St. Mary's University

Committed to Excellence!

Proceedings of the 11th Multi-Disciplinary Seminar

Research and Knowledge Management Office (RaKMO)

August 22, 2019
St. Mary's University
Addis Ababa, Ethiopia

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Preface

The Research and Knowledge Management Office of St. Mary's University (RaKMO SMU) has been organizing Multidisciplinary Seminar (MDS) since 2009. The purpose of MDS is to create an opportunity for academicians and practitioners to share their research findings and experiences with their peers and academic staffs.

At this 11th MDS, papers were presented by researchers who came from different universities including St. Mary's University, Bahir Dar University, Jimma University, Debre Markos University, Birhan Bank S.C., Adama Science and Technology University, Ambo University, Wolkite University, and Dire Dawa University. The papers presented at the Seminar had various focus areas. At the Seminar, paper presenters shared how they identified their research problems, the methodologies employed, findings they have come up with and the research ethics they have pursued while conducting their research.

SMU publishes every year papers presented at the MDS in proceedings for wider dissemination and use. In doing so, the University recognizes the contributions of the scholars and the practitioners for their valuable outputs.

Therefore, this proceeding is a compilation of 14 papers presented on the 22nd of August 2019. The University would like to note that the ideas reflected in the papers are those of the authors and do not represent the position of the Research and Knowledge Management Office of St. Mary's University.

The Research and Knowledge Management Office of St. Mary's University would like to thank all participants who contributed to the realization of the event and publication of the proceedings.

How Economical is Regional Integration as Free Trade Area in Africa? Empirical Evidence from Live Animal and Products Trade - COMESA Region, Binyam Kassa and Maru Shete, St. Mary's University

Abstract

Globalization is an increasing integration of national economies into expanding international markets and viewed as instrument for economic growth, development and emancipation. It has many dimensions of which its trade and growth dimension are the key themes of the current study. Recently, African nations are moving towards a continental free trade area establishment in addition to the previous regional integrations such as ECOWAS, SADC and COMESA. A number of reports are available with regards to trade and economic growth in light of such preferential trade areas that presented varying views from different dimensions of regional integration. This study was conducted to assess the impact of live animal and animal products international trade on economic growth and to describe the association between membership to FTA of COMESA and live animal and products trade in member nations. A secondary panel data from 11 COMESA member states of which two are non-FTA members was used to model the economic growth impact of livestock production, live animal export and animal products import and export, data ranging between 1991 and 2018. FGLS was deployed to correct data problems and model the impact of independent variables on GDP, with overall R^2=0.8389. Among the explanatory variables livestock production, live animal import, animal product import and export were significant at 99% confidence interval. Correlation results showed that there is positive correlation between FTA membership and economic growth as well as live animal and products trade. It was concluded that livestock commodities trade has positive impact on economic growth and the FTA membership improves trade in livestock commodities in COMESA region. Further research is recommended on the export destinations and commodities to fill the knowledge gap in livestock intra-regional and non PTA trade.

Keywords: international trade, economic growth, COMESA, FTA, livestock commodities

Introduction

Globalization has shown a remarkable growth in trade among countries. Transactions in the increasingly globalizing world include goods (physical products that are physically transported across borders by road, rail, water, or air) and services (immaterial commodities, such as tourism, financial and legal services). Many traded services make merchandise trade easier or cheaper—for example, shipping services, or insurance and financial services. Trade in goods has been happening for millennia; while trade in services is a relatively recent phenomenon. Over the last couple of centuries the world economy has experienced sustained positive economic growth, so observing the dynamics of trade in relation to GDP offers an interesting perspective towards understanding development. Many developing countries depend on exports of primary products, which are subject to disproportionate price fluctuations and this category of exports had

negligible impact on economic growth, while manufactured exports had a positive and significant effect on economic growth (Kim & Lin, 2009).

Regional trade blocs are recently promoted globally as drivers of economic growth. In general free trade facilitations in regional blocs are well documented by previous studies from developed and developing regions. Most developing countries are members of regional integration agreements (RIAs). From the viewpoint of the efficiency of resource allocation, however, RIAs between developing countries (so-called South– South agreements) are likely to hurt member countries because low-priced imports from non-partner countries are replaced with higher-priced products from partner countries. The African continent is recently moving towards a continental free trade area, in addition to strengthening the existing regional blocs such as ECOWAS, SADC and COMESA.

Established in 1994, COMESA is one of the largest blocs in Africa with vast population and area coverage. Currently it has 21 member countries. In October 2000, nine of the member countries (Djibouti, Egypt, Kenya, Madagascar, Malawi, Mauritius, Sudan, Zambia and Zimbabwe) signed the free trade area (FTA) agreement and eliminated their tariff on COMESA originating products. However, some members are still not FTA members of this regional bloc, namely Ethiopia and Eritrea. The region is composed of nations with varying economic base and geographic location that determines the nature of traded goods and services.

Even though the agriculture sector contributes the least to the region's economy, it remains the most important in creating employment opportunities. According to Upton (2014), agriculture provides a livelihood for more people than any other industry in the world. Growth in agricultural production and productivity is needed to raise rural incomes, to support the increasing numbers dependent on the industry and to meet the food and raw material needs of the faster growing urban populations. Enhancing agricultural productivity contributes to industrial growth by providing cheap labor, capital investment, foreign exchange and markets for manufactured consumer goods.

Agriculture contributes to 20–60% of the Sub-Saharan Africa (SSA) Gross Domestic Product (GDP) by mobilizing up to 80% of labor force and constituting 50–90% of export share (Cleaver, 1985). As an integral part of the agriculture sector, livestock industry contributes about 1.2 percent of the global GDP—as much as 5 percent for some countries—and is growing by about 2.5 percent per annum (Iimi, 2007). The contribution of live animals and their products to the agricultural economy accounts for 40%, excluding the values of draught power, manure and transport of people and products (Winrock International, 1992) in Ethiopia, whereas its contribution is between 18 and 88 % of the net value of agricultural production in East Africa (Noula *et al*, 2013).

In many of the poorest countries, livestock farming is one of the important industries to develop for not only economic growth but also poverty reduction and environmental protection. The

livestock industry contributes about 1.2 percent of the global GDP—as much as 5 percent for some countries—and is growing by about 2.5 percent per annum (Iimi, 2007). IGAD (2013) estimates that livestock and their products constitute a fifth of Ethiopia's exports, but about half of these exports are not recorded or officially recognized because they are produced by the informal cross border trade in live animals. These unofficial exports contribute to the welfare of Ethiopians by financing the importation of a wide range of consumer goods, including necessities such as clothing and staple food items.

Most of African nations have economies based on agriculture and internationally trade primary products. Trade in similar goods between similar countries is welfare improving (Bjornskov, 2005). Sub-Saharan Africa exports to EU is decreasing; bovine meat at 22.5% and raw hides and skins at 3.3% between 2016 and 2017 (EU, 2018). Livestock and products trade within and outside of the COMESA region has significant contribution to economic growth in the region. Livestock provided 45% of agricultural GDP in 2008 according to IGAD (2013) estimates that included their contribution to crop production in terms of draught power. The hides, skins and leather industry in the East African region is one of the key agricultural sub-sectors with a high potential towards commodity development that addresses pertinent issues of socio-economic importance and positively impact on rural development, creation of wealth and employment (IGAD, 2013).

According to Upton (2014) livestock and livestock products are estimated to make up over half of the total value of agricultural gross output in the industrialized countries, and about a third of the total in the developing countries. The global importance of livestock and their products is increasing as consumer demand in the developing countries expands with population growth and rising incomes. This growth in consumption is reflected in improvements in the average human nutritional status due to the intake of animal protein. The resultant changes have been dubbed 'the next food revolution' and the growth in developing country consumption of animal products is predicted to continue at least until 2020.

Arega (2011) reported on the impacts and determinants of agricultural exports from Sub-Saharan Africa to the West that highlighted both demand and supply side variables affecting agricultural trade. Goodhope (2014) reported that trade liberalization has a direct positive implication for national economic development and emancipation, particularly in Nigeria within the ECOWAS sub region. Similarly, Sunge and Mapfumo (2014) called for the coming into effect of the establishment of the COMESA-EAC-SADC FTA following their study on intra-regional trade agreements effect on trade flows in Zimbabwe. Mamo (2014) examined the trade linkages among the member countries of the COMESA and the extent to which the introduction of the COMESA common external tariff liberalized their trade regimes and reported a negative association between the region's external tariff and trade. In light of these reports about the relationship between free trade and economic growth little has been done to document the impact of specific commodities in the economy of nations within the COMESA bloc.

Even though the contribution of live animals and their products to the agricultural economy accounts for 40%, excluding the values of draught power, manure and transport of people and products (Winrock International, 1992) and 18 and 88 % including the draught power (Behnke and Metaferia, 2013), its impact on the economic growth of COMESA member nations has not been documented. In addition, the difference between FTA member and non-FTA member countries economy and livestock commodities trade is not yet documented. Should these non-FTA member states liberalize or restrict their international trade in the context of agricultural commodities trade requires detailed knowledge on specific impacts of commodities trade on their economic growth. If the African Continental Free Trade Area is to materialize in the near future, there needs to be an understanding of its importance to specific traded goods. This paper tries to address the information gap regarding the relationship between free trade area and economic growth in Africa by taking COMESA member countries and their trade in livestock and products.

Research Methodology

Research Approach and Design

The research approach of this study is quantitative as it used econometric data, such as GDP and export values, to identify association between economic growth measured in GDP and agricultural commodity production and commodity trade (live animal and products) in COMESA preferential trade area. The research was designed following descriptive and causal relationship between economic growth and livestock commodities export while quantifying the share of these commodities from the total exported commodities in the economy of the selected COMESA member countries. A quantitative approach whereby descriptive and inferential statistics design was followed in this study to assess the theoretical relationship with empirical evidences particularly in the context of agricultural commodity international trade and economic growth in preferential trade bloc in Africa.

