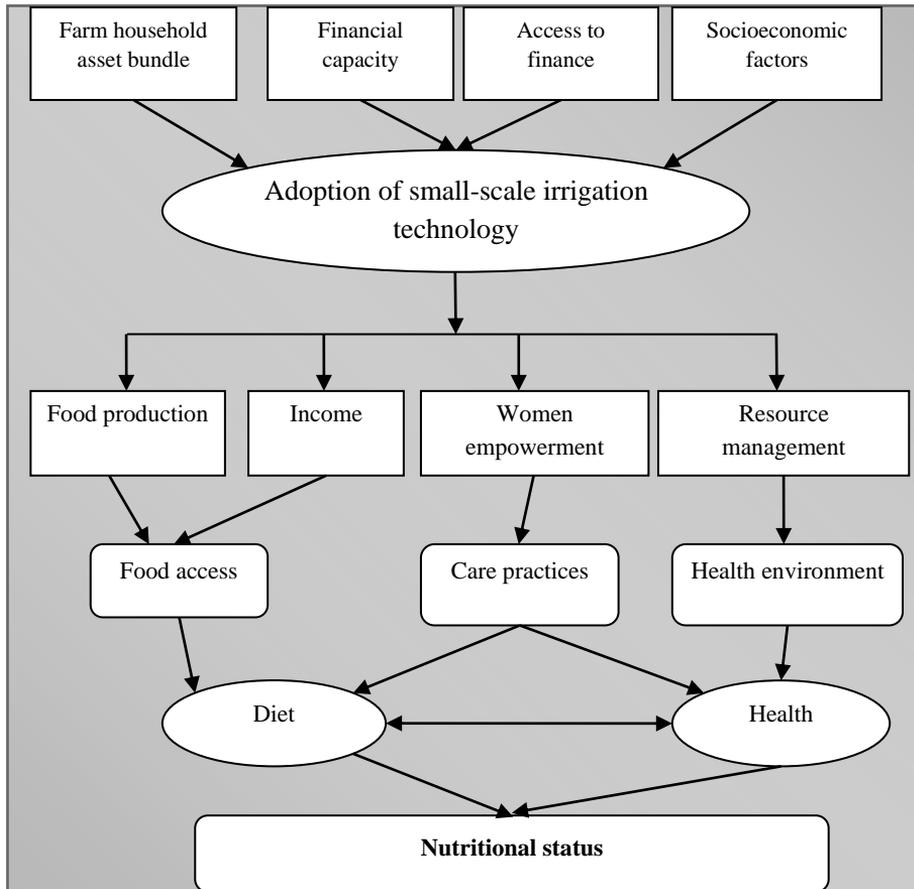
Small-scale irrigation is a policy priority in Ethiopia for poverty alleviation and addressing malnutrition to achieve sustainable development (World Bank, 2010; Haile, 2015; Solomon and Ketema, 2015). According to Hagos *et al.* (2009b), Ethiopia is said to have an estimated irrigation potential of 3.5 million hectares. From this total irrigation potential, only 5.2 percent is reported to be used during the 2015/16 production period (Central Statistical Agency (CSA), 2016). Irrigation practiced by smallholder farmers in Ethiopia is used only as supplementary to solve their livelihood challenges (Awulachew *et al.*, 2006; Hagos *et al.*, 2009; Kulkarni, 2011). Irrigated agriculture is becoming vital in meeting the growing demand for food security, poverty reduction and livelihood improvement in Ethiopia. A study by Asayehegn, Yirga, & Rajan (2012) in Laelay Maichew district of Tigray region using Hickman a two-stage model and Getacher *et al.* (2013) in Tigray region, Northern Ethiopia using ordinary least square show that small-scale irrigation has a positive and significant impact on improving the income of rural farm households. In Gubalafto district of North Wollo, Ethiopia, small-scale irrigation has helped to improve the livelihoods of farm households (Mengistie and Kidane, 2016). Studies on the impact of small-scale irrigation technologies in Ethiopia are biased towards the food security, income increment and poverty reduction outcome. A closer look at the literature on impacts of irrigation reveals a number of gaps and flaws. That is, evidence on nutritional outcome of irrigation is quite limited, highly inconsistent, and insufficient to draw strong inference. Some have applied a qualitative approach, which can't be tested empirically, and some others have failed to show the outcome is due to irrigation. Thus, further investigation in the study area is crucial to understand the nutritional outcome of small-scale irrigation technology more adequately.

Hence, this study attempts to provide empirical evidence on the impact of small-scale irrigation technology on farm household nutritional status of Dangila town and Bahir Dar Zuria district of the Amhara National Regional State, Ethiopia. Specifically, it attempts to investigate the nutritional status of farm households in the study areas. The rest of the paper is organized as follows. The second part of the paper describes the methodology used in this study, section three presents the results, and the last section provides conclusions and policy implications.

### **Conceptual framework**

There are several potential pathways in which irrigation can influence nutrition outcomes including (1) production pathway, (2) income pathway (3) women's empowerment pathway, and (4) environmental pathway (Domènech, 2015b; Herforth and Ballard, 2016). The framework indicates that irrigation can influence the underlying and immediate determinants of nutrition such as food access, care practices, and health environments. Following the literature, the effect of small-scale irrigation technology on nutrition pathways is illustrated in Figure 1.

**Figure 1: Conceptual frame work on impact of irrigations technology on nutrition status**



Source: Author

## **2. Material and Methods**

### **2.1 Data**

In this study, we utilize data from a household survey collected from mid May to early June 2016 from two *woredas* (Dengeshita and Robit *woreda*) of Amhara national region of Ethiopia (Figure 2). Primary data were collected from 135 randomly selected farm households, using a multi-stage stratified random sampling technique. In the first stage, Dengeshita and Robit *woreda*'s were selected purposely based on the existence of irrigation technology as pilot *woreda*'s (intervention sites) of the Innovative Lab for Small-Scale

Irrigation (ILSSI) project<sup>4</sup>. In the second stage, information from the agricultural offices of the selected *woreda*'s was used to select one *kebele* (the smallest unit of administration in the government structure under a *woreda*) in each *woreda* with a high concentration of smallholder technology such as pulley and rope-and-washer. In the third stage, the list of farm households in the selected communities was used to disaggregate them into adopter<sup>5</sup> and non-adopter<sup>6</sup> households. Finally, we used the proportional random sampling technique to select our sample farm households. Of the total sample households, 83 were classified as adopters of small-scale irrigation technology. Treated households (adopters) were selected by the ILSSI project at the time of intervention, which distributed either of the two irrigation technologies to the households (rope-and-washer and pulley) to produce the same crop (elephant grass and tomato in Robit, onion in Dengeshita, and pepper in all sites).

Data on anthropometric measure such as age, height and weight were administered by health extension workers from mid May to early June 2016. Mothers or closest caregivers from 13 to 49 years of age were interviewed to obtain information on the children's age and sex.

According to the protocol used by DHS, for children below 60 months of age, height is measured to the nearest 0.1 cm. The recumbent measure was used to measure the length of children younger than 24 months; standing height was measured for children aged 24 months and above. Weight was measured to the nearest 0.1 kg through beam balance scale (O'Donnell, Doorslaer, Wagstaff, & Lindelow, 2008).

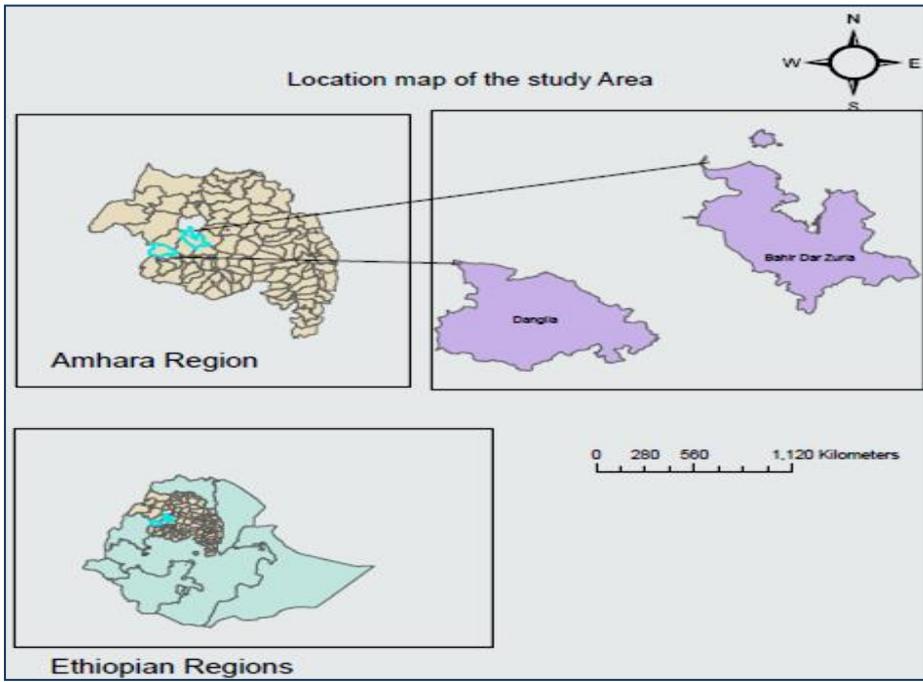
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<sup>4</sup> Feed the Future Innovative Lab for Small-Scale Irrigation (ILSSI) is a five-year project launched in 2013, aiming to increase food production; improve nutrition and livelihoods of farm household; accelerate economic development; and protect the environment through improved access to small-scale irrigation technologies. The technical intervention (irrigation technology provision) of the project is aimed at expanding irrigable land, using optimum irrigation techniques in order to battle poverty and malnutrition problems, and improve the livelihoods of farm households in Tanzania, Ethiopia and Ghana.

<sup>5</sup> Adopter (treated) households are farm households who adopt either of the two irrigation technologies, i.e., rope-and-washer or pulley.

<sup>6</sup> Non-adopter (control) households are farm households who rely on rain-fed agriculture.

**Figure 2: Study Area Map**



## **2.2 Analysis of Child Nutritional Status**

In this study, the nutritional status of the child was compared with Z-scores<sup>7</sup> of the reference group. Computation of normalized anthropometric Z-score requires data on sex, height, weight of the children. Z-score of height for age (HAZ), weight for age (WAZ) and weight for height (WHZ) were calculated using the 2006 WHO growth standards with dedicated anthropometric software in STATA version 13. A sample of 130 children was used for the final analysis, and the remaining 5 samples that had missing anthropometric data were excluded. Based on the 2006 WHO recommended cut off points, children whose HAZ was below -6 and above +6, whose WAZ was below -6 or above +5, and whose WHZ was above +5 or below -5 were excluded, since these extreme values were probably a result of measurement or data entry error (Mei and Grummer-strawn, 2007).

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<sup>7</sup>  $Z - score = \frac{\text{observed value} - \text{median value of the reference population}}{\text{standard deviation value of reference population}}$

### 2.3 The Analytical Model

In this study descriptive statistics and econometric analyses were employed to analyze the impact of the intervention on the nutritional wellbeing of treated groups. Nutritional impact evaluation was conducted by employing the Propensity Score Matching (PSM) method to answer the question: “What if a household had not adopted irrigation technology?” Anthropometric indicators of nutrition such as stunting, being underweight, and wasting of children under five years of age were used as they are more reliable and accurate indicators of the nutritional status of households (Amendola and Vecchi, 2008). To do so, propensity score  $P(x)$  is calculated on the basis of all observed covariates ( $X$ ) that jointly affect participation in small-scale irrigation technology adoption and outcomes of interest (Khandker, Koolwal and Samad, 2010).

The adoption decision of small-scale irrigation technology is a discrete outcome with a value of 1 if the household adopts either or both of the technology and 0 otherwise. The probability of small-scale irrigation technology (pulley and rope-and-washer) adoption is estimated through binary logistic regression. The econometric estimation is specified as:

*The latent (index) model:*

$$y^* = X_i\beta' + u \quad (1)$$

Where,

$y^*$  is latent variable,  $x\beta'$  is index function and  $u$  is the error term;  $u \sim l(0, \frac{\pi^2}{3})$ .

If  $y^* > 0, Y = 1$  and  $y^* \leq 0, Y = 0$

$$\begin{aligned} pr(Y_i = 1/x) &= \frac{1}{1 + e^{x\beta}} = \frac{e^{x\beta}}{1 + e^{x\beta}} \\ &= \Lambda(x\beta') \end{aligned} \quad (2)$$

Where  $pr(Y_i = 1/x)$  is the probability of success and  $x\beta'$  is the linear combination of covariates,

whereas the probability of failure is specified as:

$$1 - pr(Y_i = 1) = \frac{1}{1 + e^{x\beta}} \quad (3)$$

Odds ratio (L) is obtained by dividing (2) by (3)

$$L = \frac{pr(y_i = 1/x)}{1 - pr(y_i = 1/x)} = \frac{\frac{e^{x\beta}}{1+e^{x\beta}}}{\frac{1}{1+e^{x\beta}}} = e^{x\beta} \quad (4)$$

Finally,

$$\ln(L) = \ln\left(\frac{pr(y_i = \frac{1}{x})}{1 - pr(y_i = \frac{1}{x})}\right) = \ln e^{x\beta} = \Lambda(x\beta) \quad (5)$$

Where  $\ln(L)$  log of logit model odds ratio,  $\Lambda(x\beta)$  is cumulative distribution function,  $\beta'$ s are coefficient of the regression estimated by maximum likelihood estimation technique and  $x'_i$  vector of covariates that determine the dependent variable (decision on irrigation technology adoption).

So, the logit (treated) model of estimating the propensity score is

$$\ln(L) = x_i \beta'_j + U \quad (6)$$

Where U is error term and other variables are as defined above.

Hence, impact is measured by the difference in outcomes of control and treatment group by average treatment effect.

$$ATT = E(\tau_i / \varphi = 1) = E[(Y_1 - Y_0) / \varphi = 1] \quad (7)$$

Where  $E(Y_1 / \varphi = 1)$  is an average outcome of households who are treated (used the technology);

$E[Y_0 / \varphi = 1]$  is an average outcome of treated households if they did not use the technology. In this study the outcome variables are:

**1. Stunting (HAZ):** the measure of growth retardation (shortness) for the given age. It measures the prevalence of children in long-term growth problems as a result of poverty, chronic diseases and low socio-economic status. The prevalence of chronic malnutrition (stunting) is the percentage of children 0-59 months old who are below minus two (moderate) and below minus three (severe) standard deviation from the median height for the age of the WHO child Growth Standard.

**2. Wasting (WHZ):** the measure of thinness for the given height. Prevalence of acute malnutrition is the percentage of children 0-59 months old who are below minus two (moderate) and below minus three (severe) standard deviations from the median weight for the height of the WHO child Growth Standards.

**3. Underweight (WAZ):** the measure of underweight as a result of composite problems of chronic and acute malnutrition problems. Prevalence of underweight is the percentage of children 0-59 months old who are below minus two (moderate) and below three (severe) standard deviations from the median weight for the age of the WHO child Growth Standards.

### **Explanation of variables and hypothesis**

Following the adoption literature of Adeoti (2008), Asante (2013), and Gebregziabher *et al.* (2014), the explanatory variables included in our model and their hypothesized effect on adoption decision of small-scale irrigation technology are discussed below.

**Household head age:** is the age of the household head in years to capture the working capacity of farm household heads. The effect of age on adoption is dichotomous. On the one hand, older farmers are experienced enough and they have accumulated physical and social capital, adaptive expectation which enables them to try the new technology. Therefore, they are highly likely to adopt new irrigation technologies. On the other hand, younger household heads are less likely to own productive resources and they are exposed to farm risks but they are more capable to work than older heads. Therefore, young households can cope with farm risks like drought by adopting technology. Thus, it was difficult to prioritize the effect of age on small-scale irrigation technology adoption before seeing the empirical result.

**Dependency ratio:** is the proportion of dependants who rely on economically active household members in the given household. This variable indicates the number of household members that can assist in operating the irrigation technology. Small-scale irrigation technologies are labour-intensive and require adult labour to operate them. Farm households with a lower dependency ratio offer extra labour to assist irrigation technology. Therefore, we hypothesized that households with low dependency ratios have higher probability to adopt small-scale irrigation technologies.

**Household head education level:** is the maximum schooling level (grade) that the household head completed. This indicates household capacity to adopt a technology. More education enables farm households to manage and operate the complex technology. In adoption studies by Adeoti (2008) and Getacher *et al.* (2013b), it was found that better educated households have a higher tendency to adopt irrigation technology. Thus, it was expected that better educated households would be more interested in adopting irrigation technologies.

**Land holding size:** is the land holding size of the households in hectares, which measures the wealth status of the households. In agricultural activity, land is the prime input for both dry and rain-fed production. In technology adoption research, large land holding encourages the adoption of irrigation technology (Adeoti, 2008; Bagheri and Ghorbani, 2011). Accordingly, we hypothesized that farmers with greater land holding have greater probability to adopt irrigation technologies.

**Extension service:** is the frequency of visits made by agricultural extension workers per year. Extension service enables farmers to identify problems related to farming activity, crops, and soil. Hence, access to this service is important to adopt technology. Therefore, we hypothesized that households who were frequently visited by extension workers have a higher tendency to adopt irrigation technology than less frequently visited farming households.

**Market distance:** is the distance in kilo-meters from a household's residence area to the nearest market. Living closer to a market centre helps farm households to have alternative income sources other than farming (irrigation) activities. On the other hand, farmers living farther away from markets have less opportunity to be engaged in off-farm activities like petty trades, which encourage irrigation in dry seasons and adoption of irrigation technologies. Therefore, we hypothesized that the effect of the distance of markets from farm households' villages on adoption of small-scale irrigation technology is difficult to predict.

**Credit access:** is the dummy variable with a value of 1 if the household has access to credit and 0 otherwise. Investments on farmers (credit provision) facilitate the diffusion of irrigation technology. Empirical evidence confirms that households with credit access are more likely to adopt irrigation technology than those without (Adeoti, 2008). Likewise, it is expected that access to credit positively affects the adoption of irrigation technologies.

### **3. Results and Discussion**

#### **3.1 Nutrition analysis**

The survey results show that the mean Z-score of height-for-age, weight-for-age, and weight-for-height are -1.78, -1.29, -0.32, respectively, which shows the entire distribution has shifted downward below the mean. As depicted in Table 1, the standard deviations of height-for-age, weight-for-age, and weight-for-height are 1.55, 1.06, and 1.44, respectively. The findings of this study show that the distribution of the sample was spread wider than the reference group, so there is no data inaccuracy as a result of measurement error (Mei and Grummer-strawn, 2007).