Data Sources and Collection Methods

This study used the secondary balanced panel data from year 1991 to 2018. Total observations of 308 were targeted for each variable from 11 panel and 28-time variables. Data were gathered from official online secondary sources such as FAOSTAT DATA for agricultural export commodity data, the World Bank for National Accounts data. All data used in the study were quantitative.

Variables Description

This study attempted to identify the association that live animal and animal products trade (export and import) have with economic growth in COMESA member countries. The following variables were used to describe and analyze the impact of livestock sector contribution to economic growth in the COMESA region.

Table 1: Variables Description, Data Source and Expected Association

Variable and code	Data Source	Data Description	Expected association
Gross domestic product (GDP)	World Bank Data	Gross domestic product in USD as current value to each year and each country	Dependent variable
Livestock Production (LSProd)	FAOSTAT Data	Value of livestock production in USD	Independent variable with positive association with GDP
Live animal import (IMPLA)	FAOSTAT Data	Value of live animal imports in USD	Independent variable with negative association with GDP
Live animal export (EXPLA)	FAOSTAT Data	Value of live animal exports in USD	Independent variable with positive association with GDP
Livestock products export (PEXP)	FAOSTAT Data	Sum of value of dairy products, meat, hides, skins and eggs exported, in USD	Independent variable with positive association with GDP
Livestock products Import (PIMP)	FAOSTAT Data	Sum of value of dairy products, meat, hides, skins and eggs imported, in USD	Independent variable with negative association with GDP

Population and Sampling

Description of the Study Area

COMESA region is the largest regional bloc in Africa. It stretches between Tunisia in the northern Africa and Zimbabwe in the south covering area of 11.8 million square kilometers. The area is home to more than 555 million people that generated 2.2 trillion USD incomes in 2018. Vast populations of livestock are found in this region with the leading cattle population records of 95 million heads in total from Ethiopia and Sudan (CIA, 2018). Table 2 presents details of geographic, economic, demographic and livestock resource base of the COMESA region.

Table 2: Geographic, Economic, Demographic and Livestock Resource Base of COMESA Member Countries

Countries	Human population /in million/	Area /km^2/	GDP/PPP/ /In billion USD/	% OF GDP			Animal population /in million /		
				Agriculture	Industry	Service	Cattle	Camel	Sheep & Goat
Burundi	11.80	27,830	8.00	40	16	44	0.33	na	0.26
Comoros	0.80	2,235	1.32	48	12	41		na	na
Congo, D.R.	85.20	2,344,858	68.60	20	44	37	0.90	5.30	0.85
Djibouti	0.88	23,200	3.64	2	17	80	0.27	na	0.97
Egypt	99,4	1,001,450	1200.00	26	25	49	4.80	0.15	9.40
Eritrea	5.97	117,600	9.40	12	30	59	1.55	0.37	3.27
Ethiopia	108.00	1,100,000	200.60	35	20	45	60.00	4.80	82.00
Kenya	48.50	580,367	163.70	6	7	87	13.30	3.10	13.40
Libya	6.30	1,759,540	61.97	1	52	46	1.70		3.32
Madagascar	25.60	587,041	39.80	24	20	57		na	na
Malawi	19.80	118,484	39.80	22	77	4	0.75	na	1.37
Mauritious	1.30	2,040	28.20	4	22	74	1.40	na	10.30
Rwanda	12.10	26,338	24.60	31	18	52	0.73	na	0.92
Sychelles	94.60	455	2.75	3	23	74		na	
Sudan	43.10	1,861,484	45.80	40	3	58	35.00	3.00	79.50
Swaziland	1.08	17,364	4.47	7	45	49	0.66	na	0.46
Somalia	11.25	637,657	20.44	60	7	33	0.34	0.08	4.60
Tunisia	11.50	163,610	137.70	10	26	64	1.50	0.24	7.90
Uganda	40.85	241,038	89.19	28	21	51	5.70	na	5.55
Zambia	16.40	752,618	68.93	8	35	57	2.20	na	1.19
Zimbabwe	10.03	390,757	34.27	12	22	66	5.50	na	3.30
TOTAL	**555.06**	**1,755,966**	**2253.18**	**21**	**26**	**53**	**136.62**	**17.03**	**228.56**

Source: Authors' compilation from World Factbook, CIA (2019)

Population of the Study: Neuman (2003) stated that target population is said to be a specified group of people or object for which questions can be asked or observed made to develop required data structures and information. Therefore, for this study, the target population is a finite population of COMESA member countries, namely Burundi, Comoros, D. R. Congo, Djibouti, Egypt, Eritrea, Eswatini, Ethiopia, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Sudan, Somalia, Uganda, Zambia and Zimbabwe. The descriptive analysis part has been based on these population data.

Sampling

According to Alreck & Settle (2005) the choice of sample size is normally made after considering statistical precision, practical issues and availability of resources. Malhotra & Peterson (2006) stated that, the larger the sampling size of a research, the more accurate the data generated. This study included all the member countries with adequate data set to make inferences about their livestock sector international trade. Of the 21 countries listed in the population above, only Burundi, Egypt, Eritrea, Ethiopia Kenya, Madagascar, Mauritius, Malawi, Rwanda, Sudan and Tunisia were selected for having adequate data for years 1991 – 2018 to run balanced panel data regression analysis with post-estimation tests. Therefore, the econometric analysis was made based on data from these sample countries.

Analysis Tools

After the data were collected both descriptive and inferential econometric analyses were employed to analyze the panel data. The descriptive analysis illustrates economic growth of the sampled countries in COMESA. Thus, both the strength of used includes mean, minimum, maximum and standard deviation. The regression analysis was used to identify effect of livestock production and trade (import and export) on the relationship between variables and the influence of independent on dependent variable and statistical significance were assessed. STATA 14 software was used for the inferential analysis and SPSS 16.0 was used for the descriptive and Pearson's correlation analysis.

Model Specification

The objective of this study was to analyze the relationship between livestock product and trade on economic growth of COMESA member countries. To achieve the entire objective, the model had the following macro-economic variables. The variable included GDP, Livestock Production (LSProd), live animal import (IMPLA), live animal export (EXPLA), livestock product import (PIMP), livestock product export (PEXP) which were collected from FAOSTAT and the World Bank databases. Livestock products included dairy products, meat, eggs, and hide and skins. And live animals included cattle, camel, sheep, goats, pigs and poultry. All variables' data were in values of USD.

Model Specification

The standard panel data model according to Wooldridge, (2002) which satisfies the classical model assumptions was developed as

$$\ln GDP_{it} = \beta_0 + \beta_1 \ln LSProd_{it} + \beta_2 \ln IMPLA_{it} + \beta_3 \ln EXPLA_{it} + \beta_4 \ln PIMP_{it} + \beta_5 \ln PEXP_{it} + u_{it}$$

$$u_{it} = \alpha_i + v_{it}$$

Where, GDP is GDP at current value,

LSProd is Livestock production value,

IMPLA is Import value of live animals,

EXPLA is Export value of live animals,

PIMP is Import value of animal products,

PEXP is Export value of animal products,

´´U´´is the Error term and the subscript ´´*it*´´ indicates the country and the time period respectively and

´´ln´´ is the natural logarithm form of each variable described above.

Post Estimation Tests

Test for unit roots: The unit root tests of the variable was checked using Harris-Tzavalis unit-root test, Levin- Lin- Chu & Hadri Lm stationarity tests with the following hypotheses;

H0: Panels contain unit roots and

H1: Panels are stationary

If the variable is stationary or not based on the P-value if the p value is greater than 0.05(5%) reject the null hypothesis which implies that there is stationeries; otherwise the variable has stationary problem. Annex 1.1 shows the results of the unit root test.

Normal Distribution Test: Skewness test was made and results showed that data did not have normal distribution ($P>Chi^2$). As a remedy data was transformed to natural logarithmic value of all dependent and independent variables.

Multi-collinearity is phenomenon that, when it occurrs in the multiple regressions, it results in greater confidence interval and high estimation of standard errors (small t- value) and high R^2. It may occur as a result of little variation in the explanatory variable or high correlation between one or more explanatory variables (Gujarati, 2004). In this study the problem was checked by the variance inflation factor (VIF). As a rule of thumb if the VIF is greater than 10, there is a multicollinearity problem. It was found that the explanatory variables, i.e. livestock production, export and import, showed no multicollinearity as all VIF values were less than 10.

Hausman Specification Test: Under this section, we carry out some diagnostic tests to examine the estimation technique which fits the model and the data well. Panel data models examine fixed and/or random effects of group of time. Hence, our data should have individual effects or time

effects. In order to examine the presence of individual effects and/or time effects, it is required to perform either fixed effects or random effects test.

For choosing whether fixed effect or random effect used in the mode Hausman specification teste is used. Therefore, the study test the specified models under which model they fail whether fixed effect or random effect is appropriate. The null and alternative hypotheses for this test are:

H_o: difference in coefficients not systematic (Random effect is appropriate) and
H_1: Ho is not true.

If we fail to reject the null hypothesis, the random effect regression model is favored and vice versa. The results of this test are presented in Annex 1.4. A fixed effect was, thus, followed to run the regression as $P > Chi^2$ was significant enough to reject the null hypothesis.

Hetroskedasticity: The homoskedasticity assumption states that the variance of the unobservable error, u, conditional on the explanatory variables, is constant. Homoskedasticity fails whenever the variance of the unobservable changes across different segments of the population, which are determined by the different values of the explanatory variables (Wooldridge, 2004). In short, if we persist in using the usual estimation procedures despite hetroskedasticity, whatever conclusions we draw or inferences we make may be very misleading according to Gujarati (2004). In this study, thus, the Breusch – Pagan test was applied for detecting hetroskedasticity as discussed in Verbeek (2012). This study estimated the square of residual of the random effects model. The test statistics multiplies the R^2 of auxiliary regression of this residual with explanatory variables used in the model by N (T-1). The test statistics has a Chi-square distribution with J degrees of freedom, where J is the number of explanatory variables used in the auxiliary regression. Variables were showing heteroscedasticity and as a result a generalized transformation was used and the feasible generalized least squares (FGLS) estimators were used to correct heteroscedasticity as well as serial correlation problems (Gujirati, 2011).

Results and Discussion

COMESA member countries have a total of 2.2 Trillion USD economy which is much less than world's top 5 countries economy. On the average, share of service sector is 54.12% of GDP which makes the sector the main actor in the majority of member countries. The agricultural sector is at 21% of the GDP contribution which is still within range of the report from the end pf the previous millennia (Cleaver, 1985).

On average, livestock production accounts to 28% of the agricultural production in the sampled countries as shown in Table . According to IGAD (2013) national accounts neglect the contribution of livestock to crop production in the form of manure as fertilizer, drought power as means of cultivating land and transporting agricultural produce to the market and farm in countries such as Ethiopia where 80% of the crop production utilizes oxen power. Therefore, it

can be argued that this result represents the minimum contribution of livestock sub-sector to the economy of nations in COMESA region. Ethiopia, Sudan and Kenya has cattle population of 60, 35 and 13.3 million respectively and share of service 87.2%, 45% and 43.1% respectively, which can show that livestock sector is not contributing much to the economy. The same is presumed on other livestock sources, such as sheep and goats, which these member countries are not doing well in the sector under consideration. However, it should be noted that the contribution of the cattle is underestimated by national accounts as reported by IGAD (2013).

Table 3: Mean Values of Production and Trade of Agriculture and Live Animal (1991 – 2018)

Variables	Mean	Minimum	Maximum	Std. Deviation
Agricultural Production (in Million USD)	6082.80	136.04	38028.93	7405.32509
Livestock Production (in Million USD)	2056.70	37.74	15775.21	2978.89507
Livestock to total Agriculture Ratio (%)	28.55	4	81	16.738
Total Agricultural Imports (in Million USD)	1160.10	12.28	15252.57	2428.03176
Total Agricultural Exports (in Million USD)	730.07	.16	5093.66	969.94918
GDP, Current (million USD)	27877.00	422.03	3.33E5	53321.92228
Live animal import (million USD)	12.1486	.00	240.61	33.66127
Live animal export (million USD)	21.1613	.00	544.76	69.88111

Source: Authors' calculations from FAOSTAT data (2019).

Livestock and Products Balance of Trade in COMESA Member Countries

Fifty-five percent of the sampled countries are in negative balance of trade in terms of live animal commodity with Egypt scoring the highest (-85.7 million USD) between 1991 and 2017. Sudan has the highest positive balance of trade in live animals, with record of 144 million USD, followed by Ethiopia. Placed at the top in cattle population from Africa, Ethiopia seems losing benefits of its immense livestock resources (Figure 1.)

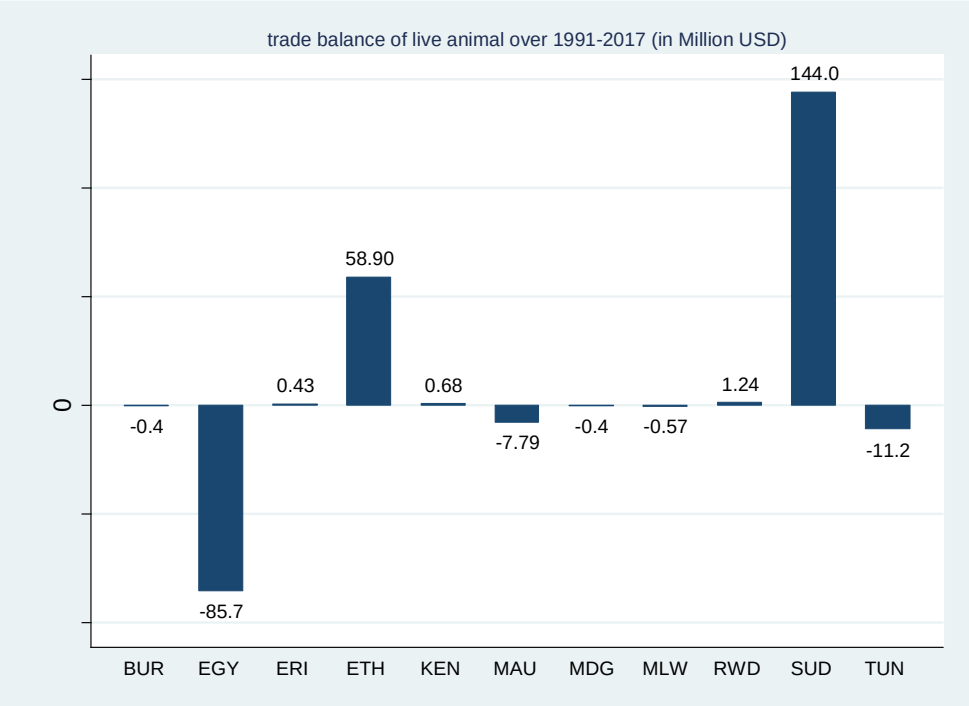

Figure 1: Trade Balance of Live Animal Over 1991 -2017 in Million USD

Source: Authors' computation from analysis of FAOSTAT data.

Figure 2 below illustrates the balance of trade of COMESA member countries in animal products commodity. The countries with the higher positive balance of trade are Sudan and Ethiopia which is expected considering their livestock resource endowments and similar magnitude of trade balance in live animal commodity. However, since this study did not analyze data about the destination of exports and source of imports it is less confident to address the share of COMESA region from this expanded market.

Animal products trade is subject to a number of regulatory standards and requires higher level of technology such as processing and cold chain facilities as compared to live animal trade (Geboye, Melaku. 2007). The negative balance of trade observed in majority of the COMESA member countries in the current study signals COMESA member nations trade mostly with the rest of the world. This in turn indicates a potential to develop the intra-regional trade for live animal and products.

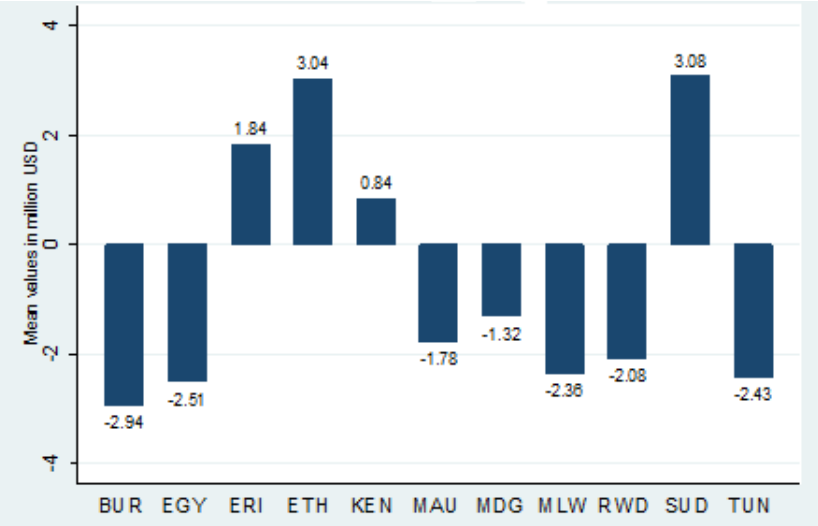

Figure 2: Animal Products Balance of Trade in COMESA Member Countries (in million USD, 1991-2017)

Source: own computation from analysis of FAOSTAT data.

Trends in Livestock and Products International Trade in COMESA

Figure 3 below shows the trend in live animal international trade in COMESA member countries. Apparently, there is an increasing trend in live animal exports in COMESA member countries especially since 2008. Following this time overlap between the accelerated growth in live animal export trend and COMESA establishment, it is argued here that COMESA has an effective trade facilitation role through its FTA.