**Table 1: Summary Statistics of Anthropometric Indices Z score in the Sigt**

<b>Variable</b>	<b>Observation</b>	<b>Min</b>	<b>Max</b>	<b>Mean</b>	<b>S.D.</b>
Haz	132	-5.37	4.03	-1.779	1.548
Waz	135	-5.19	2.51	-1.288	1.059
Whz	130	-4.23	4.98	-0.324	1.441

Source: Survey Result Estimation

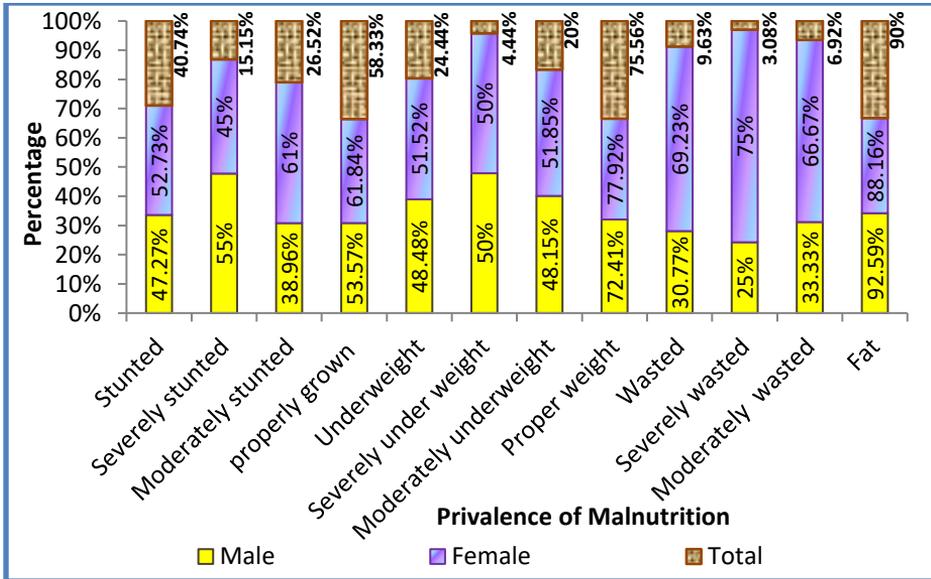
The prevalence-based analysis of child nutritional status was reported based on common cut-off values, often considering whether or not the z-scores of the indices are below the median of the reference group by about twice of the standard deviations.

#### **Stunting (chronic malnutrition)**

As can be seen from Table 2 and Figure 3, 40.74% of the sampled children were suffering from growth retardation (too short for their age). This chronic malnutrition (stunting) is due to long-term factors such as poverty, inadequate dietary intake in their lives, and recurrent illness. The prevalence rate of stunting in the study area was higher than the prevalence rate of Ethiopia at national level (40%) but lower than the prevalence of stunting in the Amhara Regional State (42%) (CSA, 2014). The prevalence rate of stunting in the study area was very high, which results in poor mental and physical

performance and poor school performance. It also reduces intellectual capacity and deters long-term economic progress.

**Figure1: Prevalence of Malnutrition, by Gender**



Source: Survey Result Estimation

Boys suffer from chronic malnutrition more than girls (47.3% vs 53%). From the total percentage of malnourished children (40.70%), 53% of the girls and 47.3% of the boys were dissatisfied with their basic needs during their first years of life (Figure 1). Besides, from the 15.2% stunted children, 11.84% of the girls, and 19.64% of the boys had severe chronic malnutrition. Of the 26.52% of the children, 38.96% of the boys and 61.04% of the girls had moderate chronic malnutrition. But of the remaining 58.33% children, 61.84% of the girls and 53.57% of the boys were found to have grown well in terms of their long-term growth status (Figure 1).

Prevalence of chronic malnutrition is higher for children aged below two years than children above two years by about 10.67%. The proportion of children who have grown well aged above two years is also higher than the proportion of children aged below two years by 11.79%. Accordingly, children below two

years of age suffer stiff chronic malnutrition whereas children above two years of age are characterized by a lower level of stunting (Table 2).

Children of both irrigation technology adopters and non-adopters are persistently short heterogeneously (Figure 2).

**Table 2: Prevalence of Malnutrition in Children under 5 Years of Age, by Sex and Age**

Anthropometric indices	Age group in months	
	0-24	24.1-60
Stunted	46.67	36
Severely stunted	22.48	9.46
Moderately stunted	25.86	27.03
Properly grown	51.72	63.51
Underweight	21.67	26.67
Severely underweight	1.67	6.67
Moderately underweight	20	20
Proper weight	78.33	26.67
Wasted	13.33	6.67
Severely wasted	3.57	2.7
Moderately wasted	10.71	4.05
Fat	85.71	93.24

Source: Survey Result Estimation

The prevalence of severe chronic malnutrition problem was more serious for technology adopters than for non-adopters (17.65% and 12.5%, respectively). But the problem of moderate stunting is more prevalent for technology non-adopters (28.75 %) than it is for technology adopters (23.53%). Finally, the result indicates that a larger proportion of children whose parents adopted irrigation technology was well-nourished than those whose parents did not adopt the technology. That is, 58.82% of the technology adopters and 57.75 % of the non-adopters were properly grown for their expected age.

### **Wasting (acute malnutrition) of children**

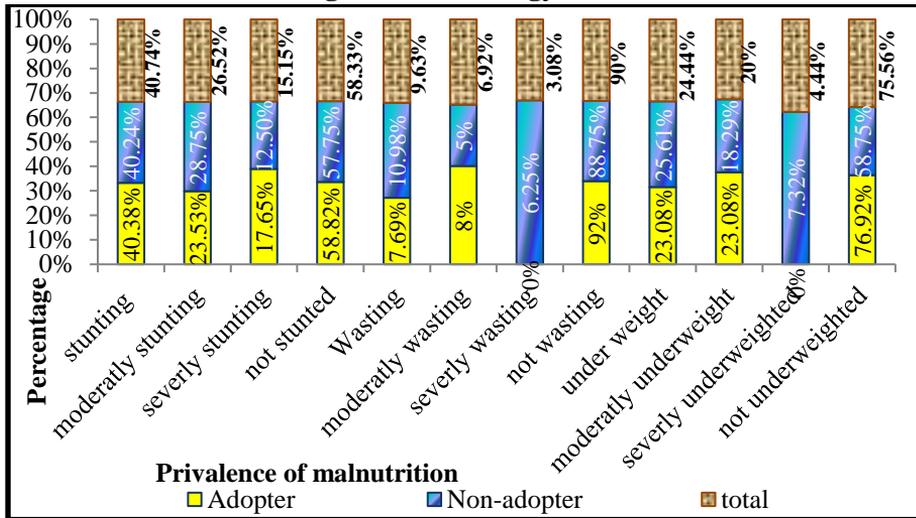
The result in Table 2 indicates that, on average, 9.6 percent of the children had acute malnutrition (low weight-for-height of the child for the given sex and age) as a result of recent malnutrition problems. The prevalence rate of acute malnutrition in the study area was medium, which is higher than the prevalent rate of children in Ethiopia in general and the Amhara region in particular (ICF International, 2011; Woldehanna, 2014). As presented in Figure 1 and Table 2 above, the prevalence rate of thinness (wasting problem) is higher for girls and children younger than 2 years of age. The result is consistent with previous studies (CSA, 2014; ICF International, 2011; Woldehanna, 2014).

The prevalence of wasting is higher among children of households that adopted technology than those that did not, accounting for 11% and 7.7%, respectively. Children of technology adopters were fat 92% compared with 88.75% of those children whose parents did not adopt the technology.

### **Being underweight**

The survey result also shows that 24.44% of the children were found underweight (Figure 3). From two children at least one suffers health and general nutrition problems. This was higher as compared to the result obtained from 2011 DHS data of Ethiopia at national level and the regional level prevalence rate (CSA, 2014). Table 3 and Figure 1 jointly show that 20% of the children, 51.85% of the girls, and 48.15% of the boys were moderately underweight; 4.44% of the children, 50% of the girls and 50% of the boys were severely underweight. Moreover, the problem of being underweight was more prevalent on girls (51.52%) and children older than 2 years (26.67%). Finally, children of households that did not adopt technology suffer from the problem of being underweight by about 2.5 percent more than those children whose parents adopted the technology.

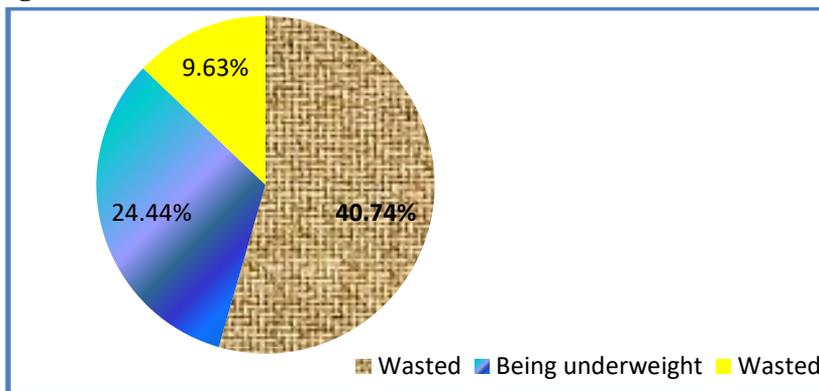
**Figure 2: Anthropometric Measures of Adopters and Non Adopters of Small Scale Irrigation Technology**



Source: Survey Result Estimation

Moreover, children whose parents adopted the technology have a higher probability of being moderately underweight and having the appropriate weight than those whose parents did not adopt the technology by about 4.79% and 18.17%, respectively, but none of the children of technology adopters was severely underweight (Figure 2). Therefore, the prevalence of being underweight is higher among children of farm households that did not adopt the technology.

**Figure 3: Pie Chart of Child Malnutrition**



Source: Survey Result Estimation

## **3.2 Econometric Analysis**

### **3.2.1 Estimation of propensity scores**

To match treated households with counter-factual households, propensity score matching was carried out by binary logistic regression. In this study, participation in adopting small-scale irrigation technology was the dependent variable with a dichotomous value of 1 for a technology adopter and 0 otherwise. The Wald test reveals that, jointly, all estimated coefficients are statistically significant at 1 percent (Table 3). The result revealed that additional years of schooling of the household heads increases the probability of adopting small-scale irrigation technology by 5.82 percent, *ceteris paribus*. More educated farm households have better knowledge on the importance of technologies and are able to adopt them. The result is in line with the finding obtained in Kenya (Godfrey *et al.*, 2014) and in Alamata District, Tigray, Ethiopia (Wehabrebi, 2014).

Dependency ratio of a household negatively affects the likelihoods of technology adoption because more adult members in the household imply cheap labour availability in the household, which can assist in the operation of the technology.

The result also shows that households with large land holdings have higher likelihoods of adopting technology, which is statistically significant at 5 percent. This might be due to the fact that irrigation is the activity in the dry season, and land for irrigation is prepared at the end of the Ethiopian summer season where rain-fed crops are not yet harvested. Thus, the household should leave the land waiting for irrigation. Therefore, having a large land size may permit households to allocate parts of their land for irrigation and adopt technology so as to lift water and irrigate in the appropriate season. This result is in line with the finding obtained in Ghana (Asante, 2013) .

Extension service has a positive significant impact on the probability of adopting irrigation technology. Receiving extension service for one more day augments the likelihood of adopting small-scale irrigation technology by 2.51

percent. The result is in line with the empirical finding of Gebregziabher *et al.* (2014) in Ethiopia.

**Table 3: Logistic Regression Result for Propensity Score Estimation**

Variables	Coefficients	MEF(dy/dx)	Z-value
Constant	-6.84 (1.678)		-4.08*
Age of the head	0.032 (0.006)	0.0077	0.222
Education of head	0.245 (0.0177)	0.0582	3.28*
Dependency ratio	0.599 (0.0775)	-0.143	-1.86**
Land size	0.796 (0.075)	0.189	2.52*
Extension service	0.106 (0.0091)	0.0251	2.76*
Market distance	0.165 (0.0195)	0.0392	2.01**
Credit access <sup>++</sup>	2.674 (0.084)	0.488	5.81*
Number of obs.	= 133		
LRchi <sup>2</sup> (7)	= 53.53		
Prob>chi <sup>2</sup>	= 0.0000		
Pseudo R <sup>2</sup>	= 0.3007		
Log likelihood	= -62.238351		

**Remark:** Figures in brackets are standard errors. ++ indicates dy/dx is for discrete change of dummy variable from 0 to 1; and \* and \*\* indicate significance at 1% and 5% significance levels, respectively.

Source: Survey Result Estimation

Finally, investment in irrigation technology requires investment fund, which is the main constraint for most rural farm households (Godfrey *et al.*, 2014). Thus, provision of either cash credit for technology or the technology in kind encourages farmers to adopt the technology. The econometric result of this study revealed that the probability of adopting irrigation technology for households with credit access is higher than households without credit access by 48.8%. The finding is in line with the finding obtained from Kenya (Godfrey *et al.*, 2014).

### 3.2.2 Common support region

In this study, the common support region lies between 0.06 and 1 (Table 4). This means observations with the propensity score matching of below 0.06 and above 0.82 were discarded out of the matching sample. Based on the min-

max criterion of determining the common support region, out of 130 households, 27 (15 control and 12 treated) lay out of the common region (support region) and were discarded from the analysis.

**Table 4: Distribution of Estimated Propensity Scores**

Groups	Obs.	Mean	Sta.Devia	Min	Max	Off support
All	133	0.39	0.29	0.003	1	27
Adoper	52	0.6	0.263	0.061	1	12
Non- adopter	81	0.26	0.216	0.003	0.817	15

Source: Survey Result Estimation.

In choosing the best matching algorithm equal mean test, low pseudo- $R^2$  value and large matched sample were considered as the criteria. In line with this, kernel matching with band width 2 fits all the three criteria, and hence, the estimation result of this study is based on kernel matching algorithm with 2 band widths.

Standardized bias, t-test, joint significance and Pseudo- $R^2$  are used to check the matching quality. Both partial and joint test of covariate and propensity score balance confirm that after matching, there is no significant mean difference between adopters and non-adopters. Therefore, it is trustworthy to estimate treatment effects based on kernel matching algorithm with 2 band widths.

### **3.2.3 Impacts of small-scale irrigation technology on child nutritional status**

The propensity score matching result (Table 5) shows there is a significant difference in acute malnutrition (wasting) status of children between households that adopted the technology and those that didn't. It is statistically significant at 10% level of significance. On average, Z-score of weight for a height of a technology adopter is 0.01 standard deviation above World Health Organization (WHO) child growth standard median of the reference group, whereas z-score of weight for a height of a technology non-adopter is 0.56 standard deviation below the median of the reference group. The result implies that children of households that did not adopt the technology are too thin for

their height as a result of an acute food shortage, severe diseases or a combination of both, but children of technology adopting households are well nourished. The result is consistent with the descriptive statistics result prior to matching. From this result, it is possible to infer that adopting irrigation technology helps to improve the body weight for the given height of technology adopting households. The noteworthy impact of small-scale irrigation technology on immediate nutritional wellbeing of adopting households might have resulted from rapid change in food supply, rapid access and availability of nutritious food, improved maternal and child care, and health care service of technology adopting households.

**Table 5: Impacts of Small-Scale Irrigation Technology Adoption on Household Nutrition**

<b>Outcome variables</b>	<b>Treated</b>	<b>Controls</b>	<b>Difference</b>	<b>S.E<sup>B</sup></b>	<b>T-value</b>
Whz	0.011	-0.551	0.561	0.399	1.81***
Haz	-2.069	-1.724	-0.345	0.426	-1.16
Waz	-1.199	-1.344	0.145	0.405	0.74

<sup>B</sup> Standards for bootstrapped error after 100 replications.

Source: Survey Result Estimation.

In contrast, chronic malnutrition (growth retardation) is more severe for children of technology adopting households than for non-adopting households. On average, the prevalence of stunting (too short for their given age) is more severe for the children of technology adopting households than it is to those of technology non-adopting households with a z-score of -2.07 and a 1.74 standard deviation below the median of the reference group, respectively. The severe problem of growth retardation from their long-term growth performance is due to recurrent infection resulting from the environmental cost of irrigation and the loss of care from their mothers because of work load of women brought about by irrigation activities. But the result is statistically insignificant.

The result also shows that the prevalence of being underweight for non-adopting households is higher than it is for adopting households. A glimpse into the nutritional status indicator of being underweight shows that, on average, the weight-for-age z-score indicator of technology adopting households is higher than it is for non-adopting household by 0.15 standard

deviations. This means children of technology non-adopting households are both thinner for their height and shorter for their given age than children of technology adopting households as a result of a combination of both wasting and stunting problems. The reason might be due to the fact that technology adopting households have produced more both in rainy and dry seasons; this may in turn have which might have reduced both acute and chronic malnutrition of their children. But the result is statistically insignificant.

#### **3.2.4 Sensitivity analysis**

Sensitivity analysis was employed to check the problem of hidden bias as a result of unobserved confounder (Caliendo and Kopeinig, 2005). The estimation result of this study shows that the upper bound significance level (p-value) is significant ( $p < 0.05$ ) at different sensitivity parameter up to  $\Gamma=6$ . This lower significant level shows the estimated result is insensitive to hidden biases. Hence, the inferences on the impacts of small-scale irrigation technology adoption on household child nutritional status (stunting, wasting and underweight) results are insensitive to unobservable characters.

### **4. Conclusion and Policy Implication**

The ultimate motive of this study was to evaluate the impact of small-scale irrigation technology on farm household nutritional status in the study area. To do so, impact evaluation was undertaken on 130 households in Dengeshita and Robit towns of the Amhara region, Ethiopia. To analyze the impact of technology adoption on the intended treatment outcome, both descriptive and econometric analyses were employed.

Nutritional analysis through anthropometric measures indicated that malnutrition problems were found severe. More specifically, 40.7% of the sampled children were found suffering from the problem of growth retardation (stunting), 9.6% of the children were victims of wasting (thinness), and 24.44% of the sampled children suffered from a combination of both chronic and acute malnutrition problems. The problems of stunting, wasting and being underweight were harsh for girls and children aged below 24 months. Such a

high prevalence of malnutrition severely affects future human capital formation and long-term economic performance. The prevalence of being underweight was serious for children of non technology adopting households, particularly girls and children aged above 2 years.

The average treatment effect shows that adoption of small-scale irrigation technology helps to solve acute malnutrition problems of children. Therefore, children of non-adopting households were found much thinner for their age than those of adopting households, but adoption of small-scale irrigation technology has no significant impact on stunting and being underweight in the study area.

Chronic malnutrition problem was more severe for technology adopters but a combination of acute and chronic malnutrition problem of technology adopter household was found better than their counter parts, the effect is statistically insignificant. Hence, the treatment effect estimation result shows small-scale irrigation technology adoption has a significant impact on improving short-term nutritional status of farm households.

The result of the sensitivity analysis test shows that the treatment effects were insensitive to the hidden biases. This means that the estimated impacts of small-scale irrigation technology on nutritional status were based on observed covariates.

Based on the empirical findings, the following policy implications are suggested. Policies and interventions of development agencies should incorporate strategies of expanding small-scale irrigation technology adoption focusing on the production of highly nutritious food, nutrition-sensitive agriculture, wiping out food insecurity, and environmental protection. We suggest nutrition-specific intervention, particularly during the child's first two years including pregnancy, is required for long-term nutritional improvement with short-term impacts on nutrition. Lastly, we recommend further research concerning the cost-effectiveness of the impact.

This study provides a set of lessons for policy makers and other development agencies for future project design in agricultural interventions in developing countries.