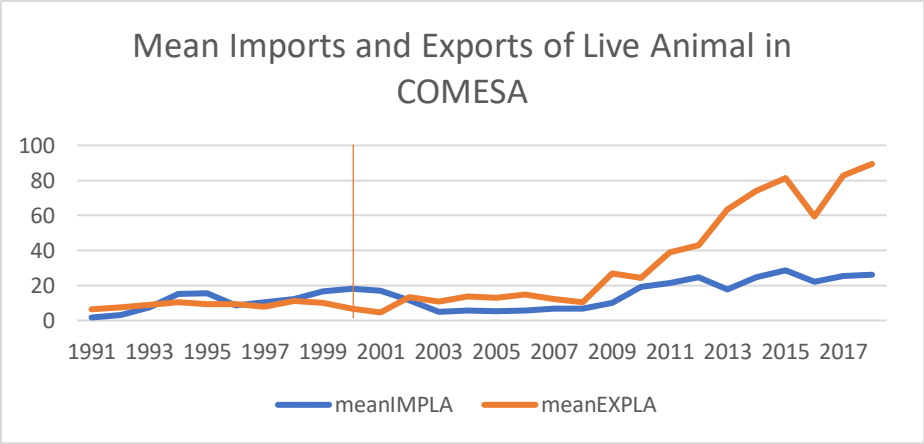

Figure 3: Mean Imports and Export Values of Live Animal in COMESA Member Countries

Figure 4 below illustrates the trend in the import and export of animal products in COMESA region. The year 2000 was a benchmark for the establishment of COMESA FTA. The increase in trade values trends is observed to accelerate afterwards, especially since 2005. This indicates that free trade areas promote the exchange of livestock products

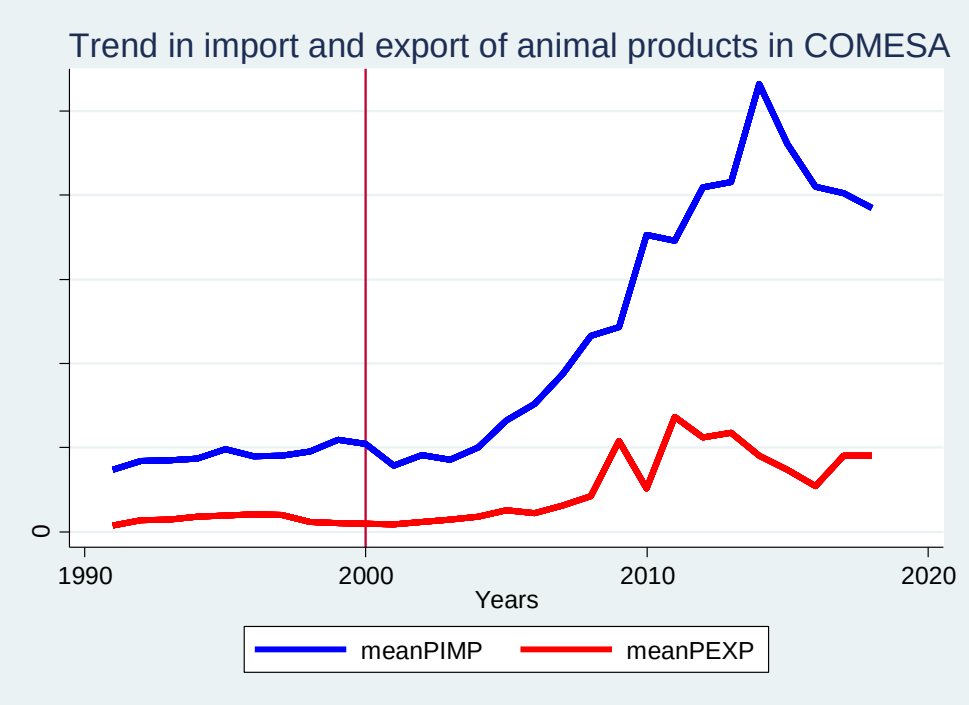

Figure 4: Trend in Animal Products Import and Export in COMESA Member Countries

Relationship between COMESA FTA Membership and Live Animal and Products Trade

Table 4 below shows the correlation between membership to the FTA of COMESA and livestock commodities trade. GDP and imports of animal products have highly significant correlation with FTA membership addressing free trade area's importance to develop economic growth and promote importation of welfare improving goods such as high quality animal proteins. This is in line with the above results where growth trends in live animal and animal products accelerated after the establishment of COMESA FTA in year 2000. Live animal import has shown significant correlation with COMESA FTA membership.

As COMESA FTA facilitates international trade in the region through lifting tariff and non-tariff barriers such as high standards for primary products, the livestock sector of member states can improve efficiency as one of the key impacts of free trade is efficiency improving and welfare improving (Bjornskov, 2005).

Table 4: Pearson's Correlation between Trade, Economic Growth and FTA Membership to COMESA

Pearson Correlation	GDP	FTA-membership	IMPLA	EXPLA	PIMP	PEXP
GDP	1	0.252**	0.696**	0.162**	0.925**	0.777**
FTA-membership		1	0.120*	0.077	0.230**	0.137*
IMPLA			1	0.040	0.709**	0.420**
EXPLA				1	-0.019	0.087
PIMP					1	.761**
PEXP						1

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

Source: Authors' analysis from FAOSTAT (2019) and World Bank (2019) data

Estimation Results for Economic Growth and Livestock Commodity Trade variables

The main objective of this study was to detect and measure the impact of live animal and products international trade on economic growth of nations that are member of the COMESA regional integration. Since the data for this study cover a time period of 28 years across 11 COMESA member countries, the estimation and interpretation of the inferences is based on panel data analysis. After checking the normality and stationarity tests of the variable, the study used the Hausman specification tests to choose whether the fixed effect model or random effect is appropriate to interpret the regression results. Finally, the multicollinearity and heteroskedasticity problems were also checked and the existing problems solved using logarithmic transformation and using the feasible generalized least square (FGLS) methods to rectify heteroscedastic and serially correlated nature of the variables.

The FGLS model estimation result is displayed in detail in Annex 1.6. The growth model equation tested was as follows;

$$LnGDPit = \beta_0 + \beta_1 lnLSProd_{it} + \beta_2 lnIMPLA_{it} + \beta_3 lnEXPLA_{it} + \beta_4 lnPIMP_{it} + \beta_5 lnPEXP_{it} + u_{it}$$

Estimation Results

Table 4 presents model estimation results after the post-estimate tests were made and remedial measures were taken. The Prob > Chi^2 = 0.000 result show that the model is fit enough to explain the association between GDP and the livestock commodities trade variables considered.
Overall R^2 of 0.8377 indicates that for the variation observed in the dependent variable in GDP in the above model, 83.77% is explained by variation in the independent variables. This means

local livestock production, live animal import, animal product export as well as import have shown significance in explaining the variation in GDP.

Among the explanatory variables only lnEXPLA was insignificant in explaining the observed variation in GDP. Hence, export of live animal does not contribute to economic growth. Export of goods and services are expected to contribute to economic growth. However, live animal export in COMESA region was found to be insignificant to economic growth of the member countries.

Table 5: Growth Model Estimation Results

Dependent variable log of GDP (lnGDP)			
Independent variable	Coefficient	Sd. Error	P>z
lnLSProd	0.49	0.023	0.000***
lnIMPLA	0.02	0.011	0.091*
lnEXPLA	-0.01	0.009	0.399
lnPIMP	0.29	0.017	0.000***
lnPEXP	0.12	0.017	0.000***

*Significant at 10%, ** significant at 5% & *** is significant at 1%

Number of observation=308 Time periods = 28 Number of groups =11

Overall R^2 = 0.8377 Waldchi^2 =3656.57 Prob > chi^2=0.000

Source: model result of growth equation

All the expected signs were observed to hold in the model except for lnEXPLA. Even though this variable is not significant, the negative association between export and economic growth was unexpected. This could arise from either quality of data as secondary data are subject to modifications such as projecting missing data and reliability of local reports.

The current study results indicate that livestock production significantly contributes to economic growth of COMESA member countries and explains the variation in GDP by 49% (P<0.000). The contribution of livestock as food and non-food products and services to households has been reported by different earlier reports (Aklilu and Catley, 2009; Upton, 2014; IGAD 2013; Wannous and Nabarro, 2014). A report by IGAD (2013) addressed the unaccounted contribution of livestock to agriculture sector in the forms of manure for soil fertility improvement, draught power for cultivation of land and transportation of agricultural and non-agricultural products to and from market. Therefore, the current results are in line with previous reports.

It was also found in this study that import of live animals in the COMESA member countries significantly explained 2% of the variation in GDP. Live animals are imported for the purpose of consumption as well as parent breeding stock for rearing animals for later consumption. The data used for this analysis was total value of imports in USD for live animal import and did not differentiate between livestock species. Nevertheless, a significant causal effect was observed of live animal imports on economic growth. Import of live animals, for instance cattle, can be beneficiary as it gives option to further produce products such as milk, meat and hides that give way to further economic activities and income. On the contrary, export of live animals without cuts the benefits of value addition and may render less than expected contribution to economic growth. Taking cattle export for example, is subject to a number of sanitary and phyto-sanitary regulations, less value to volume ratio, and cuts the benefit of producing beef, hide and other by products within the boundaries (Wannous and Nabarro, 2014). This means that exporting products could have contributed better to the economic growth than live cattle export by creating more jobs and income along the beef and leather value chains.

Animal product international trade in COMESA region has significant impact on economic growth, which has explained 29% and 12% of variations in GDP, by import and export, respectively, in the current study. The animal products considered in the current study are dairy products, eggs, meat and raw hides and skins. Arega (2011) tested the relationship between trade openness and economic growth using data from agricultural trade between 47 SSA countries and the West and reported positive association between economic growth and international trade which is in line with the current study results.

The current results that showed higher contribution by import of products than exports in explaining economic growth in COMESA member countries indicate that this theme needs further study as to the determinants of agricultural products trade in the region. Some presumptive explanations worth discussing are the fact that most of the countries in the region have less developed agroindustry to add value to primary products and the fact that more countries are in negative trade balance of products than live animal (63% vs. 54%). Theoretically, free trade promotes welfare in both the importing and exporting countries that have either absolute or comparative advantages through. As being composed of countries with dominant primary product exporters, COMESA region has less comparative advantage in terms of processed commodities such as dairy products, meat and eggs that require more capital than labor and land to produce and trade.

Summary of Findings

Livestock sector comprises 28% of agricultural production in value in the COMESA region which shows that the sub-sector is important for the economy of the region. Most of the members of COMESA regional integration are in negative trade balance in terms of live animal and animal products trade. The negative balance of trade was observed in the majority of the COMESA member countries. In the current study signals COMESA member nations trade mostly with the

rest of the world. This in turn indicates a potential to develop the intra-regional trade for live animal and products. There is a growing trend in live animal and products international trade in the COMESA region which is accelerated by the COMESA FTA facilitation. Moreover, membership to FTA of COMESA has highly significant correlation between animal product import and GDP and less significant correlation with import of live animals and export of animal products. Economic growth, as measured by GDP, is significantly determined by livestock production value, live animal import value, animal products import and animal products import, but not by live animal export in the COMESA region.

Conclusion

From the abovementioned findings of this study, the following conclusions are drawn. Livestock production and trade has important contribution to economic growth of nations in COMESA regional bloc. It is significant enough to deserve attention from national policy makers as well as regional institutions that endeavor development of the region and the respective countries that constitute COMESA. Membership to the free trade area of COMESA positively affects growth of economy as well as livestock and products international trade. Therefore COMESA member nations that are not yet FTA members such as Eritrea and Ethiopia are losing the trade facilitation benefits of COMESA. COMESA establishment has positively affected the trends of live animal and products trade. However, most of the members are still in negative balance of trade which signals a higher proportion trade with non-member countries. Economic growth as measured in GDP is significantly determined by livestock production, live animal imports, animal products imports and exports in COMESA member countries. Even though the agricultural sector in general has the least contribution compared to manufacturing and service in COMESA region, its growth has important purpose to economic growth, as empirical evidence shows in this study.

Recommendations

The positive association between live animal and animal products import and export in COMESA region should be promoted with institutional and policy infrastructures to enhance economic growth of nations in the region. Supporting policies are required to be crafted and enforced to further exploit the potential of livestock sub-sector for the development of the economy of nations in COMESA region. Countries with *Working Papers*, Washington, D.C. EU 2018. *AGRI-FOOD TRADE STATISTICAL FACTSHEET; European Union - Sub-Saharan Africa Directorate-General for Agriculture and Rural Development.* Retrieved online on December 2018

Livestock resource endowments, especially Ethiopia and Sudan should design convenient systems through policies and institutions to implement them in favor of livestock value chains to contribute more to the development of their economy. As shown empirically, it is economical to join FTA, COMESA members that are not yet member of the FTA of the region, namely Eritrea and Ethiopia, should become members of the FTA and benefit from the trade facilitation

the regional bloc offers. Regional economic integration is eminent in the globalizing world and, thus, nations should prepare themselves towards joining such beneficial trade blocs. Further research should be conducted to identify which export destinations and commodities have the higher advantage for the members of COMESA. In addition determinants of live animal and products trade and economic growth in the COMESA region should be conducted to strengthen the knowledge base of the sector in the region.

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Educational Data Mining for Students' Academic Performance Analysis in Selected Ethiopian Universities, Alemu Kumilachew Tegegnie and Tamir Anteneh Alemu, Bahirdar University

Abstract

Universities are working in a very dynamic and powerfully viable environment today. Due to the advent of information technology, they gather large volumes of data related to their students in electronic form in various formats like records, files, documents, images, sound, videos, scientific data and many new data formats. This study focuses on predicting performance of student at an early stage of the degree program, in order to help the university not only to focus more on bright students but also to initially identify students with low academic achievement and find ways to support them. The knowledge is hidden among the educational data set and it is extractable through data mining techniques. The aim of this paper is to use data mining methodologies to design and develop a Data Mining model to predict academic performance of students at the end of first year degree program in selected Ethiopian higher educational institutions (universities).The data of different undergraduate students has been mined with decision tree classifiers. A model is built using C4.5 Decision tree learning algorithm – generates five classification rule set classifiers (predictors) in an experiment. The experiment using a test data set produces 81.4% accuracy.

Keywords: educational data, educational data mining, decision tree, classification rule, C4.5

Introduction

The advances in the data mining field make it possible to mine the educational data and find information that allow for innovative ways of supporting teachers, students, and decision makers. The main functions of data mining are applying various methods and algorithms in different applications such as biological data analysis, financial data analysis, transportation, and forecasting/prediction as discussed by Heikki and Mannila (1996). Such data mining and knowledge discovery applications have got a great attention due to its significance in decision making and it has become an essential component in various organizations including universities where educational data is mostly available. Moreover, knowledge extraction has got an additional opportunity since data mining techniques have been introduced into new fields of Statistics, Databases, Machine Learning, Pattern Reorganization, Artificial Intelligence and Computation capabilities, etc.

The major motivation behind educational data mining in universities is that there are often information "hidden" in the data that are not readily evident, which may take enormous human effort, time and therefore cost to extract. Furthermore, with exponential increase in the processing power of machines now available today, it is possible for data mining search algorithms to quickly filter data, extracting significant and embedded information as required.

The ability to extract important embedded information in data suffices in many situations, helping organizations, companies, and research analysts make significant progress on different problems and decisions that are based on more information. By this task we extract knowledge that describes students' academic performance (achievement) up on the completion of the first year program. It helps earlier in identifying the dropouts and students who need special attention and allow the teacher to provide appropriate advising/counseling or devising appropriate teaching methods.

However, U. Fayadd et.al (1996) discussed that evaluating students' academic performance is generally a complex task since there are a number of factors that contribute to the success or failure of students in a course. This study will explore the ability to mine available data using data mining algorithms, and therefore the information acquired be able to associate what factors are more predictive for the success or failure of students, how those critical factors can be fine-tuned for effecting better performance of students, and looking for optimal rule (model) in the predication of the overall students' academic performance. The main objective of this paper is to use data mining techniques and methodologies to design and develop a predictive model at the end of first year degree program to help for decision makers in a related domain.

Thus, this study is aimed to answer the following basic research questions

- To what extent data mining techniques applicable in predicting students academic performance through the use of academic (educational) factors
- What variables or combination of variables collected can be used as predictors of students' performance at the desired academic level?
- Can we elicit the basic classification/association rule in analysing students' academic performance at the early stage of a program?
- How the discovered knowledge from academic data can aid decision makers to improve decision making processes?

Literature review

One of the significant facts in higher learning institution (universities & colleges) is the explosive growth educational data they generated and gather large volumes of data with reference to their students, teachers and researchers in electronic form. However, they are data rich but information poor which results in unreliable decision making. One of the biggest challenges is unable to transform large volumes of data into knowledge effectively to improve the quality of managerial decisions and impart quality education in the area.

Good prediction of student's success in higher learning institution is one way to reach the highest level of quality in higher education system as well as to make good managerial decisions based on prior academic characteristics (pre-university information, socio-economic or demographic features, and soon). As discussed by Han and Kamber (2000) that application of educational data mining techniques concerns to develop the methods that discover knowledge from data and used to uncover hidden or unknown information that is not apparent, but potentially useful.

The discovered knowledge can be used to better understand students' behavior, to assist instructors, to improve teaching, to evaluate and improve teaching-learning system, to improve student academic performance; to improve curriculums and many others benefits. In the other hand, mining these educational data is used to find information that allow for innovative ways of supporting teachers, students and decision makers. Moreover, it increases the hope that the possibility to predict students' performance from such complex relationships can help facilitate the fine-tuning of academic systems and policies implemented in learning environments. Furthermore, the application of educational data mining techniques in higher education institutions can be used to enhance learning, analyzing students' enrolment data to prevent drop-off and improve retention, to predict student retention at an early stage, and help to analyze the usage of learning materials given to students as presented in Hijazi and Naqvi (2006).

A number of works have investigated predicting performance at a university degree level. The study in Sajadin Sembiring, et. al. (2011) determines the relationship between students' demographic attributes, qualification on entry, aptitude test scores, performance in first year courses and their overall performance in the program. The investigation by Raheela Asif (2015) finds that performance in the first year of computer science courses is a determining factor in predicting students 'academic performance at the conclusion of the degree. A similar work by Aboma Olani (2008). employs the data mining technique random forests, essentially a set of decision trees, to predict students' graduate level performance (Master of Science, M.Sc.) by using undergraduate achievements (Bachelor of Science, B.Sc.). Another work by Kuma and Saurabh (2013) predicts academic performance using the data of two different universities. In the first case study, they use the data of undergraduate students of the University (CTU) in Vietnam to predict GPA at the end of 3rd year of their studies by using the students 'records (e.g. English skill, field of study, faculty, gender, age, family, job, religion, etc.) and 2nd year GPA. In the second case study, they consider the data of masters 'students of Asian Institute of Technology (AIT). By using students' admission information (like academic institute, entry GPA, English proficiency, marital status, Gross National Income, age, gender, TOEFL score etc.) they predict the GPA of students at the end of 1st year of the master degree.

The study by Alnasir and Jaradat (2011) predicts students' university performance by using students' personal and pre-university characteristics. They take the data of 10330 students of a Bulgarian educational sector, each student being described by 20 attributes (e.g., gender, birth year and place, place of living, and country, place and total score from previous education, current semester, total university score, etc.). They have applied different data mining algorithms such as the decision tree C4.5, Naive Bayes, Bayesian networks, K-nearest neighbours (KNN) and rule learner's algorithms to classify the students into 5 classes i.e. Excellent, Very Good, Good, Average or Bad. The best accuracy obtained by all these classifiers is 66.3%.

Methodology

The data used in this study is collected from five selected regional universities in Ethiopia, namely Bahirdar university, Wollo University, Gondar University, D/Markos University and Debre Berhan University. The collected data comprises of quantitative aspects of a student in academic life properties from a year 2007 to 2012 excluding their name, ID, other indicative properties of a particular student. The data is purposely analyzed and a four years program of a student's data is used in the study. Though, the data is collected from where there is little differences in establishment, location, newness/oldness or other characteristics, we didn't differentiate among the data based on the assumption that all universities in Ethiopia has followed the same academic calendar, curriculum, seasoning, and mostly share the same academic characteristics. However, a data of which completely different academic characteristics with others is filtered and removed during the analysis stage.