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# Multiple Credit Constraints and Borrowing Behavior of Farm Households: Panel Data Evidence from Rural Ethiopia

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## *Abstract*

*Promoting an inclusive rural credit market in developing countries is a re-emerging and pressing development agenda, given its importance in the poverty reduction and economic growth process. Existing literature mainly focuses on the supply side of the market with little or no attention given to demand aspects. This paper analyzes both the demand and supply side factors affecting credit constraints and borrowing behavior of farmers. Two waves of survey data, which included about 1,200 randomly selected households from four zones of the Amhara region in Northern Ethiopia, were used for the analysis. The Generalized Linear Latent and mixed model (gllamm) was employed to account for unobserved heterogeneity and potential correlations across credit constraint categories. The results show that the probability of quantity rationing increased in the study area between the years 2011 and 2013. Exposure to climatic shocks, age, and lack of education were found to increase the probability of being constrained while female and married heads were relatively less constrained. The results further indicate that borrower's perceived probability of rejection due to strict lending policies and institutional rigidities; the transaction cost of borrowing; and risk aversion behavior of farmers highly reduced the probability of borrowing from the formal credit market. Compared to North Shewa, farmers living in South Wollo zone were found to be discouraged and hence did not prefer borrowing from the formal sector. However, farmers in West Gojjam were less discouraged and had a higher probability of participating in the formal credit market, signifying zonal variation in credit constraints and borrowing behavior. This suggests the need to work on more innovative lending approaches by giving attention to context-specific factors to build demand-driven, climate-smart, and inclusive rural credit market.*

**Key words:** credit constraint, borrowing behavior, rural credit market, inclusive finance, gllamm, Ethiopia.

**JEL codes:** C23, G29, G30, Q12, Q54

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## **1. Introduction**

In developing countries where agriculture takes the lion's share of the GDP, rural credit market plays a crucial role in enhancing agricultural growth and transformation. For farm households, access to rural credit services is crucial as it facilitates access to recommended agricultural technologies and farming tools to improve productivity and produce marketable surpluses. It also helps farm households to build assets and smooth out consumption in the face of fluctuating agricultural income due to climatic shocks.

However, prior studies show that most farm households in developing countries are credit constrained. It is estimated that only five percent of farmers in Africa and about fifteen percent in Asia and Latin America have access to formal credit. On average, 80 percent of this credit goes only to 5 percent of the borrowers in many developing countries (Bali Swain, 2001; Antwi and Antwi, 2010). The condition is not much different in rural Ethiopia. For example, during the period 1951 – 1969, smallholder farmers received only 7.5 percent of the total loan disbursed by the Development Bank of Ethiopia. The rest was going to wrong groups of the society such as “absentee landlords”, merchants, and government officials, and it did not reach poor farmers (Admassie, 1987). Only 4.7 percent of the domestic credit went to the private sector during the period from 1986 to 1991 (World Bank, 1991) and more than 89 percent of the banks' agricultural credit went to state farms during that period (Admassie *et al.*, 2005). This created binding credit constraints on farm households over the decades.

Hence, promoting an inclusive credit market and ensuring farm households' access to financial services in developing countries is a re-emerging and pressing development agenda, and the recent policy emphasis has shifted to "Finance for All" (Lamberte *et al.*, 2006; World Bank, 2007).

In line with this policy shift, Ethiopia has done much in reforming its financial sector in recent years. Although there is an improvement in access to credit following these reforms, smallholder farmers still face credit constraints. Commercial banks in Ethiopia hesitate to lend to farmers due to the inherent risk in agricultural production and lack of the required loan collateral, and

hence, farm households are excluded from the formal banking market. Microfinance institutions and financial cooperatives are the alternative credit providers to these households. However, despite the rapid growth of these institutions in recent years, they reach only about 20 percent of the rural poor (AEMFI, 2011; EEA, 2011), implying the existence of binding credit constraints.

Studies confirm that such binding constraints have significant adverse impacts on farm investment (Carter and Olinto, 2003; Karlan *et al.*, 2014), agricultural output (Petrick, 2005), and efficiency of intra-household resource allocation (Fletschner, 2008). It also reduces farm profit (Foltz, 2004) and technical and financial efficiency in agriculture (Hamda and Öhlmer, 2006; Fletschner *et al.*, 2010). Credit constraints, coupled with exposure to climatic shocks, may also force farmers to shift away from high-income and high-risk economic activities to low-risk and low-income activities, leaving them in unsustainable livelihoods and the vicious circle of poverty (Humphreys and Verschoor, 2004; Charles, 2011).

Thus, identifying the nature of credit constraints and borrowing behavior of households is crucial both from empirical and policy perspectives, since it is a central welfare and development issue. But empirical evidence on this topic is rare in the context of rural areas in the sub-Saharan Africa in general, and particularly in rural Ethiopia. In filling this gap, the current study set out to: (1) identify the types of households who are credit constrained; (2) investigate the demand and supply side factors affecting credit constraint status; and (3) examine how such constraints affect the borrowing behavior of farm households. Hence, this study contributes to the existing literature in three ways. First, there are only few studies on credit constraints and borrowing behavior in rural Ethiopia and, to the knowledge of the author, there is no rigorous prior work on this topic in the context of the study area. Second, the existing few studies categorize households into two regimes as either credit constrained or unconstrained<sup>2</sup>. This is a crude measure and does not provide

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<sup>2</sup> See, for example, Hamda and Öhlmer (2006); and Kedir and Ibrahim (2007) for recent studies. Though these studies recognize that using a dummy does not entangle between borrowing status and credit constraint condition, they classify the households only into two categories in their final econometric analysis.

adequate information about the real causes and multiple manifestations of credit constraints. Guirkinger and Boucher (2008) and Reyes and Lensink (2011) argue that existence of the credit market may not guarantee participation of households in the credit market; or getting some amount of loan may not automatically solve the credit constraint problems of farmers. Hence, this study extends the binary categorization into five, using the direct elicitation approach. These are: (i) unconstrained non-borrowers, (ii) unconstrained borrowers, (iii) quantity constrained borrowers, (iv) transaction cost constrained borrowers, and (v) risk rationed borrowers. Such detailed categorization is expected to provide a clear understanding about both the demand and supply side causes of credit constraints in the rural credit market. Section 3 provides further details about the classification strategy. Third, prior comparable studies mentioned above rely on cross-sectional data which show only a one-period picture of the credit constraint situation and may not provide precise estimates due to omitted variables. This study is based on a unique panel data collected from randomly selected rural households, and this is expected to show possible changes in the credit constraint status of farm households over time. Moreover, a multinomial logit model with random effects was estimated to control for unobserved heterogeneity, and this has an added advantage of providing more efficient and unbiased results. Fourth, using zone dummies, this study also shows to what extent the rural credit market is segmented and how credit constraints vary across the study sites.

The rest of the paper is organized as follows. Section 2 briefly discusses the theoretical and empirical literature related to credit constraints and borrowing behavior. Section 3 gives a description of the data and method of analysis. Section 4 presents a discussion on the results and section 5 concludes the paper.

## **2. Credit constraints and borrowing behavior: A brief review of the theoretical and empirical literature**

The concept of credit constraints and borrowing behavior of households is linked with the permanent income or the life-cycle hypothesis (Friedman, 1957; Modigliani, 1986). This theory states that households try to maximize their utility by smoothing the marginal utility over the life cycle. It assumes

existence of a perfect and complete capital market where households can borrow the amount of credit they want when they face liquidity problems and repay it in a period of high income. Thus, with standard convex preferences, and in the absence of borrowing constraints, transitory income shocks will not affect consumption, since it depends only on permanent income.

However, the credit market literature provides three competing theories about the structure of rural credit market in developing countries, namely: the monopoly market theory, the perfectly competitive market theory, and the imperfect information theory (Stiglitz and Weiss, 1981; Hoff and Stiglitz, 1996; Bardhan and Udry, 1999; and Ho, 2004). The monopoly market theory argues that informal credit dominates in the rural credit market where village money lenders have a monopoly power and can charge the maximum possible interest rate to maximize their profits. This market is highly complicated because money lenders use various strategies to control their clients. This theory, however, does not capture the full image of the rural credit market in developing countries. It does not explain why formal and informal lenders co-exist despite the fact that formal loan interest rates are much lower than that charged by informal lenders. Moreover, it fails to explain the tricks and reasons for the inter-linkages between the formal and informal credit transactions in rural areas. The perfectly competitive market theory, on the other hand, predicts that the rural credit market clears with a market-clearing single equilibrium where the lending interest rate serves as the main screening device. It means that lenders increase the interest rate when the loan applicant is a high-risk borrower and they reduce it for low-risk borrowers. But this theory is based on unrealistic assumptions, and it fails to describe the real world condition, where a pervasive credit-rationing is observed in the rural credit market even when there is equilibrium in the market. Compared to the above two theories, the imperfect information theory provides a more advanced and realistic explanation of the nature of rural credit markets in developing countries. According to this theory, the rural credit market is characterized by market imperfections such as: uncertainty, the problems of incentive compatibility and information asymmetry, which lead to the problems of adverse selection, moral hazard, higher transaction cost and higher risk in borrowing and lending transactions. This leaves many households credit constrained.

Prior empirical studies also confirm that most households in developing countries are credit constrained due to market imperfections (See, for example, Kochar, 1997; Foltz, 2004; Khandker, 2005; Chen & Chivakul, 2008). However, in sub-Saharan Africa, and particularly in rural Ethiopia, quantitative evidence on the causes of credit constraints and borrowing behavior of households is thin (Hamda and Öhlmer, 2006; Aterido *et al.*, 2011; and Ayalew and Deininger, 2014). This calls for further studies aiming at explicitly addressing the demand and supply side causes of credit constraints and borrowing behavior of households in the context of imperfect credit markets.

### **3. Data and Method of Analysis**

#### **3.1. Data description**

Data used in this study were collected in two rounds (in 2011 and 2013) from 1,200 randomly selected households living in four zones of the Amhara National Regional State located in the northern and central highlands of Ethiopia. About 33 percent of these households reside in north Shewa, 31 percent in west Gojjam, 23 percent in south Wollo, and the remaining 13 percent in north Wollo zones (Table 1). The surveys were conducted by the Ethiopian Economics Association in collaboration with the University of California, University of Athens, FAO, and the European Commission Joint Research Center. The two surveys provided information on livestock and crop production, marketing, farm and non-farm income, household consumption expenditure, ownership of assets, participation in non-agricultural enterprises, exposure to various climatic shocks and coping strategies, attitude towards risk, demand for crop insurance, and credit constraints.

The analysis in this paper is based on a balanced panel data of 1,189 households who were interviewed in both rounds.

Socio-economic and demographic characteristics of these households is presented in Table A1 in the appendix. As indicated in that table, the average age of household heads in the sampled zones was about 50 years, and heads in west Gojjam zone are relatively younger than those in the other three zones.

**Table 1: Sample Households, by Zone (2011 and 2013)**

<b>Region</b>	<b>Percent</b>
north Shewa	33.22
west Gojjam	31.12
south Wollo	23.13
north Wollo	12.53
Total	100

The average household size was about 5 and the number of female-headed households has increased from about 9 percent in 2011 to 12 percent in 2013. The survey instrument gathered information on years of schooling of the heads, and on average, 51 percent of the heads have no education while about 22 percent have about 5 years of formal education, and 27 percent have attended some informal education.

### **3.1.1 *Dependent variables***

The dependent variables of this study are the probability that a household will fall in one of the credit constraint categories, and the probability of participating or getting credit from formal, semi-formal, or informal sources. Unlike prior studies, which mainly focused on supply-side factors, the current study considers both demand- and supply-side causes of credit constraints and borrowing behavior of households. From the supply side, prior studies suggest that potential borrowers may be constrained due to creditworthiness issues, and/or due to liquidity constraints of lending institutions. When lenders face shortage of loanable fund, they may ration credit, leading to quantity constraints. The creditworthiness factors include: (i) households' socio-economic characteristics; (ii) endowment of livelihood assets; and (iii) institutional constraints (Kon and Storey, 2003; Mpuga, 2008; Cheng, 2009; Reyes and Lensink, 2011).

The theory of discouraged borrowers (Kon and Storey, 2003) suggests that demand-side factors affect households' decision to participate in the credit market. The imperfect credit screening mechanisms used by lenders usually force potential borrowers not to apply for credit. Following this theory, the

demand-side factors can be conceived as households' rational reaction to institutional rigidities of lending institutions. Thus, in this study, it is hypothesized that farm households may shy away from formal lenders due to such factors as: (i) high transaction cost of borrowing; (ii) high risk costs of loan contracts or due to risk aversion behavior of households; and (iii) cognitive and behavioral biases created due to previous borrowing experiences. However, these factors, which create barriers on credit market participation and hinder investment on profitable activities, have not been studied thoroughly in the context of rural Ethiopia. Thus, this study tries to investigate the types of households who are discouraged, rejected or systematically excluded from the rural credit market in the context of rural Ethiopia.

### **3.1.2 Explanatory variables**

Although there are a host of variables that determine the credit constraint condition and participation in the rural credit market, the choice of variables for this study is guided by the review of related literature and context of the study area. Accordingly, demographic variables (such as sex, age and marital status of the head, and household size), education, farm size, livestock ownership, membership in a primary credit cooperative, location dummies and exposure to climatic shocks are included in the regression analysis as explanatory variables.

Moreover, the different credit constraint categories (such as being risk rationed, discouraged due to high transaction cost of borrowing and quantity constrained) are included as additional variables in the credit market participation equation. A detailed discussion about each variable is provided in section 4 below.

#### **Identifying credit constraint categories using the Direct Elicitation strategy**

Identifying credit constrained households is an empirical challenge since credit rationing cannot be observed directly. The literature suggests the direct and the indirect elicitation strategies as two possible solutions to this challenge (see Boucher *et al.*, 2009; Cheng, 2009; Ayalew and Deininger, 2014). The indirect strategy is based on the life-cycle or the permanent income hypothesis,

which is discussed in section 2 above<sup>3</sup> while the direct approach is based on household survey data. Using the direct elicitation strategy, this study identified five credit constraint categories as shown in Table 2. First, the unconstrained borrowers are those who are willing to participate in the credit market and have full access to credit facilities from a given lending institution. The credit limit set by lenders to overcome the information asymmetry problem will not be binding for such borrowers. Second, the unconstrained non-borrowers are those who do not borrow from credit institutions because they do not have an urgent need for external finance or they do not have a profitable project that would require a loan. The production and consumption (resource allocation) decisions of such households is not affected by the prevailing credit market imperfections.

<b>Classification Criteria Based on the Responses of HHs</b>	<b>Credit Constraint Category</b>
I prefer working with my own funds.	Discouraged HH (risk-rationed)
My productive activities do not give me enough to repay debt.	Discouraged HH (risk-rationed)
I do not want to put my land and other assets at risk.	Discouraged HH (risk-rationed)
I do not want to be worried; I am afraid.	Discouraged HH (risk-rationed)
Group loan is risky.	Discouraged HH (risk-rationed)
My religion doesn't allow me to borrow.	Discouraged HH (risk-rationed)
Formal lenders do not offer refinancing.	Quantity constrained borrowers
The collateral asked is too large.	Quantity constrained borrowers
The interest rate is too high.	Quantity constrained borrowers
Formal lenders are too strict and inflexible.	Discouraged HH (tran. cost-rationed)
The bank branch is too far away.	Discouraged HH (tran. cost-rationed)
It is too time consuming to deal with commercial or other banks.	Discouraged HH (tran. cost-rationed)
I do not need a loan.	Unconstrained non borrowers

Third, the quantity constrained borrowers have an excess effective demand for credit but face a binding credit limit due to supply-side limitations. These households stated that they applied for credit and received the loan, but the

<sup>3</sup> Further discussion about the strengths and weaknesses of this strategy is given in Diagne *et al.* (2000).

loan amount is less than their effective demand given the available contract terms. Fourth, from the demand side, the 'transaction-cost rationed' households are identified as those who have a positive effective demand but do not apply for credit. These households confirmed that they do not want to incur the additional costs associated with the loan application process, including the extra paper work and the time they waste dealing with lenders. Further, from their past experience or from their knowledge about lenders' credit procedures, they are sure that their application will be rejected. Such households may have profitable agricultural projects but they do not participate in the credit market because their projects become unprofitable once these costs are accounted for. Fifth, lenders normally want borrowers to bear a certain amount of risk to overcome the moral hazard problem in the borrowers' effort or choice of investment projects. One mechanism to do so is to ask for collateral. However, from the questionnaire, it was identified that risk-averse households prefer working with their own funds not to put their land and other assets at risk. These farmers do not want to incur debt even if they qualify for the loan and have a profitable project after accounting for transaction costs.

## **3.2 Econometric Model**

### **3.2.1 *The Generalized Linear Latent and Mixed Model (gllamm)***

A unique feature of longitudinal categorical data is the existence of unobserved heterogeneity among the repeated observations for a single individual (Train, 2009; Haan and Uhlenborff, 2006). This heterogeneity may occur because each household can make several choices which may not be independent, and hence, the probabilities of each category for the same household will share the same unobservable random effects (Reyes and Lensink, 2011). If these 'unobservables' are not handled properly, the parameter estimates will be biased. This calls for a more advanced estimation strategy beyond the traditional pooled multinomial model without the random effects. Hence, the generalized linear latent and mixed model (gllamm) is employed to fit a multinomial logit model with correlated random intercepts, which accounts for any spurious dependence between individuals or categories.

Consider an individual  $i$  who is faced with  $J$  different alternatives at time  $t$ . The probability that this individual falls in a specific category  $j$  conditional on observed characteristics  $x_{it}$ , which vary between individuals and over time and also conditional on unobserved individual effects,  $\alpha_i$  which are time constant, can be specified as:

$$prob(j|x_{it}, \alpha_i) = \frac{\exp(x'_{it}\beta_j + \alpha_{ij})}{\sum_{k=1}^J \exp(x'_{it}\beta_k + \alpha_{ik})} \quad (3.1)$$

It is assumed that  $\alpha$  is identically and independently distributed over individuals and it follows a multivariate normal distribution with mean  $\mu$  and variance-covariance matrix ( $\Omega$ ), i.e.  $\alpha \sim iid(\mu, \Omega)$  (Haan and Uhlenborff, 2006; Train, 2009).

The likelihood function for equation (3.1) can be specified as:

$$L = \prod_{i=1}^N \int_{-\infty}^{\infty} \prod_{t=1}^T \prod_{j=1}^J \left( \frac{\exp(x'_{it}\beta_j + \alpha_j)}{\sum_{k=1}^J \exp(x'_{it}\beta_k + \alpha_k)} \right)^{d_{ijt}} f(\alpha) d\alpha \quad (3.2)$$

This is so because the choice probabilities given in equation (3.1) are conditioned on  $\alpha_i$ , and hence, it must be integrated over the distribution of  $\alpha$  to get the sample likelihood for the multinomial Logit with the random intercepts. This model will be identified if the coefficient vector  $(\beta)$  and the unobserved heterogeneity term  $(\alpha)$  of one category are set to zero. Hence,  $d_{ijt} = 1$  when individual  $i$  falls in category  $j$  at time  $t$  and zero otherwise.

The key problem in solving equation (3.2) is that an analytical solution cannot be found for the integral part of the model. This is because the random effects are assumed to have a multivariate normal distribution and the marginal

distribution can be found only after integrating out these random effects. This calls for some form of numerical integration. The literature suggests various simulation and Quadrature techniques including: the Adaptive Gaussian Quadrature (AGQ), Monte Carlo Simulation, Laplace Approximation, Taylor series approximation, and Gauss Hermite Quadrature to solve this problem (Rabe-Hesketh *et al.*, 2004; Haan and Uhlenborff, 2006; Train, 2009; Cameron and Trivedi, 2009). Among these simulation and Quadrature techniques, the AGQ approach is preferred for a longitudinal categorical data because it is computationally more efficient than the ordinary Quadrature in performing the numerical integration of equation (3.2) above. Another advantage of using the AGQ is that the number of Quadrature points required to approximate the integral are much fewer than that of the ordinary Quadrature and prior studies used this technique to evaluate similar integrals (examples include: Hartzel *et al.*, 2001; Rabe-Hesketh *et al.*, 2004; and Haynes *et al.*, 2006).

Inclusion of the AGQ technique is a recent development in statistical software. For instance, STATA software has a procedure called the generalized linear, latent and mixed model (gllamm), which is designed to model categorical dependent variables with repeated observations (Rabe-Hesketh *et al.*, 2004; Haan and Uhlenborff, 2006). It is an extension of the generalized linear model because it incorporates both the fixed and random effects, and hence, the response distribution is defined conditionally on the random effects. This model takes care of individual unobservable heterogeneity by capturing them through the alternative-specific random intercepts or coefficients (ASC), and it accounts for the possible correlation of choices made by individuals.