As shown in figure 1, the collected data is analyzed and pre-processed using python 3.0. Python 3.0 is a power full text processing tool which all of the research team is familiar. It is used also to prepare the data to the format used in WekaV.0 decision tree classification model, which is the implementation tool. The prepared data is classified in to 70/30 principle, i.e. 70 % of the data is used for training the model, and remaining 30% of the data set is used for testing the model. Then the accuracy of the model is measured how much of the test document is correctly predicted/ classified by the model.

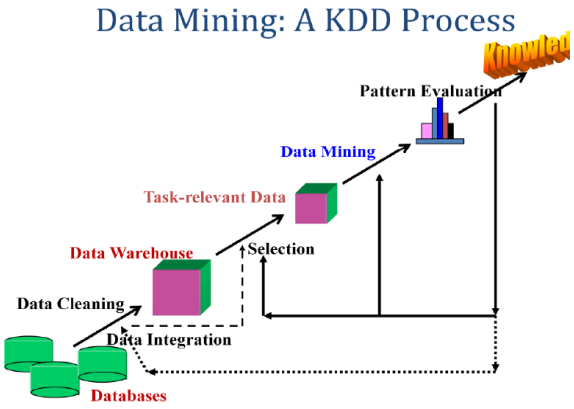

Fig. 1: Data mining: A KDD Process

Data Mining Definition and Techniques

Data mining, also popularly known as Knowledge Discovery in Database, refers to extracting or "mining" knowledge from large amounts of data. Data mining techniques are used to operate on large volumes of data to discover hidden patterns and relationships helpful in decision making. While data mining and knowledge discovery in database are frequently treated as synonyms, data mining is actually part of the knowledge discovery process -the sequences of steps identified in extracting knowledge from data. K.R.Lakshmi (2013) discussed various algorithms and

techniques such as Classification, Clustering, Regression, Artificial Intelligence, Neural Networks, Association Rules, Decision Trees, Genetic Algorithm, Nearest Neighbor method etc., are used for knowledge discovery from databases. These techniques and methods in data mining are briefed as follows to have better understanding.

Classification

Classification is the most commonly applied data mining technique, which employs a set of pre-classified examples to develop a model that can classify the population of records at large. This approach frequently employs decision tree or neural network-based classification algorithms. The data classification process involves learning and classification. In Learning the training data are analyzed by classification algorithm. In classification test data are used to estimate the accuracy of the classification rules. If the accuracy is acceptable the rules can be applied to the new data tuples. The classifier-training algorithm uses these pre-classified examples to determine the set of parameters required for proper discrimination. The algorithm then encodes these parameters into a model called a classifier.

Clustering

Clustering can be said as identification of similar classes of objects. By using clustering techniques, we can further identify dense and sparse regions in object space and can discover overall distribution pattern and correlations among data attributes. Classification approach can also be used for effective means of distinguishing groups or classes of object but it becomes costly so clustering can be used as pre-processing approach for attribute subset selection and classification.

Predication

Regression technique can be adapted for predication. Regression analysis can be used to model the relationship between one or more independent variables and dependent variables. In data mining independent variables are attributes already known and response variables are what we want to predict. Unfortunately, many real-world problems are not simply prediction. Therefore, more complex techniques (e.g., logistic regression, decision trees, or neural nets) may be necessary to forecast future values. The same model types can often be used for both regression and classification. For example, the CART (Classification and Regression Trees) decision tree algorithm can be used to build both classification trees (to classify categorical response variables) and regression trees (to forecast continuous response variables). Neural networks too can create both classification and regression models.

Neural networks

Neural network is a set of connected input/output units and each connection has a weight present with it. During the learning phase, network learns by adjusting weights so as to be able to predict the correct class labels of the input tuples. Neural networks have the remarkable ability to derive meaning from complicated or imprecise data and can be used to extract patterns and detect trends

that are too complex to be noticed by either humans or other computer techniques. These are well suited for continuous valued inputs and outputs. Neural networks are best at identifying patterns or trends in data and well suited for prediction or forecasting needs.

Association rule

Association and correlation is usually to find frequent item set findings among large data sets. This type of finding helps businesses to make certain decisions, such as catalogue design, cross marketing and customer shopping behavior analysis. Association Rule algorithms need to be able to generate rules with confidence values less than one . However the number of possible Association Rules for a given dataset is generally very large and a high proportion of the rules are usually of little (if any) value.

Decision Trees

Decision tree is tree-shaped structures that represent sets of decisions. These decisions generate rules for the classification of a dataset. The three widely used decision tree learning algorithms are: ID3, ASSISTANT and C4.5. C4.5 is used as an implementation algorithm in this study.

Data Sets

The collected data sets are mostly comprises dependent and/or independent academic variables

Independent variables

Such variables (predictors) were coded as:

PSGPA = Preparatory School Grade Point Average result

EUEE = Ethiopian University Entrance Examination result

FCI = Field Choice Interest

FYFSA = First Year First Semester Academic Achievement

Dependent (criterion) variables

Commutative Grade Point Avarage(CGPA) earned by each student at the end of first year second semester was the dependent variable of the study. It is annotated as

FYSSA = First Year Second Semester Academic Achievement

Data Mining Process

The data mining process is undertaken by evaluating student related variables as shown in table 1.

Table 1: Student related variables

Variables	Descriptions	Possible values
PSGPA	Preparatory School Grade Point Average result	{High – >85%, Medium – >65% and Low>50%}
EUEE	Ethiopian University Entrance Examination result	{High – >600%, Medium – >450% and Low>320%}
FCI	Field Choice Interest	{Yes, No}
FYFSA	First Year First Semester Academic Achievement	{Promoted – >2.00 Warning – >1.50 Sup >1.45}
FYSSA	First Year Second Semester Academic Achievement	{Promoted– >=2.00 Dismissal –<2.00}

The domain values for some of the variables were defined for the present investigation as follows:

PSGPA: the cumulative, average Preparatory School grade Point Average result. It is split into three class values: High – average marks scored including and above 85 to100%, Medium – average marks scored including and above 65 to 85% and Low – average marks scored between and above 50 to 65%.

EUEE: average Ethiopian University Entrance Examination result of 700 mark in both natural and social science. It is categorized into three class sets as: High – average marks scored including and above 600 up to 700, Medium – average marks scored including and above 450 up to 600 and Low – the minimum passing (university entrance result, i.e. 320 in 2014/2015) up to 450.

FCI: Field Choice Interest that determines whether the field he/she has engaged is as per his interest/choice o not. Thus it has been classified in to two class values: Yes – the field is as per his interest, No –the field is not as per his interest

FYFSA: First Year First Semester Academic Achievement result obtained by the student. It has been classified as Promoted – students score (first semester GPA) including and above 2.00 Warning – students score(first semester GPA) including and above 1.50 ; and students score(first semester GPA) including and above 1.45}

FYSSA: First Year Second Semester Academic Achievement result obtained by the student and declared as dependent/response variable that determines the students' academic achivment in the university at the end of first year second semester. It has only to class sets: Promoted– >Average

End semester Cumulative GPA is including and above 2.00 and Dismissal – Average End semester Cumulative GPA is below 2.00.

Results and Discussion

The data set of 5729 students' record in this study was obtained from five university's 2014/2015 entry student records found in Amhara Regional state, Ethiopia. Table 2 shows the sample data set for the first 60 students of 2014/15 entry according the previous pre-defined academic variables as stated in table 2 below.

Table 2: Sample result data set

S.N	PSGPA	EUEE	FCI	FYFSA	FYSSA
1	High	Med	Yes	Pro	Pro
2	High	High	Yes	Pro	Pro
3	High	High	Yes	Pro	Pro
4	High	Med	No	Sup	Dis
5	High	Low	Yes	War	Dis
6	High	High	Yes	Pro	Pro
7	High	High	No	War	Pro
8	High	Low	No	Sup	Dis
9	High	Med	Yes	Pro	Pro
10	High	High	No	Pro	Pro
11	High	Med	Yes	Pro	Pro
12	High	High	Yes	Pro	Pro
13	High	Med	No	War	Pro
14	High	Low	No	Sup	Dis
15	High	Med	Yes	Pro	Pro
16	High	High	Yes	Pro	Pro
17	High	Med	Yes	War	Pro
18	High	Low	No	Sup	Dis
19	High	Med	Yes	Pro	Pro
20	High	High	Yes	Pro	Pro
21	Med	Low	No	War	Dis
22	Med	High	Yes	Pro	Pro
23	Med	High	Yes	Pro	Pro
24	Med	Med	No	Sup	Dis
25	Med	Low	No	War	Dis
26	Med	High	Yes	Sup	Pro
27	Med	High	No	War	Pro
28	Med	Low	No	Sup	Dis
29	Med	Med	Yes	Pro	Dis
30	Med	High	No	Pro	Pro
31	Med	Med	Yes	Pro	Pro
32	Med	High	Yes	Pro	Pro

33	Med	Med	No	War	Dis
34	Med	Low	No	Pro	Pro
35	Med	Med	Yes	Pro	Pro
36	Med	High	Yes	Pro	Pro
37	Med	Med	No	War	Dis
38	Med	Low	No	Sup	Dis
39	Med	Med	Yes	Pro	Pro
40	Med	High	Yes	Pro	Pro
41	Med	Low	No	Sup	Dis
42	Med	Med	No	Sup	Pro
43	Med	Low	Yes	Pro	Dis
44	Med	Low	No	Sup	Dis
45	Med	Med	Yes	War	Pro
46	Med	High	Yes	Pro	Pro
47	Med	Low	No	War	Dis
48	Med	Med	No	Sup	Pro
49	Med	Low	No	War	Dis
50	Med	Low	No	War	Dis
51	Low	Med	Yes	War	Pro
52	Low	High	Yes	Sup	Pro
53	Low	Low	No	War	Dis
54	Low	Low	No	Sup	Dis
55	Low	Med	Yes	Pro	Pro
56	Low	High	No	Sup	Pro
57	Low	Low	No	War	Dis
58	Low	Low	No	War	Dis
59	Low	Med	Yes	Sup	Dis
60	Low	High	Yes	Pro	Pro

*Note that – Med is for medium, Sup is for supplementary exam, Pro is for promoted, War is for warning, and Dis is for Dismissal.

To work out the information gain for A relative to S, we first need to calculate the entropy of S. Here S is a set of 60 examples are 20 “High”, 30 “medium”, 10 “low” .

Entrophy (S) = − PHigh Log 2(PHigh) −Pmedium Log2(Pmedium)− PLowLog2(P Low)

$$= - \left(\frac{20}{60}\right)\text{Log 2}\ \left(\frac{20}{60}\right) - \left(\frac{30}{60}\right)\text{Log 2}\ \left(\frac{3}{60}\right) - \left(\frac{10}{60}\right)\text{Log 2}\ \left(\frac{10}{60}\right)$$

= 1.946

To determine the best attribute for a particular node in the tree we use the measure called Information Gain. The information gain, Gain (S, A) of an attribute A, relative to a collection of examples S,

Gain(S PSGPA)= Entropy(S) $-\frac{|Shigh|}{|S|}$ Entropy(SHigh)

$-\frac{|Smedium|}{|S|}$ Entropy(SMedium)

$-\frac{|low|}{|S|}$ Entropy(SLow)

Thus, it results the information Gain is presented as shown in table 3.

Table 3: Gain Values

Gain	Values
Gain(S, PSGPA)	0.567036
Gain(S, EUEE)	0.515125
Gain(S, FCI)	0.025410
Gain(S, FYFSA)	0.437022

PSGPA has the highest gain, therefore it is used as the root node as shown in figure 2.

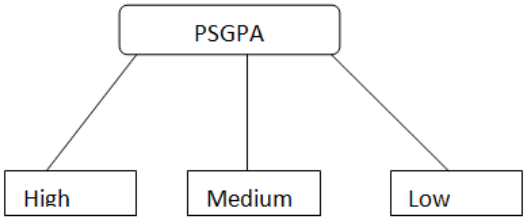

Fig. 2: PSGPA as root node

Gain Ratio can be used for attribute selection, before calculating Gain ratio Split Information is shown in table 4.

Table 4: Split information

Split information	Value
Split(S,PSGPA)	1.37565
Split(S, EUEE)	1.43755
Split(S,FCI)	1.98664
Split(S,FYFSA)	1.50263

Gain Ratio is shown in table 5 bellow.

Table 5: Gain ratio

Split information	Value
Gain ratio (S,PSGPA)	0.41535
Gain ratio (S, EUEE)	0.34565
Split(S,FCI)	0.02136
Gain ratio (S,FYFSA)	0.28874

This process goes on until all data classified perfectly or run out of attributes. The knowledge represented by decision tree can be extracted and represented in the form of IF-THEN rules.

Table 6: Rule Set generated by Decision Tree

IF PSGPA =’High’ AND EUEE =’High’ OR ‘medium’ AND FYFSA=’promoted’ THEN FYSSA=’Promoted’
IF PSGPA =’High’ AND EUEE =’High’ AND FYFSA =’Promoted’ OR ‘warning’ then FYSSA=’Promoted’
If PSGPA =medium AND EUEE =’High’ OR ‘medium’ AND FCI=’yes’ THEN FYSSA=’Promoted’
IF PSGPA =’low’ AND EUEE=’low’AND FYFSA=’sup’ THEN FYSSA=’Dismissal’
IF PSGPA =’low’ AND EUEE=’low’ AND FYFSA=’sup’ OR ‘warning’ THEN PSGPA=’low’

One classification rules can be generated for each path from each terminal node to root node. Pruning technique was executed by removing nodes with less than desired number of objects. IF-THEN rules may be easier to understand as shown in table 6. In this experiment, the decision tree classifier produces 81.4% accuracy with a new test data set.

Conclusion

This study focused on predicting students’ academic performance through educational data mining at an early stage of the degree program, in order to help the university and other decision makers not only to focus more on bright students but also to initially identify students with low academic achievement and find ways to support them. This paper is aimed to use data mining methodologies to design and develop a Data Mining model to predict academic performance of students at the end of first year degree program. The data of different undergraduate students has

been mined with different classifiers. In this study, the dependent and/or independent variables have been identified and utilized. These variables are used in an experiment using decision tree. Hence, classification rule is generated and applied on a new test data set and result in significant accuracy. The findings of the study have important implications for educators, teachers, counselors, university curriculum designers, students and other decision makers.

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Prevalence and Associated Factors for Rural Households Food Insecurity in Selected Districts of East Gojjam Zone, Northern Ethiopia: Cross-Sectional Study, Amare

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Abstract

Food insecurity is a pressing social and public health issue that varies in degree and impact on individuals and social groups, requiring immediate attention for policymakers and decision makers. This study was conducted to identify the prevalence and associated food insecurity factors in East Gojjam zone of rural households, particularly in the Shebel Berenta and Machakel districts. A cross-sectional study design was conducted, particularly Machakel and Shebel Berenta districts, in the fall of March 2017 among 504 households. Households are selected using systematic sampling technique through multistage cluster sampling technique (two stage cluster sampling). Data were collected using a structured interviewer administered questionnaire covering a range of topics including 18 core food security modules (CFSM) question series, socioeconomic, demographic and related variables.

Multivariable Partial proportional odds model (PPOM) was employed to identify the factors associated with food insecurity in rural households. Of a total of 504 households considered in the study, 54 (10.71%) were highly food secure, 75(14.88%) were marginally food secure, 157 (31.15%) were low food secure, and 218 (43.25%) were severely food insecure. District (Machakel) (AOR=3.28 95% CI: 1.73, 6.24), household head education status, illiterate (AOR=113.4,95% CI:7.02,1832.02), read and write (AOR=169.29,95%CI:11.64,2461.39),and elementary completed (AOR=119.75,95%CI:8.43,1700.74), agro-ecological zone, Woina Dega (AOR=0.0021,95% CI: 0.00009,0.0514), Dega (AOR=0.0323, 95%CI: 0.002, 0.5209), family size (AOR=1.18, 95%CI: 1.01, 1.36), landholding (AOR=0.767, 95% CI: 0.605, 0.972),TLU (AOR=0.15195 % CI: 0.0716, 0.3189), access to toilet (no) (AOR=7.63, 95% CI: 1.459, 39.78), practicing irrigation (yes) (AOR=0.121, 95% CI: 0.037, 0.38), loan (no) (AOR=2.83, 95% CI:1.36, 5.89), access to energy, government electric (AOR=0.468, 95% CI: 0.23, 0.94), solar panels (AOR=0.45, 95% CI: 0.25, 0.79), soil fertility, moderate (AOR=0.28, 95 % CI: 0.12, 0.87), fertile (AOR=0.15, 95 % CI: 0.032, 0.72) were significant associated food insecurity factors in the study area. In this study a high prevalence of food insecurity and various associated food insecurity factors have been identified in the study area. Thus, the concerned stockholders should intervene on food insecure households via different irrigation practices and by considering household size, community-based household head education, and landholding in hectare.

Keywords: East Gojjam Zone, Ethiopia, food insecurity, partial proportional odds model, rural household

Background

Food insecurity is a situation where the availability of nutritionally adequate and safe foods is limited or uncertain, or the socially acceptable ability to acquire acceptable foods [1, 2]. It also

incorporates low food intake, variable access to food, and vulnerability to a livelihood strategy that generates adequate food in good times but is not resilient to shocks [3]. Globally, the number of people facing chronic food deprivation has risen from around 804 million in 2016 to nearly 821 million in 2017. Most of the world's hungry people live in developing countries, where 12.9 percent of the population is undernourished. Asia is the continent with two - thirds of the total hungry people. The percentage in South Asia has fallen in recent years, but it has slightly increased in West Asia. Sub-Saharan Africa is the region with the highest prevalence of hunger, with one in four people undernourished [4, 5].

Household food insecurity affects food intake, and it may prevent an individual from consuming enough of the right kinds of nutrients to support and maintain health. Adults with food insecurity report poor health, including mental, physical and oral health, and chronic conditions such as diabetes, heart disease, hypertension, depression, and fibromyalgia [6, 7]. It also affects people's ability to manage chronic health problems, resulting in food insecurity taking a significant fee on the health care system with significantly higher costs for food insecure households [8]. In addition, children who experience hunger are more likely to have poorer health. Multiple episodes of hunger among children over time are associated with higher chances of chronic conditions and asthma [9]. The global food crisis has hit Sub - Saharan Africa hard. The underlying causes of this food crisis include both short term and long term factors. Increasing demand in large developing countries, especially for meat and dairy products, has resulted in increased grain use. On the supply side, in developing countries, investment in agriculture has been declining for more than two decades, while developed countries have provided subsidies and trade protection to their farmers, further depressing world prices and discouraging investment and production in developing countries [10].

Ethiopia has experienced structurally food deficit since at least 1980. The food gap increased from 0.75 million tons in 1979/80 to 5 million tons in 1993/94, falling to 2.6 million tons in 1995/96 despite a record harvest [11]. Approximately 84% of the country's labor force takes agriculture in Ethiopia, which is the largest contributor to economic growth and the most important sector of the economy. The livelihood of most Ethiopians depends on agriculture, especially among the poor rural population. Although it is a country with significant agricultural potential due to its water resources, fertile land areas and a large labor pool, this potential is largely undeveloped [3]. Food insecurity is currently a critical social issue that requires immediate attention from policymakers and other decision makers [12-14]. Food insecurity is a pressing social and public health issue that varies in degree and impact on individuals and social groups. For this reason, it is critical to understand how food insecurity patterns appear across different demographic and socio economic issues to meet specific needs by implementing appropriate policy programs and other initiatives [15, 16].