## **4. Results and Discussion**

### **4.1 Credit constraints and borrowing behavior: An econometric assessment**

Initially, a conventional, robust panel data multinomial logit (MNL) model without random effects was estimated on the determinants of credit constraints and borrowing behavior of farm households in the study area (Tables A4 and A5 in the appendix). However, given the type of problem at hand and the panel nature of the data, it is suspected that an unobserved heterogeneity may

exist between individuals and across different constraint categories. Therefore, an MNL model with random effects is also estimated using the generalized linear latent and mixed model (gllamm) (Tables 3 and 4). To select one of these two sets of specifications, the Likelihood Ratio (LR) test, the Bayesian Information Criterion (BIC), and Akaike's Information Criterion (AIC) tests were conducted. The test results support the gllamm more than the MNL model without random effects. Therefore, the discussion that follows is based on the results given in Tables 3 and 4. The unexplained variance in the first two categories and the correlation between all the three categories is captured by the random effects at the individual level (Table 3). These values statistically differ from zero and this implies that the individual effect captured by the MNL model with random effects explains a considerable portion of the total heterogeneity.

The null hypothesis of the Wald test that all coefficients except for the intercept term are equal to zero is rejected at a one percent level of statistical significance, and this confirms the theoretical predictions of the model. Variables explaining credit constraint and borrowing behavior are categorized into: (i) household demographic characteristics; (ii) ownership of livelihood assets; (iii) risk preference behavior; (iv) institutional constraints; and (v) control variables such as location and exposure to shocks. A descriptive statistics of the variables used in the analysis is given in Table A3 in the appendix.

**Table 3: Determinants of different credit constraint categories of borrowers compared with unconstrained borrowers - generalized linear latent and mixed model (gllamm)§**

<b>Variable</b>	<b>Unconstrained non-borrowers</b>	<b>Constrained - Quantity rationed borrowers</b>	<b>Discouraged - Tran. Cost and risk rationed borrowers</b>
age	.0231*** (0.00694)	.0127* (0.00652)	.0276*** (0.00706)
female	-1.4*** (0.454)	-0.553 (0.44)	-1.08** (0.461)
married	-.745* (0.422)	-0.424 (0.423)	-.735* (0.431)
Household size	-0.0772 (0.05)	-0.0245 (0.0476)	-0.0545 (0.0509)
No educ.	.459** (0.228)	-0.2 (0.213)	.497** (0.237)
formal educ.	-0.106 (0.239)	0.107 (0.223)	0.178 (0.247)
Land hect.	.466*** (0.12)	0.00962 (0.123)	0.134 (0.125)
Own livestock	-1.28** (0.568)	-0.795 (0.574)	-1.11* (0.579)
Coop member	0.0732 (0.302)	0.137 (0.308)	-0.11 (0.307)
Year dummy	-0.148 (0.183)	.613*** (0.189)	0.159 (0.19)
ln(food exp)	0.191 (0.121)	0.035 (0.119)	.274** (0.126)
Drought shock	0.18 (0.187)	.459** (0.181)	0.279 (0.192)
west Gojjam	-1.65*** (0.228)	-0.136 (0.209)	-1.32*** (0.229)
south Wollo	1.56*** (0.279)	1.63*** (0.288)	1.38*** (0.284)
north Wollo	-.493* (0.297)	.93*** (0.271)	-.909*** (0.314)
_Constant	0.944 (0.95)	-0.22 (0.947)	-0.283 (0.982)

<b>Variance - Covariance Matrix of the Random Effects</b>			
	<b>ucnb</b>	<b>qcb</b>	<b>Disc</b>
ucnb	1.49***(0.158)	0.567***(0.206)	1.36***(0.164)
qcb	0.567***(0.206)	0.463*(0.239)	-0.314(0.200)
disc	1.36***(0.164)	-0.314(0.200)	0.001(0.412)
Statistics			
Log likelihood	-2794.11		
N	2294		
AIC	5696		
BIC	6081		

**Note:**\* p < .1; \*\* p < 0.05; \*\*\* p < 0.01

BIC and AIC are Bayesian Information Criteria and Akaike's Information Criteria, respectively.

Ucnb, qcb and disc stand for unconstrained non-borr., quantity constrained borr., and discouraged borr.

§ All reported coefficient estimates are marginal effects after *gllamm*.

### *i) Household demographic characteristics*

The age of the household head is used in this study as a proxy for maturity and the potential for careful handling of bank loans and repayment capability of the borrower. It is assumed that lenders discourage individuals who are above 40 years of age given the health risks and shorter life expectancy in developing countries such as the sub-Saharan Africa (SSA). Table 3 shows that age has a positive and statistically significant effect on the probability of being discouraged, and this is as expected since the average age of the heads in the study area was 49. Moreover, the result in Table 4 reveals that older individuals do not want to borrow both from formal and informal lenders. This is so, probably, because they are already discouraged by lenders or because they do not want to take the risk related to borrowing. These results are consistent with the findings by Crook (2001) and Mpuga (2008) that the demand for credit becomes negative for individuals who age above 40s.

**Table 4: Determinants of farm HHs' choice of lenders compared to non-borrowers-generalized linear latent and mixed model (gllamm) §**

Variable	HHs who prefer formal lenders	HHs who prefer informal lenders	HHs who prefer semi-formal lenders
Risk averse	-2.01*** (0.224)	-1.02*** (0.226)	.655* 0.339
Discouraged borrower	-1.83*** (0.449)	.652* (0.379)	-0.212 (0.575)
Quantity constrained borr.	-.287* (0.174)	-0.0258 (0.192)	0.0251 (0.329)
Age	-.0154*** (0.00573)	-.0192*** (0.00592)	0.00489 (0.00966)
Female	.698* (0.383)	0.0463 (0.391)	0.0603 (0.6)
Married	0.191 (0.36)	-0.176 (0.359)	-0.42 (0.544)
Household size	.0771* (0.0414)	0.0167 (0.0457)	-0.0377 (0.0706)
No educ.	-.316* (0.19)	-0.128 (0.199)	-.529* (0.319)
Formal educ.	0.0766 (0.201)	-0.00907 (0.221)	-.81** (0.365)
Land hectare	-.215** (0.102)	-0.19 (0.117)	0.0985 (0.196)
Own livestock	1.11** (0.508)	0.322 (0.438)	-0.169 (0.61)
Coop. member	-0.0416 (0.26)	0.165 (0.298)	-0.111 (0.415)
Year dummy	.56*** (0.166)	.377** (0.185)	-2.22*** (0.38)
ln(food exp.)	-0.169 (0.103)	-0.1 (0.116)	-0.101 (0.177)
Drought shock	-0.215 (0.163)	0.00795 (0.18)	0.239 (0.3)
West Gojjam	1.07*** (0.177)	-.729*** (0.204)	-0.228 (0.317)
South Wollo	-1.47*** (0.239)	-0.234 (0.228)	-3.06*** (0.653)
North Wollo	-0.123 (0.25)	0.371 (0.263)	.629* (0.354)
Constant	-0.867 (0.818)	-0.691 (0.822)	-0.653 (1.24)

<b>Variance-Covariance Matrix of the Random Effects of HH Lender Choice</b>			
	<b>formal</b>	<b>informal</b>	<b>semi-formal</b>
formal	.992***(0.155)	0.219(0.201)	0.459***(0.384)
informal	0.219(0.201)	0.127(0.305)	-0.966(0.73)
semi-formal	0.459***(0.384)	-0.966(0.73)	0.863(0.696)
<b>Statistics</b>			
Log likelihood	-2002.87		
N	2294		
AIC	4132		
BIC	4580		

Note: \*  $p < .1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$

BIC and AIC are Bayesian Information Criteria and Akaike's Information Criteria, respectively.

§ All reported coefficient estimates are marginal effects after *gllamm*.

The gender of the household head is captured as a dummy variable with a value of one for female and zero for male. The result shows that gender has a negative and significant effect on the probability of being credit constrained (Table 3), and females prefer borrowing from the formal sector (Table 4). This implies that female-headed households have higher probability of access to rural credit, compared to their male counterparts. This may be due to the recent micro credit revolution which focuses more on empowering women. It agrees with the actual case in rural Ethiopia where 54 percent of the clients of micro finance institutions are females (EEA, 2011). Ashraf *et al.* (2003) also showed that credit schemes which favor female borrowers have gained popularity in recent years and become successful. Hansen and Rand (2011), using micro-level data from eight sub-Saharan African countries, found that there is female favoritism rather than discrimination in the African credit markets since women are considered as more loyal to their groups and have better repayment performance. Aterido *et al.* (2011) also reached a similar conclusion.

**Marital status:** Married individuals have a higher probability of access to rural credit as revealed by the negative and statistically significant coefficient on the probability of being discouraged (Table 3), and this is in line with the results of prior studies. For instance, according to Mpuga (2008), married heads are more likely to be stable, trustworthy and abide by rules and regulations compared to the unmarried or separated heads, and financial institutions view them as more reliable and allow them to have better access to credit.

**Household size:** The result shows that having a larger household increases the probability of demanding credit from formal lenders. In developing countries where the rural labor market is usually imperfect or missing, family labor is an important source of agricultural labor supply. Hence, it is possible to argue that larger a household may mean more labor supply in agriculture, which can lead to higher agricultural production, higher household income, and better capacity to accumulate productive assets. Some members of the household may also migrate to nearby towns or bigger cities for off-farm employment and may send remittances back to their families. This, in turn, may help farm households to build assets which can serve as loan collateral.

**ii) Ownership of livelihood assets**

The literature on rural livelihoods argues that household income and participation in the credit market is determined by the portfolio of assets owned (Ellis, 2000). In relation to this, size of land owned, ownership of livestock asset, level of education, and membership in primary multi-purpose cooperatives are included in this study as indicators for natural, physical, human, and social capital of households, in that order.

**Farm size:** As presented in Table 3, ownership of farm land has a significant positive effect on the probability of being an unconstrained non-borrower. This may be because households who own relatively larger sizes of land asset are expected to have more potential for equity financing and thus may not go for credit. Mpuga (2008) also finds that households having larger sizes of land do not have demand for credit in rural Uganda.

**Ownership of livestock asset** has a significant negative effect on the probability of being discouraged (Table 3), and those who own livestock asset prefer borrowing from formal lenders (Table 4). The probable reason for this result is that households who own livestock have higher probability of obtaining credit from formal sources because of its positive influence on lenders' valuation of the creditworthiness of the loan applicant since livestock can easily be converted into cash in cases of default.

**Human capital:** In this study, household heads are classified as having no education, some informal education, and some formal education. Compared to those who have some level of education, uneducated heads are highly discouraged, and hence, do not want to borrow from the rural credit market. This finding is consistent with the results of Gropp *et al.* (1997), who showed the positive effect of education on access to credit. This suggests the importance of education in access and participation in the rural credit market. Some level of education is expected to increase technical knowledge, know-how and farming skills, better credit information and familiarity with credit procedures of lending institutions. It is also expected that educated individuals will be engaged in non-farm business activities and are more likely to use the loans more wisely than the uneducated ones.

### **iii) Borrower's risk aversion behavior**

The result shows a significant negative effect of risk aversion on the probability of borrowing from formal and informal sources of credit (Table 4). This can be explained by the fact that lenders require their clients to bear some amount of risk in the form of collateral. However, risk averse farmers do not want to put their assets at risk, and hence, prefer working with their own funds (Table 2). This implies that these farmers choose less risky but low-value crops or projects which require no credit. Choosing such less risky but low-value crops, in turn, means that these farmers are less efficient in agricultural production and are generating lower incomes for their households. Thus, following Boucher *et al.* (2009), it is possible to note that credit constraint can occur even when there is an excess supply of credit and this arises when the effective demand for credit is lower than the supply due to risk aversion.

### **iv) Institutional constraints**

Table (2) presents institutional constraints in the credit market of the study area and these include: (a) long and strict credit procedures such as collateral requirements or group formation, fixed repayment schedules which do not fit with harvest seasons; (b) high transaction costs of borrowing associated with the loan application process, paper works, distance, and the number of times an applicant should visit a lender's office to secure the loan; (c) cost of

negotiation with lenders; and (d) institutional mistakes made in selecting applicants. The result also shows a significant negative effect of these constraints on the demand for credit. Household heads who are discouraged due to these constraints do not prefer borrowing from formal lenders. This can be explained by the fact that lenders usually make their credit procedures very strict to solve the screening, monitoring, and moral hazard problems which are common in the credit market of developing countries (Stiglitz and Weiss, 1981; Hoff *et al.*, 1996; Antwi and Antwi, 2010). These strict and lengthy credit procedures make the transaction cost of borrowing very high, and hence, discourage genuine applicants who want to have access to rural finance.

**v) Control variables**

**Year dummy** is used as a control variable to capture the change in credit constraints and borrowing behavior of farm households between 2011 and 2013. The result shows that demand for credit both from formal and informal sources has increased by 56 percent and 38 percent, respectively (Table 4). However, the probability of being quantity constrained has also increased by 61 percent, which implies that farm households do not get the amount of credit they applied for. Possible reasons for this gap between the demand for and supply of rural credit include: lack of adequate ‘loanable’ fund in the hands of lenders; strict refinancing policy of lenders; lack of loan collateral in the hands of borrowers; and lack of loan track record or long-term relationships between borrowers and lenders.

**Exposure to climatic shocks:** Exposure to drought shocks increases the probability of being quantity constrained by 46 percent (Table 3). In a rain-fed smallholder agriculture (as is the case in Ethiopia), good harvest is possible only if it rains and other shocks do not occur. In such a fragile environment, access to external sources of finance is very difficult because lenders do not want to take the risk of default in case crops fail.

**Location:** Households living in drought- and disease-prone zones such as south Wollo are highly discouraged and also quantity constrained, relative to households residing in the other three zones of the country. According to World Bank (2004), 45 percent of the south Wollo zone is exposed to Malaria.

Households residing in west Gojjam have relatively better access to formal credit and this may be because west Gojjam is a more fertile region known for its Teff production (a crop used to make a staple food called “INJERA” in Ethiopia).

## **5. Conclusion and Implications**

Using household-level panel data from four zones of the Amhara region in Ethiopia, this paper examined the constraints to farmers’ access to rural credit. An attempt has been made to explore the extent to which credit constraints stem from demand- or supply-side factors. An in-depth analysis is also made on key variables explaining the probability of a household to fall into one of the listed credit constraint categories and their respective borrowing behavior.

A generalized linear latent and mixed model (gllamm) was estimated, and the result showed that credit constraint status and borrowing behavior are significantly affected by: (1) a borrower’s perceived probability of rejection due to institutional rigidities; (2) location, a borrower’s exposure to climatic shocks and risk preference behavior; (3) availability of mortgage-able livelihood assets; (4) the transaction cost of borrowing; and (5) household demographic characteristics such as gender, age, education, family size, and marital status.

Understanding household socio-economic conditions is essential in designing credit market policies. For instance, gender-credit constraint gap is of central policy importance as many micro credit institutions in sub-Saharan Africa target females to enhance their asset-building capacity and to pull them out of abject poverty. This story is largely supported by the data used in this study as evidenced by the result that the probability of being credit constrained decreases for female-headed households in rural Ethiopia (Table 3).

The result also shows that education is an important determinant of credit constraint status and of the demand for credit in rural areas. Mobilizing and sensitizing literate people about the need for and importance of credit would be easier and this suggests that more investment on primary education in rural

areas would reduce credit constraints and improve participation of farm households in the rural credit market. In addition, the demand for credit is higher for households who own livestock and they are also less discouraged in the credit market. It is therefore important to devise policies that aim at increasing household income and asset holdings to promote their participation in the credit market.

Demand factors such as risk aversion behavior of farm households play important roles to have access to rural credit as confirmed by the results discussed in the above section. The key lesson from this result is that increasing the supply of credit alone is not the solution for the credit constraint problem of farm households. It is crucial to understand farmers' attitude towards risk and to follow a bottom-up approach in designing credit market policies that encourage farm households to take risk. In Ethiopia, the credit market is basically supply-driven in the sense that borrowers take only what the lender offers and do not ask too many questions. The type of loan products, prices (interest rate), quality and reliability of the services are determined by the supplier, and innovative loan products are not very common in this market. This implies that institutional issues of the credit market need more attention of the macro-, meso- and micro-level policy makers and practitioners to make the market demand-driven, inclusive, and more competitive.

As discussed above, lenders require their borrowers to bear some amount of risk in the form of collateral. However, risk averse farmers are not willing to take such risks, and this necessitates designing innovative collateral-substitutes such as contract farming, using supply contracts as collateral, reputation-based lending, directly monitoring borrowers, lending according to crop cycle, and providing group loans. The sign and significance on the location and drought shock dummies also call for credit market policies which consider location-specific key variables and not simply make blanket recommendations to be applied across the board. For instance, farm households in south Wollo are vulnerable to drought shocks, and hence, they are highly discouraged. Although it requires further study to identify its benefits and drawbacks, interlinking credit with insurance may also be suggested as a solution to the credit constraint problem stemming from risk aversion.

Information asymmetry is another important source of credit constraint in the study area as discussed above, and credit reference bureaus can help lenders to have credit information of loan applicants. Hence, strengthening such credit reference bureaus may help in solving the information asymmetry problem and may reduce credit constraints. As the sign and statistical significance of the year dummy reveals, there is an increased demand for formal credit and yet a serious quantity constraint over the years 2011 and 2013. This is consistent with the general situation of access to credit in Ethiopia as discussed in section 1 above. For instance, EEA (2011) and AEMFI (2011) showed that micro financing institutions, which are the major formal credit providers to rural farm households, reach only about 20 percent of the rural poor. This is, by and large, a supply-side constraint, which usually occurs due to lack of 'loanable' funds in the hands of the rural credit service providers. As Kristen (2006) argues, compared to the bigger commercial banks which have excess liquidity, the rural credit service providers possess better information and enforcement mechanisms and are typically more flexible and innovative. However, these institutions are constrained by shortage of resources and infrastructure to reach a bigger number of clients. Hence, collaboration between commercial banks and the rural credit institutions would lead to a win-win situation to both parties. This can increase the supply of credit and improve the operating environment of the rural credit institutions so that farm households will have better access to credit.

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**Appendix A: Tables and Figures**

**Table A1: Socio-economic information on the households (HHs) surveyed in 2011 and 2013 from the Amhara Region**

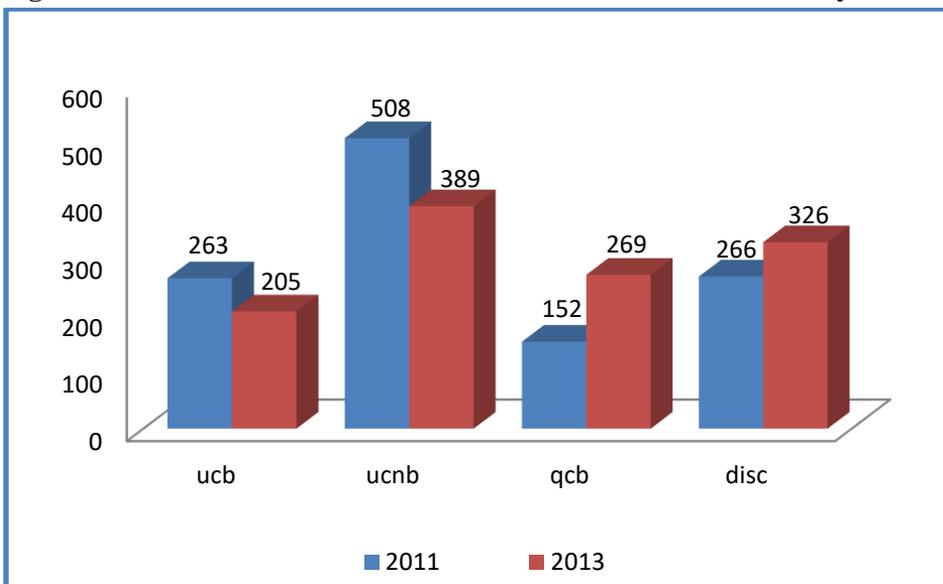
Socio-economic Info.	All		North Shewa		West Gojjam		South Wello		North Wello	
	2011	2013	2011	2013	2011	2013	2011	2013	2011	2011
Number of HHs surveyed	1189(50)	1189(50)	403(33.9)	395(33.2)	372(31.3)	370(31.1)	272(22.9)	142(11.9)		
Female-headed HHs (%)	111(9.3)	139(12)	40(10)	55(14)	25(6.7)	25(6.8)	29(10.7)	17(12)		
Average age of HH head (years)	48.9	50.5	50.8	52.6	46	47.9	49.1	50.8		
Average HH size	5.3	5.1	5.47	5.07	5.74	5.63	4.65	4.92		
HH heads who have no education	606(51)	656(55)	171(42.4)	184(46.6)	231(62.1)	243(65.7)	126(46.3)	78(54.9)		
HH heads who attended formal education	256(21.5)	243(20.4)	92(22.8)	81(20.5)	65(17.4)	56(15.1)	70(25.7)	29(20.4)		
Average years of formal education of heads	4.8	5.2	4.9	4.8	4.5	4.6	5.2	3.9		
HH heads who attended informal educ.	317(26.7)	290(24.4)	140(34.7)	130(32.9)	76(20.4)	71(19.2)	74(27.2)	27(19)		
Average area of land owned by the HH (ha)	1.07	0.73	0.99	0.96	1.4	0.17	0.9	0.77		
Average area of land cultivated by the HH (ha)	1.17	0.71	1.17	1	1.56	0.19	0.83	0.86		
Average number of parcels cultivated	3.6	3.5	3.1	3	4.4	4.5	3.6	3.3		
Households who own livestock	1158(97.4)	1130(95.2)	394(97.7)	367(93.2)	371(99.7)	363(98.1)	261(95.9)	132(92.7)		
Households whose house roof is made of iron sheets	854(72)	932(78)	287(71.2)	298(75.4)	338(91)	344(93)	169(62)	60(42.3)		
Average monthly income from a microenterprise	528.84	926.23	504	1075.1	577.3	718.9	714	317.8		
Households who benefited from PSNP	146(12.3)	136(11.4)	20(5)	0	0	0	60(22)	65(45.8)		
Households who have a bank account	164(14)	267(22.5)	60(15)	118(30)	50(13.5)	44(12)	25(9.2)	29(21.2)		

**Table A2: Credit constraint status of HHs in the study area (%)**

Credit Constraint Category	2011	2013	Full Sample
Unconstrained:			
borrowers	263(22.1)	205(17.2)	468(19.7)
non-borrowers	508(42.7)	389(32.7)	897(37.7)
Total unconstrained households	771(64.8)	594(49.9)	1365(57.4)
Constrained households:			
quantity constrained borrowers	152(12.8)	269(22.6)	421(17.7)
discouraged borrowers	266(22.4)	326(27.4)	592(25)
Total constrained households	418(35.2)	595(50.1)	1013(42.7)

Source: Calculation based on EIIPICA's 2011 and 2013 survey data

**Figure A1: Credit constraint status of farm households in the study area**



**NB.** ucb, ucnb, qcb, and disc stand for: unconstrained borrowers, unconstrained non-borrowers, quantity constrained borrowers, and discouraged borrowers, respectively.

**Table A3: Descriptive statistics of variables used in the data analysis**

<b>Variable name</b>	<b>Variable definition and unit of measurement</b>	<b>N</b>	<b>mean</b>	<b>St. dev.</b>
<b>Dependent variables:</b>				
Constraint cat.	Credit constraint category of the household (multinomial response)	2,378	2.478	1.068
Sector choice	Households' choice of loan sector (formal, semi-formal, or informal sector)	2378	1.54	.73
<b>Explanatory variables:</b>				
Age	age of the household head (years)	2377	49.725	14.118
Female	gender of the HH head (dummy = 1 if female, 0 for male)	2378	0.105	0.307
Married	marital status of the HH head (dummy = 1 if married, 0 otherwise)	2378	0.866	0.341
Household size	household size (number of members of the household)	2298	5.209	1.913
<b>Educational Status of the HH head (Informal education is the reference group)</b>				
No education	level of education of the HH head (dummy = 1 if uneducated, 0 otherwise)	2378	0.531	0.499
Informal education	level of educ. of HH head (dummy = 1 if attended informal educ., 0 otherwise)	2378	0.255	0.436
Formal education	level of educ. of HH head (dummy = 1 if attended formal educ., 0 otherwise)	2378	0.210	0.407
Land hectares	area of land owned by the HH (ha)	2378	0.902	0.697
Own livestock	Livestock ownership of the HH (dummy = 1 if HH owns, 0 otherwise)	2376	0.963	0.189
Coop. member	membership in a cooperative association (dummy = 1 if member, 0 otherwise)	2378	0.925	0.264
Food expenditure	amount of money spent on HH consumption items	2377	309.766	225.346
Drought shock	exposure to drought shock (dummy = 1 if the HH experienced drought shock, 0 otherwise)	2378	0.391	0.488
<b>Agro-ecological zones (North Shoa is the reference zone)</b>				
North Shoa	zone in which the HH resides (dummy = 1 if HH is in N. Shoa, 0 otherwise)	2378	0.336	0.472
West Gojjam	zone in which the HH lives (dummy = 1 if HH is in W. Gojjam, 0 otherwise)	2378	0.312	0.463
South Wollo	zone in which the HH lives (dummy = 1 if HH is in S. Wollo, 0 otherwise)	2378	0.230	0.421
North Wollo	zone in which the HH resides (dummy = 1 if HH is in N. Wollo, 0 otherwise)	2378	0.122	0.328

**Table A4: Determinants of credit constraint status of farm HHs compared with unconstrained borrowers - Multinomial Logit model with standard errors adjusted for cluster effects (Robust Model)§**

Variable	Unconstrained non-borrowers	Constrained quantity rationed borrowers	Discouraged tran. cost and risk rationed borrowers
Age	.0167*** (0.00529)	.0101* (0.00584)	.0215*** (0.00557)
Female	-1.21*** (0.35)	-0.445 (0.391)	-.897** (0.379)
Married	-.684** (0.335)	-0.394 (0.363)	-.674* (0.361)
Household size	-0.065 (0.0398)	-0.0172 (0.0435)	-0.0428 (0.0424)
No education	.346* (0.177)	-0.198 (0.196)	.391** (0.198)
Formal education	-0.125 (0.19)	0.124 (0.201)	0.157 (0.207)
Land (hectares)	.417*** (0.104)	-0.00162 (0.126)	0.0875 (0.111)
Own livestock	-1.08** (0.486)	-0.747 (0.529)	-.92* (0.505)
Coop member	0.00636 (0.257)	0.0882 (0.29)	-0.172 (0.273)
Year dummy	-0.0681 (0.147)	.611*** (0.182)	0.238 (0.159)
Ln(food exp.)	.158* (0.0933)	0.0494 (0.108)	.246** (0.101)
Drought shock	0.13 (0.159)	.425** (0.18)	0.236 (0.17)

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West Gojjam	-1.26*** (0.166)	-0.0616 (0.191)	-.947*** (0.177)
South Wollo	1.38*** (0.252)	1.54*** (0.278)	1.22*** (0.248)
North Wollo	-0.271 (0.251)	.911*** (0.259)	-.682** (0.275)
_Constant	0.818 (0.75)	-0.477 (0.81)	-0.452 (0.801)
<b>Statistics</b>			
Wald chi2(45)	367		
Prob > chi2	0.000		
Number of obs	2289		
AIC	5746		
BIC	6022		

**Note:** Robust standard errors in brackets; \*  $p < .1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$ ; the Wald test clearly shows the joint significance of all regressors. The variables are estimated using robust standard errors based on the White's heteroscedasticity consistent estimators of variance. The AIC and BIC stand for the Akaike's information criteria and the Bayesian information criteria, respectively, which are used to choose the appropriate model. The gllamm model (Table 3) is found to be more appropriate based on the values of BIC and AIC.

§ All reported coefficient estimates are marginal effects after mlogit.

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**Table A5: Determinants of farm HHs' choice of lenders compared to non-borrowers - Multi-nomial Logit model with standard errors adjusted for cluster effects (Robust Model)**

<b>Variable</b>	<b>HHs who prefer formal lenders</b>	<b>HHs who prefer informal lenders</b>	<b>HHs who prefer semi-formal lenders</b>
Risk averse	-1.85*** (0.194)	-.979*** (0.229)	-.555* (0.289)
Discouraged borrower	-1.68*** (0.438)	-0.612 (0.386)	-0.117 (0.468)
Quantity constrained	-0.227 (0.151)	-0.0131 (0.199)	0.0425 (0.274)
Age	-.0128*** (0.00489)	-.019*** (0.0057)	0.00377 (0.00813)
Female	.651* (0.336)	0.0347 (0.368)	0.0141 (0.397)
Married	0.207 (0.317)	-0.172 (0.348)	-0.375 (0.367)
Household size	.0721** (0.0342)	0.0136 (0.0447)	-0.0386 (0.0658)
No education	-.281* (0.167)	-0.118 (0.193)	-.459* (0.264)
Formal education	0.0782 (0.175)	-0.00129 (0.216)	-.674** (0.301)
Land (hectar)	-.198** (0.0945)	-0.188 (0.125)	0.11 (0.149)
Own livestock	1.04* (0.534)	0.308 (0.413)	-0.172 (0.445)
Coop member	-0.0177 (0.24)	0.16 (0.291)	-0.054 (0.358)
Year dummy	.497*** (0.136)	.361* (0.191)	-.2*** (0.334)
Ln(food exp.)	-.17** (0.0843)	-0.102 (0.124)	-0.106 (0.144)
Drought shock	-0.194 (0.14)	0.0145 (0.18)	0.217 (0.271)
West Gojjam	.937*** (0.147)	.694*** (0.195)	-0.197 (0.268)

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South Wollo	-1.33***	-0.208	-2.8***
	(0.218)	(0.229)	(0.614)
North Wollo	-0.0968	0.377	.589*
	(0.225)	(0.258)	(0.305)
_constant	-0.76	-0.689	-0.225
	(0.755)	(0.769)	(0.923)

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Statistics

Wald chi2(54)	455
Prob > chi2	0.000
Number of obs.	2289
AIC	4138
BIC	4465

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# Explaining Financial Crises in an African Open Economy

Oluremi Ogun<sup>1</sup> and Olutomilola Makinde<sup>2</sup>

## *Abstract*

*This study investigated the probable sources of crisis in the financial sector of Nigeria, over the period, 1960-2014. Two distinct phases of financial crises in the country were enclosed by the scope of the study. Both the policy and economic environments of the country might have contributed greatly to the scale of the crises experienced in the different periods. An analytical approach embedded in allied studies defined the empirical model. The data employed were subjected to preliminary investigations in order to eliminate the possibility of spurious statistical results. Estimates from a regression model were obtained for both endogenous and exogenous factors. Most of the endogenous factors were found to be remarkably consistent in signs and significance. The influence of most of the exogenous factors and closely linked domestic activities found parallels in business cycles of the country. Greater care in policy design and reduced propensity to borrow externally could significantly moderate the negative influence to the determinants of growth in the system.*

**Keywords:** business fluctuations; open economy macroeconomics; financial markets and the macroeconomy; policy design and consistency; policy coordination.

**JEL Codes:** E32; E44; E61; F41

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## **1. Introduction**

Financial crises had become a global phenomenon whose prevalence among industrial and developing countries alike had been disconcerting and worrisome as several countries in different regions spent a better part of the past few decades dealing with one form of crisis or another. Currency and banking crises had been especially common occurrences; also, in recent times, there had been several sovereign debts defaults even by developed countries. Laeven and Valencia (2012) identified 147 systemic banking crises, 218 currency crises and 66 sovereign debt crises as having occurred around the globe in the period 1970-2011.

In Nigeria, financial crises had usually been dominated by banking crises though the events of the 1990s had a huge dose of nonbank financial institutions' troubles. The first recorded crisis was in late 1940s/early 1950s when many banks ran into stormy waters, driven principally by undercapitalization and 'bad' management. The crisis effectively ended the era of *laissez faire* banking with the enactment of the Banking Ordinance of 1952 that stipulated conditions for establishing banking business in the country. The ordinance became the precursor to the establishment of a central bank in the country.

The third phase of financial crisis in the country as recorded beginning from around late 2007 had a large dose of interplay of endogenous and exogenous factors including stock market crash, capital outflows and continuous fall in the price of the prime export of the country, crude oil.

For reasons of data availability, this paper provided an analysis of the proximate determinants of financial crises in the country since 1960. For proper anchor, two interrelated questions were asked. Firstly, what were the prominent endogenous and exogenous factors explaining fluctuations in the financial sector? Secondly, how important were these factors? The rest of the paper was organized as follows. Section II gave an insight into the policy and economic environment of the country in the reference period while section III discussed the relevant analytical framework. Section IV presented the

methodology and data employed in the study while section V was concerned with the empirical analysis. Section VI concluded the paper.

## **2. The Policy and Economic Environments**

The agrarian economy that emerged at independence in 1960 had in first half of the decade of 1960s, been devoid of major volatility in growth fundamentals as the commodity export boom of the post-world war II era had petered out. However, the banking industry that boasted of only 8 banks of deposit and 1 merchant bank in 1960 recorded the birth of additional 8 banks of deposit by 1966. An oil boom occurred between 1973 and 1980 transferring large wealth to the country and thus helping to speed up its industrialization process: its manufacturing GDP rose from about 4% in 1971 to about 10% by the turn of the decade. Accordingly, the number of banks in the country grew to 21 with banks of deposit numbering 20.

The country was to experience a severe recession between 1981 and 1986 following the glut in the global oil market. That notwithstanding, additional 9 banks of deposit and 6 merchant banks were established in the period. The post 1986 years represented the era of economic reforms by which the country transformed from a regulated economy to one in which market forces influenced economic decisions considerably.<sup>3</sup> Thus, with the removal of barriers to entry and introduction of competition along price lines, a boom in the financial sector ensued. Between 1987 and 1992, banks of deposit grew in number to 66 and merchant banks, to 54.<sup>4</sup> Apart from the widespread nature of the boom noted in the introductory section, structural change brought in new entrants such as People's Bank, Community banks, Urban Development Bank, Maritime Bank, an export and import bank and a deposit insurer. By 1994, there were 752 registered finance houses, 879 community banks, 252 primary mortgage institutions and 271 people's bank branches in the country (CBN, 1993, 1994). However, political interference subverted prudential

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<sup>3</sup> The regime was heralded by the inauguration of an auction market for determination of the exchange rate of the local currency, the naira, in September 1986.

<sup>4</sup> All reform measures aimed at the financial/banking sector and allied growth indices were obtained from Central Bank of Nigeria's *Annual report and statement of accounts* of the relevant years.

criteria in the granting of licenses where retired military officers were directors of many banks. (Lewis and Stern 1997).

Due to its enormous growth, professionalism became a rarity in the sector. Besides, some inconsistencies in the reform programme might have sent wrong signals to market operators thereby generating adverse consequences. For instance, between 1987 and 1992, interest rate policy oscillated between regulated and deregulated regimes and sectoral guidelines were still in place all through that period. Thus, in the face of interest rate risk as well as the stiff competition engendered by the sharp increase in the number of financial institutions, banks were still being directed to lend to priority sectors irrespective of the cost of capital and the marginal rate of return in such sectors.<sup>5</sup>

Banks responded to the somewhat deregulated environment by engaging in sharp practices especially, insider lending and foreign exchange deals. The autonomous foreign exchange market had been abolished in 1989 and Bureau De Change operators had been licensed, effectively increasing the number of authorized foreign exchange dealers. With structural defects in financial arrangements especially, asset –liability maturity mismatch and the persistent misalignment between the auction and parallel markets' exchange rates, many financial institutions, especially banks with privileged access to foreign exchange, found speculative transactions more lucrative than lending to the private sector.<sup>6</sup>

Regulatory reforms of the sector were logical and warranted. The reforms took the form of macroeconomic, structural, organizational, allocative, protective and prudential controls.<sup>7</sup> A particular measure that affected all the subsectors of the system was the increase in the paid up capital of firms. For example, banks of deposit and merchant banks were mandated to increase paid up capital base from ₦20 to ₦50 million and ₦12 to ₦40 million

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<sup>5</sup> For a review of the developments in the country's banking sector between the late 1980s and the early 1990s, see for example Ogun (1994).

<sup>6</sup> See Ogun (1994) and Brownbridge (1998).

<sup>7</sup> For details on some of these measures, see for example, Central Bank of Nigeria (1990).

respectively.<sup>8</sup> For the banking industry in particular, a deposit insurer was established, the risk-weighted capital adequacy recommended by the Basle Committee of the Bank for International Settlements (BIS), prudential guidelines from Central Bank of Nigeria (CBN) and standard accounting systems (in reporting of banks' loan portfolios) from the accountancy practice regulatory bodies were brought into force.

In spite of all these, several cases of insolvency in the system were reported. For example, the 1992 annual report of Nigerian Deposit Insurance Corporation (NDIC) revealed that the financial situation of distressed banks of deposit deteriorated immensely in the year as their ratio of classified loans and advances to shareholders' funds decreased sharply from -1,977% in 1991 to -41,605% in 1992. According to the report, this indicated that the shareholders' funds were grossly inadequate to provide any cover for the banks' classified assets. Further, the adjusted shareholder's funds of the banks which was at negative level of about ₦1.9 billion in 1991 deteriorated to a negative position of about ₦4.6 billion in 1992. The report had summed the situation as, "whereas the banks in 1991 required a sum of at least ₦2,354 million as additional capital for their level of operations, the amount of additional capital funds required in 1992 increased to at least ₦6,090 million." The merchant banking segment and finance houses were not spared of the severe liquidity problems with their net worth trading in negative territories. By mid-1993, following a failed transition to civilian rule, political instability had set off a bank run, resulting in temporary closures and failure of some banks. Many finance houses too had to close shop. In 1994, exchange and interest rate controls were reintroduced by new military government.

A somewhat continuous cleaning process of the system commenced around 1994 with the NDIC favouring mergers and acquisitions but outright liquidation in hopeless cases. Four banks were put into liquidation in 1994 and another had its license suspended. In 1995, a further 13 banks were taken over by the CBN and many more distressed banks were subjected to some form of "holding action" imposed by the CBN and NDIC (Brownbridge 1998). Many licenses were subsequently revoked and many banks put into liquidation.

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<sup>8</sup> ₦ is the symbol of Nigeria's national currency.

With a civilian government taking over from the military in 1999, financial sector's reform became part of the need for an expanded and comprehensive economic reforms. Around year 2001, there was a call for banks to increase their paid-up capital to ₦1 billion; this was to be increased to ₦2 billion in 2002. As the need to effectively tackle the problem of frequent crisis in the sector remained on the front burner, additional arguments were woven around the need to strengthen the resource base of banks such that they could finance larger productive ventures without necessarily resorting to consortium arrangements. Hence, in 2003, CBN requested all deposit banks to raise their minimum capital base from about US\$15 million to US\$192 million by the end of 2005 (See CBN 2003). Banks failing to meet the new requirements were expected to merge or else have their licenses revoked. With the banking sector now under universal banking, the implementation of the consolidation exercise triggered various mergers that reduced the number of banks in the country to 25.

Unfortunately, the huge capital base could not effectively safeguard the sector from distress as it faced threats from at least two directions. Firstly, the fact that the country was part of a network of nations under its open economy policies which implied rapid transmission of shocks to the economies of its trading partners. Secondly, the monocultural export dependency of the country further increased its vulnerability to external shocks. Thus, when the global meltdown of 2007-2009 combined with the continuous fall in the export price of crude oil, the illusion of an enhanced capital base evaporated as the banking sector in particular and the financial system in general became devastated by crisis.

The macro economy had slipped into recession from the oil price development and the attendant continuous drop in foreign reserves of the country.<sup>9</sup> With over US\$15 billion (of local currency) withdrawn from circulation; the exchange rate depreciating steeply from ₦80/\$ in 2007 to ₦146/\$ in 2009; the stock market index collapsing by almost 70% from 66,371 in March 2008 to

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<sup>9</sup> Oil price fell continuously from a peak of about US\$147 per barrel in 2007 to about \$30 in 2015 while foreign reserves dropped from about \$80 billion in 2007 to about \$24 billion in June 2016.

22,349 in January 2009 with an associated market capitalization journey from about ₦12.13 billion to about ₦4.88 billion, the recession showed up as a form of apathy to bank loans on the part of non-bank public as well as an inability to service and repay existing loans.<sup>10</sup> Accordingly, incidence of loan defaults rose as non-performing loans in the system jumped to about 20.7% in 2009 while the public's apathy to bank loans combined with banks' own reluctance to lend (given the asymmetric information problem that accompanied the stock market crash) to create an unusual excess liquidity problem in the system.<sup>11</sup> And, as banks' exposure in the stock market was in the region of about ₦1 billion, their capital base became eroded accentuating the problem of fragility in the system. A joint CBN and NDIC audit was conducted in 2002 (CBN/NDIC 2002) to reduce the uncertainty that pervaded the financial sector. The audit focused on capital adequacy, corporate governance and liquidity parameters and was conducted in two batches. Out of the 24 banks audited, only 14 passed on all parameters. One bank was found wanting on two issues while the remaining 9 banks were judged to be in grave conditions.

In order to stabilize the system and return confidence to the markets and investors, the CBN injected ₦620 billion into the nine banks that had issues with liquidity and capital adequacy and replaced the executive management in eight of the banks. It gave two banks a deadline of June 2010 to recapitalize. The intervention also necessitated the establishment of the Asset Management Company of Nigeria (AMCON) which acquired the banks' toxic assets and supplied liquidity to the system so as to avoid bank runs and systemic failures. By 2011, the CBN through AMCON assumed total control of three banks, injected needed capital and reorganized their management. As at the July 2016, the total toxic assets under the AMCON rescue operation of the three banks was about ₦3 trillion.<sup>12</sup>

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<sup>10</sup> The figures quoted were from CBN Statistics Database.

<sup>11</sup> References could be made to (1) during the period under consideration, rather than lend to the public, banks in the country preferred to keep their money on deposit with the apex bank for as low as 2% interest rate (2) most of the banks were paying about 1% rate on time deposits while many of them were actually refusing to accept deposits on term basis and (3) some banks began charging maintenance fees for saving account facility.

<sup>12</sup> Information provided by the Research Department of Central Bank.

### **3. Analytical Framework**

Most of the available theoretical models of financial crises appeared to be centered on banking crisis as would be occasioned by balance of payments crises caused by weak economic fundamentals (see for example, Kouri 1976; Salant and Henderson 1978; Tularam and Subramanian 2013) or currency crisis usually associated with the collapse of exchange rate regimes (see e.g. Flood and Garber 1984; Tularam and Subramanian, 2013); existence of multiple equilibrium (see for example, Willman, 1987); the influence of financial factors such as the balance sheets of banks within the context of asymmetric information problem (see for example, Akerlof and Romer 1994; Claessens and Kose 2013); strictly predictive models (for example, Kaminsky and Reinhart 1999; Goldstein, Kaminsky and Reinhart 2000) or excessive risk taking associated with the existence of bail-outs and deposit insurance (see for example, Radecki 1990).

Two distinct theories had been identified as explaining the origin of banking panics (Allen *et al.* 2009). The first maintained that panics were undesirable events caused by random deposit withdrawals unrelated to changes in the real economy. The maturity transformation role of banks made them susceptible to sudden demands for liquidity. These multiple-equilibrium models affirmed that bank runs were often accurately predictable. On one hand, agents had uncertain consumption needs in an environment where long term investments were costly to liquidate. If depositors believed that others would withdraw, then, all agents found it rational to do likewise then a panic occurred. On another, everybody believed no panic would occur and agents withdrew their funds according to their consumption needs, demand could be met in this case without costly liquidation of assets. The shortcoming of this theory was in only explaining the possible mode of occurrence of a crisis but not accounting for the causal factor.

The second saw banking crises as a natural outgrowth of business cycles. Recessions would reduce the worth of banks' assets, raising the possibility of banks being unable to meet their obligations. Depositors anticipated financial difficulties when they received information of an impending downturn and

tried to withdraw their deposits, triggering a crisis in the process as banks could not satisfy all customers at once. In this case, crises were not random events but depositors' response to negative information about unfolding economic conditions. The sequential service constraint (first-come-first-served rule) was the essential mechanism causing the possibility of a panic in these theories.

In many emerging markets, banking crisis were triggered by external developments such as capital outflows, rising global interest rates and falling commodity prices, which led to an increase in non-performing loans (Claessens and Kose 2013). Macroeconomic fundamentals as traditional sources of financial and banking crises included (1) general uncertainty, (2) asset price bubbles, (3) terms of trade shocks, (4) monetary policy errors, (5) recession phase of business cycles, (6) exchange rate collapses, and, (7) inflation volatility. Mishkin (1996) corroborated this view by using the asymmetric information theory to explain financial crises and concluding that, these successive factors raised the probability of bank insolvency. Most banking panics were often initiated by a crisis of confidence in the banking sector (Mishkin 1996). Rise in uncertainty in financial markets due to a recession, an important individual financial or non-financial institution failure, a real shock to the economy or political instability made it harder for lenders to perform their intermediation role in such high risk environments. Information asymmetry often snowballed into bank panics and systemic failure. Further, the characteristics of developing economies could actually increase the likelihood of a banking crisis (Mishkin 1996). Being primary good producers with undiversified export base made them vulnerable to the vagaries of international commodities markets; deteriorating terms of trade often produce rapid weakening of banks' balance sheets; exchange rate risks from unanticipated depreciation/devaluation increased liabilities denominated in foreign currency.

Banking crises were often linked to problems in asset markets - stock and real estate markets. (Claessens and Kose 2013). When asset markets were in turmoil, it generated a corresponding negative effect on banks' balance sheets, securities lost value and the incidence of non-performing loans rose because non-financial firms' net worth were reduced. Problems of adverse selection

and moral hazards tended to rise. Even if banks did not fail, there was significant reduction in capital which led to decline in lending and contraction in economic activity. These problems were much evident in the recent global crisis triggered by credit contraction in U.S subprime mortgage markets.

According to Calomiris and Gorton (1991), these factors had not however been empirically or historically proven to be the sole cause or sufficient conditions for banking crises. Supporting, Caprio and Klingebiel (1996) in their historical review of prominent cases of bank insolvencies found that microeconomic factors were more prevalent. By Calomiris (2009), the existence of poorly designed microeconomic banking rules in the company of any of these macroeconomic factors made banking crises a certainty.

A historical analysis of banking crises revealed that panics and waves of failure did not always coincide; were not random events; the inevitable result of human nature; the liquidity transforming structure of bank balance sheets; and, did not typically accompany business cycles or monetary policy errors. The microeconomic structural forms of banking system rules established by governments were seen as the key additional necessary condition that raised the likelihood of banking distress (Calomiris 2009).

As defined by Calomiris (2009), risk-inviting rules are those rules that governed the location, powers, and operations of each bank, including: government subsidies; special rights granted to favoured banking system participants; the incentive consequences of those subsidies and rights were seen as factors that increased the tendency for banking crises. Explicitly, these microeconomic rules were the structural characteristics of a country's banking system or incentive distortions that prevailed therein such as: financial liberalization; government safety net (deposit insurance or public guarantee); poor supervision and regulation, lending to state enterprises, political interference, politically motivated lending, deficient risk management, weak judicial system, corruption and fraud were commonly cited factors which encouraged more imprudent risk taking on the part of bankers.

By Fischer *et al.* (1997), financial liberalization changed the macroeconomic, legal and regulatory framework under which banks operated. Financial

parameters used by economic agents in making financing decisions were usually changed by the shift from financial repression to market determined policies. An absence of a proper regulatory and supervisory structure before liberalization, would fail to effectively constrain risk taking behavior and the lending boom that typically accompanied this process. Empirical results showed that moral hazard and risk taking by bank managers and owners rose following liberalization, hence, increasing the probability of banking crisis. For instance, in 1994, Venezuela experienced a major banking crisis after financial liberalization which represented huge losses to the government in terms of the magnitude of their bailout package - 13% of GNP (see Sundararajan 1996).

Regulation with macro-prudential supervision was designed to reduce the risk taking behavior of financial institutions and to enforce rules made by the governing monitoring authority in order to ensure financial stability. Public intervention measures such as bailout guarantees, capital support and purchase of non-performing loans and so forth were important in forestalling systemic bank failures, though they often had distortionary effects (Claessens and Kose 2013). Deposit Insurance aided in reducing depositors' apprehensions which could lead to sudden withdrawals of liquidity or capital (Calomiris and Gorton 1991); and, lender of last resort facilities were necessary in providing liquidity to banks in periods of financial distress.

Ironically, banks took on too many risks because they relied on government protection in the event of failure or on the tendency of government to pursue accommodative monetary and fiscal policies following crises. Government safety nets also led to poor market discipline, it removed depositor's incentives to monitor or discipline banks when they were taking such excessive risks because they expected they would not suffer any loss if a bank failed; they also increased the risk of fraud and embezzlement, thereby producing systemic vulnerabilities (Claessens and Kose 2013; Calomiris 2009).

A bank supervisory agency with inadequate expertise and resources would be unable to effectively monitor and evaluate: appropriate management expertise, efficiency of internal risk management procedures, adherence to proper accounting standards, compliance with disclosure requirements and capital

sufficiency in order to check banks proclivities towards risk taking. Without accountability, transparency and autonomy from political influence, these agencies would engage in regulatory forbearance (that is, delay in enforcing regulations or closing insolvent banks) partly due to conflicting interests, by hiding the full extent of banking problems, preventing the prompt implementation of corrective measures that could avert a full-fledged banking crisis (Mishkin 1996).

The form of economic policy prevalent in the financial sector, especially if financially repressive, had adverse impacts on banking activities and could initiate crises. Government directives such as lending to particular sectors at preferential interest rates, extension of bank branches to certain areas without accounting for profitability considerations, non-market based government deficit funding, lending to state sponsored enterprises at submarket interest rates, and connected lending to politicians could build up systemic risks in the banking system (Latter 1997).

A weak institutional infrastructure in terms of the legal and judicial framework prominent in most developing countries hindered the efficient functioning of financial markets. Financial intermediation was severely affected when property rights were unclear and difficult to enforce. Weak legal systems made it difficult to extricate an economy from financial turmoil because of the cumbersome bankruptcy procedures usually involved in resolution of conflicting claims. (Mishkin 1996; Latter 1997).

The insights provided by the foregoing studies informed the choice of the variables in the empirical specification below. Particular attention was also paid to Eichengreen and Portes (1986) in which financial crises were viewed in terms of a disturbance to financial markets, associated typically with falling asset prices and insolvency among debtors and intermediaries, which ramifies through the financial system, disrupting the market's capacity to allocate capital within the economy; in an international financial crisis, disturbances spill over national borders, disrupting the market's capacity to allocate capital internationally. Also noted was the understanding in Claessens and Kose (2013) of their multifaceted nature; they could have domestic or external origins, and could stem from private or public sectors; they came in different

shapes and sizes, evolved over time into different forms, and could rapidly spread across borders.

The empirical specification of the model analyzed therefore took the form:

$$FSNW = f \left( \begin{matrix} M2, MPR, RIR, PMP, RER, SMC, INF, CF, IDSH, FRIR, FDY, \\ FRM, OP, TOT, EXDY, EDSX, PFS \end{matrix} \right) \quad (1)$$

Where, FSNW was financial sector’s net worth; M2 was broad money supply; MPR was monetary policy rate; RIR was real interest rate; PMP was parallel market exchange rate premium; RER was real exchange rate; SMC was stock market capitalization; INF was domestic inflation; CF was capital flight; IDSH was internal debt service – broad monetary base ratio; FRIR was foreign (advanced) countries real interest rate; FDY was fiscal deficit ratio; FRM was ratio of foreign reserves to imports; OP was crude oil price; TOT was terms of trade; EXDY was external debt ratio; EDSX was ratio of external debt service to export; PFS was profit of the financial sector. The respective partials were as shown in Table 1. In the model, FRIR, EXDY, EDSX, MPR, FRM, TOT and OP were exogenous variables.

**Table 1: A Priori Expectations**

Variable	Expected Sign	Variable	Expected Sign	Variable	Expected Sign
<b>M2</b>	+	MPR	-	RIR	+
<b>PMP</b>	+	RER	+	SMC	+
<b>INF</b>	+	CF	-	IDSH	+
<b>FRIR</b>	-	FDY	-	FRM	+
<b>OP</b>	+	TOT	+	EXDY	-
<b>EDSX</b>	-	PFS	+		

Source: Deduction from the analytical framework.

Financial sector’s net worth was total assets minus total liabilities of the financial sector and captured the growth trend in the sector. Foreign (advanced countries) real interest rate was a proxy for shocks to the economies of the country’s major trade partners, that is, exogenous shocks. External debt ratio measured the annual claim of external debt on available national resources,

that is, a measure of external debt burden. EDSX was a measure of the claim of external debt service obligations on export proceeds of the country, that is, a measure of national liquidity. Internal debt service – broad monetary base ratio measured the fraction of total new monetary base devoted to servicing internal debt annually. Monetary policy rate was the discount rate and represented a measure of monetary policy errors. Foreign reserves – imports ratio reflected the number of months the foreign reserve level of the country could finance its imports that is, import cover.

Broad money was also a measure of national liquidity. Fiscal deficit ratio was an additional measure of policy errors. Terms of trade and oil price were measures of exogenous disturbances. Inflation was the measure of effect of price level increases on financial assets' prices, net worth and profits in the financial system. Real interest rate and real exchange rate were proxies for the effect of financial liberalization (microeconomic rules) on cost of capital. Capital flight was a measure of corruption and dissatisfaction of investors with domestic economic policies and political developments. Stock market capitalization was the measure of the effect of asset price bubbles. Profit of the financial sector was a proxy for factors such as managerial capability, corruption and fraudulent practices. Parallel market exchange rate premium was a proxy for the effect of corruption and sharp practices in the system.

The log equivalent of equation (1) was of the form:

$$\begin{aligned} \Delta fsnw = & \alpha_0 + \alpha_1 m2 + \alpha_2 mpr + \alpha_3 rir + \alpha_4 pmp + \alpha_5 rer + \alpha_6 smc \\ & + \alpha_7 INF + \alpha_8 cf + \alpha_9 idsh + \alpha_{10} frir + \alpha_{11} fdy \\ & + \alpha_{12} frm + \alpha_{13} op + \alpha_{14} tot + \alpha_{15} exdy + \alpha_{16} edsx \\ & + \alpha_{17} pfs + \mu_t \end{aligned} \quad (2)$$

Variable INF denoting domestic inflation was not entered in log because it was generated as percentage change in consumer price index (CPI), not log difference of CPI when it will automatically be in log.

#### **4. Methodology and Data**

An ordinary least squares regression analysis was undertaken. The analysis was confined to the short run for two major reasons. First, in modern times, at least since the great depression, no crisis - economic or financial, had been allowed to work itself out fully; in order to short circuit the relevant cycle, governments usually intervened in various forms - quantitative easing, stimulus package or toxic asset purchase or through their deposit insurers - deposit assumption, pay-out on insurance, merger and acquisition, outright liquidation and so forth. Hence, no such crisis followed its own dynamics to the long run. Secondly, if hypothetically we envisaged a financial crisis model in which national income was specified among others, a long run driver, given the real possibility that financial crisis could be a cause of income cycle, the issue of long run became rather difficult to comprehend. The foregoing rendered any long run analysis in the context of financial/banking crisis ambiguous.

To eliminate the possibility of spurious regression estimates, preliminary investigation of data property was conducted. Thus, a unit root test was carried out with its outcome guiding the final specification of the data series. The data employed in the analysis were annual series covering the period 1960-2014 and were obtained from various issues of the Statistical Bulletin published by the Central Bank of Nigeria.

#### **5. The Empirical Analysis**

Preliminary data analysis took the form of a unit root test that was conducted according to Augmented Dickey Fuller (ADF) and Phillips Perron tests' procedures. The outcome was Table 2.

On the Table 2, the order of integration of the different series were decided on the basis of joint decision of the two test procedures. Thus, at a benchmark of 5%, only foreign reserves - import ratio (frm) was integrated at level; all others were of I(1) status. However, at 10% benchmark, only inflation and

internal debt service – broad monetary base ratio (idsh) were added to the list of series integrated at level while others were I(1).

**Table 2: Unit root tests**

Variable	Test Procedures				Remark
	ADF		PP		
	Level	1 <sup>st</sup> Difference	Level	1 <sup>st</sup> Difference	
fsnw	-2.95(0.15)	-6.71(0.00)	-2.98(0.14)	.668(0.00)	I(1)
m2	-3.27(0.08)	-4.40(0.00)	-2.70(0.24)	-4.09(0.01)	I(1); I(0) at 10% for ADF
mpr	-1.78(0.69)	-8.13(0.00)	-1.73(0.72)	-8.21(0.00)	I(1)
rir	-3.31(0.07)	-6.85(0.00)	-3.16(0.10)	-16.80(0.00)	I(1); I(0) at 10% for ADF
rer	-2.77(0.21)	-5.49(0.00)	-2.32(0.41)	-5.48(0.00)	I(1)
smc	-0.92(0.94)	-5.29(0.00)	-1.09(0.92)	-5.29(0.00)	I(1)
INF	-3.35(0.06)	-7.46(0.00)	-3.18(0.09)	-17.12(0.00)	I(1); I(0) at 10%
cf	-2.55(0.30)	-9.23(0.00)	-2.52(0.31)	-9.07(0.00)	I(1)
idsh	-3.21(0.09)	-10.35(0.00)	-3.19(0.09)	-10.74(0.00)	I(1); I(0) at 10%
frir	-3.10(0.11)	-6.85(0.00)	-3.10(0.11)	-8.09(0.00)	I(1)
fdy	-3.12(0.11)	-5.72(0.00)	-3.23(0.08)	-10.60(0.00)	I(1); I(0) at 10% for PP
frm	-3.76(0.02)	-	-3.79(0.02)	-	I(0)
op	-1.67(0.75)	-6.79(0.00)	-1.84(0.67)	-6.79(0.00)	I(1)
tot	-1.96(0.60)	-6.16(0.00)	-2.13(0.51)	-6.06(0.00)	I(1)
exdy	-1.47(0.82)	-6.40(0.00)	-1.58(0.78)	-6.38(0.00)	I(1)
edsx	-1.67(0.74)	-7.60(0.00)	-1.68(0.74)	-7.60(0.00)	I(1)

Source: Computed.

Table 3 presents the parsimonious model.<sup>13</sup> For reason of near singular matrix generating perfect collinearity of regressors, three variables, monetary policy rate, terms of trade and nominal exchange rate had to be deleted from the over-parameterized model.<sup>14</sup> Also, for reason of data unavailability, profit of financial system did not make the final model.

<sup>13</sup> The over-parameterized model could be obtained from the authors.

<sup>14</sup> The data used in the study and their sources are available from the authors upon request.

**Table 3: Parsimonious Model**

Dependent Variable:  $\Delta$ fsnw

Method: Least Squares

Sample (adjusted): 1964 2014

Included observations: 49 after adjustments

<b>Variable</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-Statistic</b>	<b>Prob.</b>
$\Delta$ fsnw(-1)	-0.51	0.12	-4.21	0.00
$\Delta$ fsnw(-2)	-0.37	0.09	-4.15	0.00
idsh(-1)	-0.06	0.04	-1.48	0.15
idsh(-2)	0.14	0.03	3.60	0.00
$\Delta$ m2	1.25	0.23	5.43	0.00
$\Delta$ m2(-1)	-1.47	0.29	-5.08	0.00
$\Delta$ m2(-2)	-0.61	0.20	-2.92	0.00
$\Delta$ edsx(-1)	0.11	0.03	3.54	0.00
$\Delta$ edsx(-2)	-0.06	0.04	-1.53	0.14
$\Delta$ exdy	-0.27	0.04	-6.68	0.00
$\Delta$ exdy(-1)	-0.41	0.04	-8.31	0.00
$\Delta$ exdy(-2)	-0.16	0.05	-3.08	0.00
$\Delta$ fdy(-1)	4.15	1.15	3.59	0.00
$\Delta$ fdy(-2)	-2.56	0.98	-2.61	0.01
$\Delta$ frir(-1)	0.56	0.24	2.32	0.03
frm	0.29	0.04	6.51	0.00
frm(-1)	-0.14	0.04	-3.54	0.00
$\Delta$ op	0.43	0.12	3.55	0.00
$\Delta$ op(-1)	-0.32	0.10	-3.00	0.00
$\Delta$ rer(-1)	0.71	0.11	6.09	0.00
$\Delta$ rer(-2)	0.19	0.12	1.61	0.12
$\Delta$ pmp	-0.07	0.05	-1.19	0.24
$\Delta$ pmp(-2)	0.19	0.07	2.61	0.01
$\Delta$ rir	0.52	0.22	2.35	0.03
$\Delta$ rir(-1)	0.95	0.17	5.30	0.00
$\Delta$ rir(-2)	-0.53	0.14	-3.83	0.00
$\Delta$ smc	-0.89	0.13	-6.47	0.00
$\Delta$ smc(-1)	-0.27	0.11	-2.43	0.02
$\Delta$ smc(-2)	-0.35	0.12	-2.76	0.01
$\Delta$ cf	-0.11	0.03	-3.04	0.00
INF	0.02	0.00	8.71	0.00
C	0.82	0.12	6.43	0.00
R-squared	0.96			
Adjusted R-squared	0.89			
F-statistic	13.63			
Prob(F-statistic)	0.00			

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Test	Diagnostic Tests	
	LM Statistics	F-Version
Normality	1.64(0.43)	N.A.
Serial Correlation: BG <sup>15</sup>	10.31(0.00)	F(2, 15) = 2.00(0.16)
Heteroskedasticity: BPG <sup>16</sup>	26.73(0.68)	F(31, 17) = 0.65(0.84)
Ramsey RESET (2)	0.54(0.76)	F(2, 15) = 0.08(0.92)
Recursive Residuals	Generally stable <sup>17</sup> .	

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Source: Computed.

Two explanatory variables, lags of the dependent variable and foreign real interest rate bore the wrong signs. Of the rest, money supply (M2), real interest rate (RIR), fiscal deficit ratio (FDY), import cover (FRM) and oil price (OP) though significant, came up with mixed signs. The remainders were remarkably consistent in signs and significance.<sup>18</sup> Thus, internal debt service, external debt ratio, parallel market exchange rate premium, real exchange rate, real interest rate, stock market capitalization, capital flight and inflation combined to explain the growth of the country's financial system. Whereas, external debt ratio, stock market capitalization and capital flight tended to exert negative influence on FSNW, the others (that is, internal debt service, parallel market exchange rate premium, real exchange rate, real interest rate and inflation) contributed positively to its growth in the period under consideration. This implies that factors that negatively impacted on the positive contributors could have induced crisis in the financial sector by way of reduced net worth. Similar outcome would also obtain with factors that induced growth in the negative contributors. With two negative factors (external debt ratio and capital flight) being partly exogenous, the role of exogenous factors in financial crises in the country appeared quite established.

The vicissitudes in the effects of some explanatory factors appeared to have parallels in business cycles of the country. The fact that money supply, import

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<sup>15</sup> Breusch-Godfrey Test.

<sup>16</sup> Breusch-Pagan-Godfrey Test.

<sup>17</sup> This implies that the recursive residuals generally lie between +/- 2 standard deviations; the instances of model instability identified with some years disappeared when 5% was made the highest benchmark for the unit root test. Details could be obtained from the authors.

<sup>18</sup> The series were mostly significant at 1% with a few at 5%.

cover and oil price had fluctuating impacts on growth in the financial system most likely suggested the possibility of an exogenous driver at work. However, given that the reactions of endogenous variables to exogenous disturbances also generally depended on the magnitude of the shocks, the duration of depression in some endogenous activities might be far greater than the expansion of the preceding boom. This perhaps supplied the reason why on the average, stock market capitalization and capital flight produced a depressive effect on growth of the financial system.

Overall, the model appeared a good fit with the explanatory variables accounting for over 89% of the movements in financial system's net worth in the period 1960 to 2014. The diagnostic tests suggested a generally well behaved model even as the test for serial correlation appeared to be mixed.

## **6. Conclusion**

The proximate determinants of financial sector growth in Nigeria were ascertained and evaluated for relative and collective importance in this study. Both endogenous and exogenous variables were discovered to have operated in concert in explaining crisis in the financial system. One issue that stood out in the analysis was the fact that practically all the influential endogenous factors were within the ambit of policy control. This raised the likelihood that policy inadequacy and possibly, somersaults, might have been important causal factors of financial crises in the country.

Exogenous disturbances might technically be outside the control of a country, external debt should not fall into this category. Hence, the external debt policy of the country as well as its debt contracting propensity might require attention in the areas of sustainability and the attendant issue of burden that had been shown to penalize financial sector's growth. Complementary policies would be expected within the broad context of management of business cycles in the country. And indeed, further research into the subject of financial crises in the country could benefit from the adoption of a cycle's approach.

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# Property Rights and Their Implications on Agricultural Productivity in Ethiopia: A History

Temesgen Gebeyehu Baye<sup>1</sup>

## *Abstract*

*Property rights and relationships in Ethiopia, though complex and difficult to define, had been associated with and expressed in terms of land, which had shaped and dictated socio-politico-economic relations and processes. During pre-revolutionary imperial Ethiopia, most debates and discussions on property rights and obligations, including agricultural productivity and efficiency, were expressed in relation to the main existing tenure regime of the country: the rist tenure. This tenure, like most other indigenous tenure regimes and property arrangements in Africa, was flexible and accommodating.*

*This historical study, based on archives, interviews and secondary sources, examines the structure and nature of property rights and relationships. The data collected through different methods was carefully examined in order to reconstruct and document property rights and their implications for agricultural productivity and efficiency in the country based on the objectives of the study.*

**Key Words:** land, tributary rights, reversionary rights, property rights, productivity, agriculture, Ethiopia

**JEL Code:** Q15; P14; P17

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## **1. Introduction and Background**

Property rights are subject to different conceptualizations. They are rights that are recognized and enforced by others to use and control of resources. They can also be specified as a bundle of characteristics that comprise exclusivity, inheritability, transferability and enforcement. They involve relations between the property and the society. Property ownership and rights are legally or customarily sanctioned entitlements which an individual could work out to the exclusion of others. What distinguishes property rights from others is their enforceability. Property rights can be described as a set of powers conveyed to a person over a particular material or resource. These are rights to employ, manage, transfer, alienate or power to acquire the income or rent of the property one owns. Property rights provide one or all of the following rights to the holder of the property: the right of use and enjoyment, the right to collect rent, the right to transfer by gift or inheritance, the right to transfer by sale, and the right to exclude others from intervening with the attribute (Hallowell, 1943).

Theoretically, ownership right is the most complete type of property right. Honoré, in his article, *Ownership*, defined ownership as “the greatest interest in a thing which mature systems of law recognize” (Honore, 1961:165-79).<sup>2</sup> Looking into existing Civil Codes, one may also find similar expressions. For example, the Ethiopian Civil Code, under Article 1204, explains ownership as “the widest right that may be had on a corporeal thing;” and “such right may neither be divided nor restricted except in accordance with the law” (The Civil Code of Ethiopia, 1960 ).

Property could be held either in private or in common or by the state. One of the main features of communal property is that all members of the community want them equally. Here, there is no single individual that has absolute control and command over all of the resources. As noted by Clark and Kohler (2005),

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<sup>2</sup> Honore provides a list of eleven attributes (property rights) found in any advanced legal system which may also be called a bundle of rights: the right to possess; the right to use; the right to manage; the right to income; the right to capital; the right to security; the right to transmitting; the absence of term; a duty to prevent harm; liability to execution; and the incident of residuary character.

“The defining characteristic of communal property is that every member of the community has the right not to be excluded from the resource... In principle, the needs and wants of every person are considered, and when allocative decisions are made, they are made on a basis that is in some sense fair to all” (Clarke and Kohler, 2005: 36).

There are also other types of property and ownership arrangements known as open access. Some properties are destined to be owned by the state instead of a particular person or community, as their use may be intended for the entire people (Yudelman, 1964; Feder and Feeny, 1991; Rahamato, 1984). The state administration and control of such properties may minimize conflict and ensure equitable use by all. For example, it would be better if grazing land, hills, water bodies, irrigation systems and forest lands are owned by the local community. If they are put under individuals, conflict may arise as the holding is unfair or inequitable. In principle, the primary function of private property is that it becomes a guiding incentive to achieve a greater internalization of externalities (Hallowell, 1943; Demsetz, 1965; Amin, 1990; Wallerstein, 1976; Cliffe, 1976; Rodney, 1982). Individuals are made to bear the costs and benefits of their own activities, and to absorb the costs of inflicting spillover effects upon others.

In Ethiopia, we know little about the history of the evolution and development of traditional property rights and arrangements. Except for the 1950s, 1960s and early 1970s when opposing views and debates on the issue and degree of reform of property and ownership rights and relations were discussed, we have only few scholarly works. If any, as the available sources reveal, there are gaps in intensity, structural analysis and focus. The issue attracted only a few intellectuals in the field. A number of factors could be mentioned for the neglect of the subject. This historical study, therefore, tries to fill the gap by focusing on the main characteristics of property rights and their implications on the productivity and efficiency of Ethiopian agriculture. This paper would thus contribute to the existing knowledge regarding the topic under consideration.

## **2. Objectives, Questions and Methodology of the Study**

The overall objective of this paper is to examine and understand the nature and features of property rights, and the implications these had on the productivity of Ethiopian agriculture before the 1974 revolution. Hence, the questions this study tries to answer are: What were the major theoretical debates over ownership and property rights and the implication they had on agricultural productivity? What was the role of politics and power in shaping and influencing in property rights arrangements in Ethiopia? How could state, *balebat*<sup>3</sup> and church relations be explained and understood in relation to tributary and reversionary rights? and what were the features of continuity and change in property rights in Ethiopian history? This study sought for answers to these questions. From a methodological standpoint, this article is based on grey literature, national proclamations and archives collected from the Ethiopian National Archives and Library Agency (hereafter NALA), Addis Ababa. In addition, seven informants were interviewed in 2017 in Gojjam and Addis Ababa.

## **3. Property Rights: Regimes and Features**

Pre-revolutionary Ethiopia (before 1974) was characterized by diversity of property right regimes. In this regard, Donald Crummey's works are significant in the clarification and conceptualization of the nature of the Ethiopian property rights and its nexus with power. He reasoned that property rights had unrestricted rights in terms of use and enjoyment. They were individually accumulated through time in various ways and procedures. They went on from generation to generation through birth, marriages, agreements and arrangements (Crummey, 2000).

During the period, property right were backed by title, license and certification.<sup>4</sup> Peasants had three types of property rights: ownership right, possession right and use right. Ownership right involved an unlimited right to

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<sup>3</sup> Literally, one who has a father; indigenous. During imperial times, it used to signify or represent a local authority linking the government with local people.

<sup>4</sup> Here, it is important to understand that certification is not titling.

use and unlimited right to transfer property. It was the highest and the most complete type of property right. The owner had an unlimited right to transfer, exchange or sell property (Demsetz, 1965).

Possession right was a type of property right that involved certain restrictions and limitations. It referred to possession of property without owning it. There was an unlimited right to use, but the right to transfer was limited (Demsetz, 1965; Wallerstein, 1974). For example, the *rist*<sup>5</sup> holding system cannot be regarded as ownership (For details on the right of transfer on *rist* land, also consult: Crummey (2000); Joireman (1996); Weissleder (1965); Bruce (1976); and Hoben (1973)).<sup>6</sup>

The other was use right. Use rights had restrictions. For example, the tenant might not possess the right to plant trees in the *rist* land. There was no right to transfer. Use rights were limited to either of two types: form of exploitation of the property or duration of use or exploitation (Woldemariam, 1995). Duration of exploitation had the following forms: (1) *indefinite time*: The peasant might use the land indefinitely. It was not permanent and still it was indefinite in time. (2) *lifetime use right*: This was a usufruct (live) right.<sup>7</sup> As long as the peasant was alive, he had the use right of the land. (3) *service time right*: The person had the right to use the property or the land as long as he rendered the service. For example, the soldier used the *maderya*<sup>8</sup> land as long as he provided the service to the state. He was not the possessor and hence he could not transfer it. (4) *the right to use in a given season or year*: There was a definite time of use. The land owner might give the land for the tenant to use for one *meher*<sup>9</sup> or more.<sup>10</sup> The three property rights were layers and they were not at all independent from one another.

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<sup>5</sup> Permanently held land; hereditary right over land; heritable property (in some cases conditional).

<sup>6</sup> In his study of peasant land tenure in Gojjam, Hoben, for instance, has mentioned the absence of egalitarian division of property in the *rist* system of tenure. Wills worked against the principle of equal inheritance. A will excluding children from inheritance was common.

<sup>7</sup> It is important to understand that usufruct does not necessarily mean lifetime rights.

<sup>8</sup> Land temporarily held in return for service to the state.

<sup>9</sup> Harvesting season

<sup>10</sup> This is common in most areas of Ethiopia till today.

Regarding the right to transfer, we had two types of transfer rights: horizontal and vertical. Horizontally, a person might transfer his land to another while alive in the form of gift or sale. In principle, the owner had an unlimited right to transfer his land so far as he was the first to acquire the land. No obligation immediately arose against him for transferring his land because the first generation was the one that acquired the land. It was from the second generation on that kinship and land rights were associated so that horizontal transfer became conditional because vertical transfer started. Vertical transfer refers to the transfer of land from parents to children. Land property went down. Land could be inherited from both parents (system of inheritance) (Mengiste, 2009).

Here, in the study of the evolution and development of property and ownership rights in Africa, in general and Ethiopia in particular, it is important to avoid generalization. There is a need to analyze the essential features of ownership and property rights in traditional economies of Ethiopia. In this regard, Mengiste writes, “Some scholars of Ethiopia viewed the Ethiopian property system through the lens of the Western European absolutist states that developed in the seventeenth and eighteenth centuries” (Mengiste, 2011: 89-106). This could lead us to misconception. There is a need to examine specifics and local features. In supporting this, Boone (2014) argues, “In sub-Saharan Africa, property relationships around land and access to natural resources vary across localities, districts, and farming regions. These differences produce patterned variations in relationships between individuals, communities and the state” (Boone, 2014). Below, we have tried to examine and conceptualize the Ethiopian property rights and their implications on agricultural productivity efficiency.

#### **4. Tributary and Reversionary Rights**

Important rights to be seen in relation to property rights during pre-revolutionary Ethiopia were tributary and reversionary rights. Tributary rights were not property rights. They were derived from the state. They consisted of the right to collect or use tribute from the owners of the land. The state could ensure anyone with the right to use tribute and hence tributary obligations

were imposed on the land as a unit. These rights were tied to the land, not the person. *Ras*<sup>11</sup> Alula and *Ras* Gugsa, two famous governors of different parts of the country, were once said to have declared: “Man is free, land tributary” (Ambaye, 2015). Whenever a person owns land, he should pay tribute. Sometimes, tributary rights might combine both the land and the person. Property and tributary rights were common rights. Both were subjected to obligations and authorizations. Obligations were tied with sanctions that included confiscations of those rights. Reversionary rights were the rights of repossessing of a tributary right by the entity from which it was originally acquired. The property could be reverted to the original owner. Reversionary rights could exist if there is a previous holder. The previous holder could be conceived at individual or state (or institutional or state) level (*Ibid*; Woldemariam, 1995). The state, even in the absence of record of transferring, had a sovereign power and right to get the land back. The state (or the emperor) ideologically and historically assumed putative ownership rights as it was the owner of the land by the fact of sovereignty and power. In this regard, the Ethiopian ruling class came to have a highly developed ideology that legitimized and reinforced its rule. For instance, Francisco Alvarez, a Portuguese priest who stayed in Ethiopia during the 16<sup>th</sup> century, mentioned that the power of the emperor was absolute (Alvarez, 1970). Another traveller, Almeida, a Jesuit priest, also stated: “The Emperor confiscates and grants all the lands as and to whom he chooses” (Pankhurst, 1966:121). Likewise, James Bruce, a 17<sup>th</sup> century traveller to Ethiopia, wrote: “All the land is the king’s; he gives to whom he pleases during pleasure and resumes it when it is his will; but the crown makes no violent use of its power in that respect” (quoted in Paul & Clapham, 1972:290). Therefore, the state/the monarchy had reversionary rights of all belongings.

Reversionary rights could be historical and putative rights (Hardin, 1968; Gesheker, 1985; Interview with Chekol Belete, 10/7/2017). Historical reversionary rights were common. They had been practiced through political

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<sup>11</sup> The highest military rank below *Ras betwoded*, which is in turn a royal title combining the power of the *ras* and the imperial flavour of the *betwoded*.

channels.<sup>12</sup> They happened when some irregularities happened after the land was sold or transferred. The irregularities happened because of power and status differences among individuals. The following case may further elaborate this:

Whereas Mr Alemu was given only one *gasha*<sup>13</sup> of land, now he possesses more than that and he may not be paying tax for the excess land he has. A claimant, thus, demands that “since I am also a soldier, the land should be re-measured and turned over to me,” or Mr Alemu should lose it to a pushy person (NALA, 4.43.23).<sup>14</sup>

Putative reversionary rights took place under extraordinary conditions or when there was intestate death (death without a will) or heirless death, if there is no successor. Death without real heir resulted in putative reversionary rights. In some rural Ethiopia, this phenomenon had been commonly described as *yemote keda*. (The phrase has two meanings: land of a traitor or land of death without will). The person might also not have a child who could inherit the land. In such cases, the land could be reverted. Non-political crimes (such as theft and murder) also caused confiscation rights to revert the land. The same was true to the political crimes, *lese majeste* (a crime on the government or the king), which resulted in property and physical punishment. Such and other reversionary rights happened during the 19<sup>th</sup> century in Shewa province and its dependencies (the south). Yet, they were not common cases. The state did not cause permanent confiscation of property. The monarchy and the state made concessions. Hence, reversionary rights were defined and redefined through time. The 1908, 1914

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<sup>12</sup> I have benefited from Dr Woldemariam’s class during my Master of Arts study regarding reversionary and tributary rights. I am grateful to him.

<sup>13</sup> *Gasha* was a unit of measurement of land. Regarding the origin of *gasha*, Gebrewold wrote the following: *Gasha* refers to a weapon made up from hides of hippopotamus. Its service was to defend oneself from spears because in ancient times spear was the major weapon of attack. In addition to this, *gasha* (shield) was used as a defensive tool in games with horses. All these descriptions are provided to explain why land is measured in *gasha*. Land given to a soldier was named after the word *gasha* by which he defends himself.

<sup>14</sup> Under such circumstances, if the holder is weak, he would lose his land, whether he had excess land or not. The practice and principles of governing and managing property and tribute could vary. Some people held excess land and accumulated wealth, not because they were born or were descendants of a particular family, but because of the status and position they had.

and 1928 proclamations were made as a move to end property confiscations. In this regard, certain reversionary rights had been abolished.

We may exemplify this by the state-church relation. The Ethiopian Orthodox Church had been granted land by the state since its introduction during the 1<sup>st</sup> Century AD. Though the state had the reversionary rights, its right started to decline as the church became powerful and influential, and hence, started to oppose the actions of the state. In this regard, Emperor Tewodros (r. 1855-68) tried to take land from the church. Stern declared that the vast landed property of the church was a great eyesore to king Tewodros (Stern, 1862). *Debtera Zenebe* also observed:

...The priests asked the emperor to allow them to possess the land they had possessed at the time of the emperors, i.e., before the rule of the *Zemene Mesafint*.<sup>15</sup> Yet, the emperor was not sympathetic to them. He exclaimed, ‘... What shall I eat and give to my soldiers. You have taken all the lands, calling them “lands of the cross.” ...the priests declared that the emperor should continue the time-honoured practice of marching from place to place in order to spread the burden of his court and army over the empire as a whole.... A fierce dispute then broke out between the emperor and his soldiers on the one hand and priests on the other (quoted in Pankhurst, 1966: 94).

Until WWII things remained unchanged. Gradually, however, with the introduction and development of capitalism, important changes occurred regarding different property rights and the role of the state. The role of the state, as elsewhere in modern Africa, in shaping property right became stronger. Boone notes:

The role of the state in defining property rights, especially rural property rights, has been decisive in shaping the locus and character of political authority in modern Africa, and in producing the successes and limitations of the nation-building project. These connections have been largely overlooked by those who study national level political processes because those [studies], for the most part, misunderstood African [property] regimes (Boone, 2007: 557-586).

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<sup>15</sup> The Era of Princes. In Ethiopian history, this period roughly covers between 1750 and 1855.

Further, with the consolidation of the central state, individual rights of property ownership became stronger. Those changes gradually became standards in most parts of the country. There was a transformation in power and property relations between the state and the elites (Bisson, 1994). In this regard, Zewde has the following to say:

“... what the nobility lost in political power it recoups in greater guarantee of property rights. For the absolutization of state power was paralleled by the absolutization of property. Absolutization of power and property was assisted by the rediscovery of the Roman property law replacing the precarious and incomplete feudal property system” (Zewde, 1984: 7).

Free hold developed and flourished. Freehold is an absolute private property. There was the separation of criminal law from civil law. The land was converted from political resource to economic resource. The process of separation of politics and property continued until the 1974 revolution. Land was used not only as a means of production but also as a means of raising capital, thereby becoming a commodity. Commoditization of land was expanded.

The essential nature of free hold and private property developed gradually and steadily. The first private property emerged with the first generation (the one who received the land from the state) and then it was followed by the process of *ristization*<sup>16</sup> by its descendants. Here, in the *rist* tenure regime, the state might not have any control authority. What it had was tributary rights over administrative units. The state rewarded its subjects by distributing these services and securing property rights. Zewde notes: “The nobility lost their power because of the absolutization and centralization of state power. They were compensated for these losses with security of property rights. The conditional and *gult*<sup>17</sup> rights were replaced by secure and complete property rights, including the land” (Zewde, 1984: 7). Emperor Haileselesie in

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<sup>16</sup> The process of turning other tenure systems into the *rist* tenure system.

<sup>17</sup> Non-hereditary right to collect tribute, bestowed on members of the nobility and clergy by the king.

particular, after struggling and winning over the old order, became a cadre of capitalist ideology - private property. The process continued until the 1974 revolution.

## **5. Ownership Rights, Productivity and Efficiency**

In the post-1941 Ethiopia, there were two opposite views and debates on the issue and degree of reform in the *rist* tenure (For further details on views and debates regarding Ethiopian land tenure patterns and constraints, see: Dunning (1970); Lawrence and Mann (1966); Warriner (1970); Ingedawork (1962); and Woldemaskal (1957)). For some, change in the *rist* tenure system of Ethiopia had to be introduced to bring socio-economic and political development. According to them, the communal land tenure system had been one of the major factors for the poor agricultural productivity and underdevelopment of the country. This could be expressed in the social, political and economic life of the people (NALA, 19.08; Interviews with Teferi Mamo and Mulugeta Chekol, 11/19/2017). Therefore, in order to bring high productivity and efficiency on the rural traditional economy, there were views that a change from communal to individual property rights should be given legal recognition. (For details on different tenure systems, see also Joireman (2000); Ingedawork (1962); Bauer (1972); Bruce (1976)). According to them, the existing tenure system lacked defined, transferable, and enforced property rights that blocked credit market and prevented peasants from developing their land through long-term investment. In this regard, the prime purpose of some research works in Ethiopia in the 1950s and 60s was to show the impact of property rights on agricultural productivity and efficiency of farming. The dominant view was that the rural agricultural decline in Ethiopia was the effect of the communal *rist* tenure system. This debate was in part stimulated by the rise of commercial agriculture in some areas in the rift valley, southern and western Ethiopia where land had been a commodity, unlike in the provinces where kinship and village tenure regimes prevailed. It was argued that Ethiopian agriculture could be transformed if the *rist* tenure system was simplified and rationalized, with land itself reduced essentially to a commodity so that it could be bought, sold or used as was most profitable (Cohen, Goldsmith and Mellor, 1976). Rather, the presence of endless claims and counter claims

contributed to the absence of extensive farming and precluded the possibility of intensive agricultural mechanization and investment. Thus, the debate on the need for reforming the *rist* tenure was taken among some Ethiopians as a political and economic solution to the problem, including the governance and development challenges of the period. The *rist* tenure system as a constraint for development was also mentioned in the government development plans. It states:

...the *rist* tenure system eliminated the possibility of mortgage credit or of transactions in land. In addition, it obstructed farmers from investing in productive farming operations particularly from safeguarding against soil and water erosion (IEG, 1962; IEG, 1967).<sup>18</sup>

Though the government recognized multiple forms of tenure systems (not just individualized ones), including village tenure systems which were neither completely collective nor individualized, such people were arguing that uniformity of land tenure regimes would be a prerequisite for productivity and efficiency. They also supported absolute land ownership rights. The logic was that in the absence of the right to sell, there is no land ownership.<sup>19</sup> This would pose a major problem in the working capacity and tradition of the peasantry. According to them, absence of ownership rights had caused economic stagnation in the country. Theoretically, this seems a strong argument as ownership refers to an absolute right, exclusive and perpetual. Ownership has three characteristics: the right of use and enjoyment, the right of abandonment, and the right of alienation *intervivos* or *mortis causa* (Desta, 1973). This exclusive quality gives the owner a privative interest in the property, preventing simultaneous and equal ownership of the thing by another person. The perpetual quality of the right of ownership relates to the fact that ownership is not limited in time (Hollwell, 1982).

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<sup>18</sup> See also Second Five-Year Development Plan, 1963-1967; Third Five-Year Development Plan, 1968-1973.

<sup>19</sup>In the main, individuals who supported radical land reform and ownership rights include a number intellectuals and university students. They demanded radical actions of the land reform. They demanded the total removal of the imperial order.

For others, the prevailing subsistence economy and absence of capital accumulation was not the result of the *rist* tenure system. The *rist* system was not the main factor in the agricultural stagnation of the country. The *rist* tenure system did not have a negative impact on the development of Ethiopian agriculture as it practically gave the owner both use and enjoyment rights. In those days, ownership was generally of less interest to the people than the issue of possession and use of property. A peasant could make his own decision in using his land. This included when to farm, what to farm and how to farm. The peasant himself indeed decided all these. This is an indicator of absoluteness of his land holding rights. He might also abandon the land at will or decide to leave it to remain idle (*Ibid*; Interviews with Alem Ayalew and Fenta Bikes 2/5/2017). He had the power to exercise considerable freedom to make permanent transfer (Mengiste, 2011). Land grants and gifts, for instance, were common between those who did not have blood relation. Adoption-related gifts were common ways of land transfer. Mengiste has the following to say:

Adoption-related inheritance worked in peculiar ways. It fused gift, adoption and inheritance at once. The term used to describe the process is *wolede*, “begot”, while the property transaction it involved is called *aworese*, “inherited”. One formality of adoption was the adoptee’s symbolic sucking of the thumb dipped into honey. This act established social ties between the adopter and the adoptee. Typically, the adopter gave property, usually land, to the adopted child or children. The relationship was long-lasting and the complete transfer of inheritance was intended to take effect after the death of the donor (*Ibid*: 313).

In supporting this view, we have documents at St. Mary Church of Gundewoyen, Gojjam:

**Document-1:**

(On 6 June 1943 [EC], during the reign of Emperor Haileselesie and priesthood Adane, Mrs Aregash Wase, by sucking the honey-dipped thumb of *Kegnazmach*<sup>20</sup> Abesha Mejale, made a solemn promise and begot

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<sup>20</sup> Commander of the right wing.

*Kegnazmach* Abesha Mejale over her *rist* and cattle equally with her biological sons. Witnesses are [list of many people]).

**Document-2:**

During the reign of king Tekle-Haymanot and Abune Lukas [pope of Gojjam], and in front of the *aqabé se'at* Asefa and the learned men of the churches and the learned men of law, and by sucking the thumb of Ayalew Mengesha dipped into honey, adopted *memehere* Alabachew over his land. Likewise, he [Alabachew] made a solemn promise to abide by the members of the kin.

**Document-3:**

During the reign of Ras Hailu and priesthood of Meteku, Mrs Etagegnehu made Walelegn her *fej*.<sup>21</sup> And also by sucking the honey-dipped thumb of Akalu Negussie, begot Akalu Negussie, who in turn made an oath to take care of her till her death. Witnesses are [list of many people].<sup>22</sup>

Therefore, it is fair to argue that the *rist* tenure, like other indigenous tenure regimes and property arrangements in Africa, was accommodating, flexible and dynamic. There is a rich literature documenting the flexibility of customary land and resource arrangements (Joireman, 2011; Manji, 2001; McAuslan, 1998).<sup>23</sup> True, sale is one of the characteristics of absolute ownership. If one could not sell his land, it means alienation of the property *intervivos* or *mortis causa* is impossible denying the absolute character of ownership, which is one of its attributes (Desta, 1973). In this regard, like other customary property rights regimes of sub-Saharan Africa, the Ethiopian customary law had been malleable and dynamic. It had the capability of accommodating changes and interests of the society.

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<sup>21</sup> Representative, local agent.

<sup>22</sup> Gratitude and familial affection were among the reasons for land grant and transfer. These documents could help us to extend our understanding and argument on the role that land plays in the degree of economic relationships among individuals until the collapse of the imperial regime in Ethiopia in 1974.

<sup>23</sup> For instance, with the rapid evolution and development of monetization of the economy and land markets, there was evidence of land sales in communal tenure areas of the country. This, however, needs a separate study.

For example, the communal or the *rist* tenure system supported and confirmed its presence regarding the exclusive nature of right and ownership. *Rist* rights were neither collectively exercised nor collectively worked. Each plot of land or *rist*, irrespective of its inefficiency, was an independent center of production. *Rist* rights had been held exclusively by the *ristegna*.<sup>24</sup> There was no tendency of reverting the *rist* land to the community; not even the nearest of kins can claim, as of right. This was because even though the group controlled land, it was held securely by the individual farmer as his or her own. Thus, the individual exclusively appropriated the produce of his own toil (Interviews with Mulugeta Teferi and Alem Biyalfew, 3/2/2017). The *rist* customary system is similar to those in other sub-Saharan Africa societies and communities. Ossome writes:

.... customary systems did not exclude individual rights, as a simple premise of ‘communal’ systems supposed [sic] Research showed individuals and small familial units who have separable claims, rights, and responsibilities work the vast majority of farms in Africa, even though land in its most general sense is usually vested in collectivities such as chiefdoms or clans (Ossome, 2014).

The right of *rist* ownership was very ancient in origin and had gone through a slow historical evolution to reach its existing feature and form during the period under consideration. It began by being communal and gradually evolved into individual ownership. Therefore, attempting and supporting individualization of the already individualized holding as part of land reform and development programs by the then Ministry of Land Reform and Land Administration in the 1960s and early 1970s had been considered just meaningless as it had no theoretical as well as practical foundation. It was a waste time and a misplaced effort on the part of the government. The presence of restrictions on the sale of land in the *rist* areas did not have such a pronounced effect on the use of land, agricultural productivity and efficiency. Therefore, instead of emphasizing on the artificial differences and characteristics, the effort should have been on fundamental solution for the problem, the issue of modernization of agriculture, technology, improvement

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<sup>24</sup> *Rist* holder; a person having *rist* rights; a person holding land in consequence of his inherited rights.

of agricultural inputs and markets. (For details, see the works of Markakis (1974, 1973); Hoben (1972); Pausewang (1970, 1973); Cohen (1973); Bondestun (1974); Stahl (1973)).

Therefore, the practical absence of a sale of land in *rist* tenure areas of Ethiopia and low agricultural productivity was not the result of the absence of ownership right, but due to other factors. True, like other land regimes in sub-Saharan Africa, the Ethiopian tenure problems were reaching a peak of crisis. During the post-war period, there was a trend of rising land values, population pressure, environmental degradation, input prices and the shifting for commercial/cash crop agriculture (Boone, 2007; Bruce, 1993; Migot-Adholla *et al.*, 1991; Joireman, 1966, 2011). The economy in Ethiopia was also at a low level of development and it could not afford a ready market not only for land but even for the produce from it. The society was at the subsistence economic stage of development, and hence, agricultural production and the orientation were mainly for consumption and immediate use. It was not used for capital, investment, or market.

Finally, the debate ended on 12 September 1974 when the Conquering Lion of the Tribe of Judah, Haile-selassie I, Elect of God, Emperor of Ethiopia, His Imperial Majesty, King of Kings, the 225<sup>th</sup> direct descendant of Menilik I (Son of King Solomon of Jerusalem and Queen Sheba of Ethiopia) was deposed. The Provisional Military Administrative Council (PMAC), also known as the *Derg*, took power. The PMAC adopted socialism and embarked on radical social changes. On 4 March 1975, the *Derg* declared land to be the property of the state and the people (Public Ownership of Rural Lands, Proclamation No. 31/1975). With this, the very purpose and nature of property rights, land in particular, were changed. Article 5 of the proclamation states:

No person may by sale, exchange, succession, mortgage, antichresis, lease or otherwise transfer his holding to another; provided that upon the death of the holder the wife or husband or minor children of the deceased or where these are not present, any child of the deceased who has attained majority, shall have the right to use the land (Ibid).

In 1991, the *Derg* was overthrown and the Ethiopian People's Revolutionary Democratic Front (EPRDF) took power. The new regime in the beginning made certain that the issue of land ownership would be settled through the new federal constitution. The constitution was adopted in 1995. Article 40 of the constitution states the right to ownership of land is exclusively vested in the people and state of Ethiopia. "Land is a common property of the Nations, Nationalities and peoples of Ethiopia and shall not be subject to sale or other means of exchange" (Sub Article 3). Sub Article 4 also states that "Ethiopian peasants have the right to obtain land without payment and the protection against eviction from their possession." Sub Article 7 mentions that "Every Ethiopian shall have the full right to the immovable property he builds and to the permanent improvements he brings about on the land by his labor or capital. This right shall include the right to alienate, to bequeath, and, where the right of use expires, to remove his property, transfer his title, or claim compensation for it."

Article 51 of the same constitution states that the Government shall enact laws for the utilization of land and related resources. Similarly, Article 52 states that regional states have the right and responsibility to administer land in line with federal laws. This law was enacted in 1997 under "Rural Land Administration Proclamation, No. 89/1997." Article 2 of the law has vested regional governments with the power of land administration and the execution of distribution of holdings." Holding rights were also defined as "the right any peasant shall have to use rural land for agricultural purposes as well as to lease and, while the right remains in effect, bequeath it to his family members; and includes the right to acquire property thereon, by his labor or capital, and to sell, exchange and bequeath same" (Article 2. Sub Article 3).

There are no fundamental differences between the *Derg* and EPRDF regarding the legal framework on land and related issues. There are more similarities in land property administration between the two regimes than differences (See also Rahmato, 1997; Adal, 1997, 1999; Ege, 1997). In this regard, current land policies are a continuation of those changes introduced towards the end of the *Derg* government. The *Derg* halted land redistribution practices in 1989. The incumbent government also seems to follow a similar policy in recent times. Though land laws contain provisions for land redistribution, it seems more

probable that no further major land redistributions will happen in the near future of the country.

## **6. Conclusion**

Property right as a social institution shows a system of relations, rights, duties, powers and privileges of certain kinds. In Ethiopia, the pre-revolutionary Ethiopia was characterized by diversity of property right régimes. During the post-war period, there were a series of debates and discussions on the need for transforming the productivity and efficiency of agriculture in the country. The land tenure patterns and regimes had been the main source of debate for the cause of the Ethiopian underdevelopment. Some argued that the *rist* tenure system was the root cause for the stagnation of the Ethiopian economy. In this regard, individualization of the *rist* tenure had been the main point of contention. There were views that a change from communal to individual tenure rights should be given legal recognition. The potential presence of many claimants, as land was inheritable through both male and female kinships, the sale of one's share would hamper the right of others who were entitled to it. Ownership of land was the birthright and the symbol of respectability. Land was not a disposable commodity which in turn aggravated economic and political tensions and conflicts in the country.

For others, the *rist* tenure, which had been the dominant tenure type in central, northern and northwest Ethiopia, like other indigenous tenure regimes and property arrangements in Africa, was accommodating, flexible, dynamic and efficient. The system supported and confirmed its presence regarding the exclusive nature of right and ownership. The arrangement permitted the owners both use right and enjoyment that indicates absoluteness of his land holding rights. *Rist* rights were neither collectively exercised nor collectively worked.

Yet, it is important to see the interwoven factors and constraints for Ethiopia's agrarian stagnation. The focus and debate on land tenure patterns and systems continued until the 1974 revolution. The revolution nationalized all tenure regimes in the country. The new regime eliminated the multiple tenure systems. Land became the property of the state and the people, not the individual. This continues to be the state policy today.

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**Interviewees:**

Alem Ayalew, Gojjam  
Alem Biyalfew, Gojjam  
Chekol Belete, Gojjam

Fenta Bikes, Gojjam

Mulugeta Chekol, Addis Ababa

Mulugeta Teferi, Addis Ababa

Teferi Mamo, Addis Ababa

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