Even though Ethiopia has made substantial progress in poverty reduction in the past two decades, food insecurity is a threat to households as result of events such as population growth, food prices

and recurrent drought. Reducing food insecurity in Ethiopia continues to be a major public policy challenge, and one that is complicated by lack of information on the location, severity, and causes of food insecurity. Such information is needed to properly target assistance, assess progress, and develop appropriate interventions to help those in need [17]. In addition, food insecurity is a multidimensional concept, experienced differently by different types of households and population groups, and it is a complex issue that may not be fully captured by a one dimensional item response model, especially as it will be used to track food insecurity over time, across different surveys, and for different subpopulations [18, 19].

Most of the previous food insecurity studies focused primarily on children and single parent households. Despite this, different approaches are commonly used in national surveys to assess food insecurity, namely FAO method, household expenditure surveys, dietary intake assessment and anthropometry are indirect or derivative food insecurity measures [20, 21]. These approaches are criticized as; dietary intake methods are generally criticized on the grounds of skipping nutrient adequacy [22], lack of vulnerability analysis, no defined calorie intake and substitution effect due to increased income [23], the FAO method focuses on food insecurity risk at the national level [20], Anthropometry method measure the consequences of food insecurity, and the household expenditure surveys method measures the amount of food available but not necessarily the amount of food consumed within the timeframe of interest, and it is difficult to estimate the amount of food consumed outside the household. Because of this disagreement in this study, continuous food security measure was used, which is the only fundamental method that directly measures the phenomenon of interest based on the experience of food insecurity as perceived by the affected individuals; and captures not only the physical but also the psychosocial dimensions of food insecurity [20].

In addition, less is known about food insecurity in other society's potentially vulnerable population such as households in general. Moreover, the statistical methodology they employed was more of qualitative and could not show the extent of severity of food insecurity. Therefore, this study aims to evaluate the prevalence and associated food insecurity factors of households in selected districts of East Gojjam zone, Northern Ethiopia via Partial proportional odds model.

Methods

Study Area and Design

This study was conducted on two randomly selected districts, particularly Machakel and Shebel Berenta, in the East Gojjam zone. In this study, household based cross-sectional survey was conducted to investigate the prevalence and associated factors in which the study population consisted of all households in the study area at the survey time.

Data Collection and Measurement

For this study, primary data was used. Data were collected using a structured interviewer-administered questionnaire that was adopted from different standard questionnaires in the fall of March 2017.The questionnaire covered a range of topics including 18 item core food security modules (CFSM) question series, socioeconomic, demographic and related variables. For the most part, pretest or pilot study was conducted to evaluate the questionnaire's clarity and suitability, and to obtain different estimates for sample size determination. After providing necessary training for data collectors and supervisors on confidentiality, data collection process, study objectives and their importance, the actual data collection process was assisted by eight data collectors and two supervisors. For the most part, pretest or pilot study was carried out for assessing the clarity and suitability of the questionnaire, and in order to get different estimates for sample size determination. Before data collection, permission to conduct the study was obtained from Debre Markos University's Directorate of Research and Technology Transfer.

The response variable for this study was food insecurity status of households with categories of food secure, marginally food secure (mildly food insecure), low food secure (moderately food insecure), and severely food insecure, which has natural ordering pattern with the degree of severity increases [24, 25]. A household is classified into one of the food security status-level categories on the basis of household's scale score on the food security scale using the set of CF35SM indicator questions (Supplementary file 1). Socio - economic, demographic, environmental and institutional predictors related to the characteristics of the household were adopted from different literatures and based on the economic theory of food insecurity [26-31].

Operational Definition

Food insecurity -is a state in which consistent access to adequate food is limited at times throughout the year due to a lack of money and other resources. It refers to the social and economic problem, lack of food due to resource or other constraints, not voluntary fasting or dieting, or because of illness, or for other reasons [32, 33].

Food security- is a state in which all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life [34].

Highly Food Secure – a households that show no or minimal evidence of food insecurity.

Marginally Food Secure or Food Insecure without Hunger- households who have an evidence in household members' concerns about the adequacy of the household food supply and in adjustments to household food management, including reduced quality of food and increased unusual coping patterns.

Low Food Secure or Moderately Food Insecure - is households who show food intake for adults in the household has been reduced to an extent that implies that adults have repeatedly experienced the physical sensation of hunger.

Severely Food Insecure or Food Insecure with Hunger - is all households with children have reduced the children's food intake to an extent indicating that the children have experienced hunger [35, 36].

Sampling Technique and Sample Size Determination

Multistage cluster sampling (two stage cluster sampling) was employed. The East Gojjam zone was primarily classified into different clusters (districts) based on geographical or administrative characteristics, among which two districts were randomly selected. Second, the district was classified into Keble's and some of the Keble's were selected using simple random sampling technique (lottery method). Finally, households that are the smallest study unit in this study were selected using systematic sampling technique.

Mathematical formulas for determining the sample size for ordinal outcome data were proposed [37], a non - parametric method based on the assumption of a constant odds ratio as given in equation 1.

$$n = \frac{6[\left(z_{1-\alpha/2} + z_{1-\beta}\right)^2 / (\log(\theta))^2]}{\left(1 - \sum_{i=1}^{k} {p_i}^3\right)} \qquad (1)$$

Where n is the sample size required, θ is the odds ratio of households being in category j or less compared to the other, p_i is the proportion of households in category$i$, α is a level of significance, and $1 - \beta$ is power of the test. As adopted from a pilot study, the proportions of households being in each category were found as $p_1 = 0.134$, $p_2 = 0.198, p_3 = 0.305$ and $p_4 = 0.363$ with odds ratio of 2.852. Setting $\alpha = 0.01$ and $\beta = 0.1$ the required sample size becomes472.33. According to [37], since the number of categories is less than five, we multiply this sample size estimate by a correction factor c=1.067 for i=4, which is 472.33 (1.067) =504. Consequently, in this study we considered 504 households.

Empirical Methodology

In order to address the objective set up for this study ordinal logistic regression model and tests related are employed as a general methodology for examining the associated factors of food insecurity of households. Ordinal logistic regression model are used to model the relationship between independent variables and an ordinal response variable when the response variable category has a natural ordering. There are different types of ordinal logistic regression models, the most commonly used are: the adjacent-category, the continuation-ratio, the proportional odds models, the unconstrained partial-proportional odds model, the constrained partial-proportional odds model [38].

Partial Proportional Odds Model

The partial proportional odds model (PPOM) formulated by Peterson and Harrell [39] , which imposes constraints for parallel lines only where they are needed. The equation can be expressed as:

$$ln\left(\frac{Pr(y \leq j|\boldsymbol{x})}{Pr(y > j|\boldsymbol{x})}\right) = \alpha_j + (\boldsymbol{x}\beta + \boldsymbol{T}\gamma_j), \quad j = 1, \ldots, J-1 \qquad (5)$$

Here **x** is the vector containing the full set of independent variables that satisfies proportional odds assumption, $\boldsymbol{T}$ is a vector containing a subset of independent variables which violate the parallel assumption, β and γ_j are the regression coefficients associated with the variables in **x** and $\boldsymbol{T}$ respectively. The model given in equation (5) can be expressed in terms of logit as:

$$\text{logit}[\text{P r}(\text{y} \leq \text{j}|\text{x})] = \alpha_{\text{j}} + \sum_{\text{k}=1}^{\text{m}} \beta_{\text{k}} \text{x}_{1\text{k}} + \sum_{\text{r}=1}^{\text{p}} \gamma_{\text{rj}} \text{T}_{2\text{r}} \quad \text{j} = 1, \ldots, \text{J} - 1 \qquad (6)$$

Results

General Characteristics of Households

A total of 504 households from two districts, explicitly Machakel and Shebel Berenta, were considered in this study. The food insecurity status of households in this study was determined from the 18-item Core Food Security Module (CFSM) question series designed by USDA, which is recognized as the standard measure of food insecurity in virtually all national, state and local surveys. The prevalence of food insecurity among households, 54 (10.71% CI: 8.29, 13.74) were highly food secure, 75(14.88% CI: 12.02, 18.27) were marginally food secure, 157 (31.15% CI: 27.24, 35.34) were low food secure and 218 (43.25% CI: 38.97, 47.63) were severely food insecure (Table 1).

Table 1: Prevalence of Food Insecurity Status of Households in the Study Area

Household Food Insecurity status	Count	Percent (95%: CI)
Highly Food Secure	54	10.71(8.29,13.74)
Marginally Food Secure	75	14.88 (12.02,18.27)
Low Food Secure	157	31.15(27.24, 35.34)
Severely Food Insecure	218	43.25(38.97, 47.63)

The prevalence of food insecurity varies by districts which were 21.6%, 19.1%, 36.1% and 23.2 % for Shebel Berenta, and 0.8%, 11%, 26.6% and 61.6% for Machakel had HFS, MFS, LFS, and SFI status. It shows that the proportion of highly food secure, marginally food secure, and low food secure status were higher in Shebel Berenta district, and to the contrary the proportion of severely food insecure was higher in Machakel district households. Furthermore, the proportion of HFS, MFS, LFS, and SFI households were higher for each level of gender and religion as the severity level of food insecurity increase (Table 2). The proportion of food insecurity prevalence shows a variation across marital status of head of households, out of 405 married status samples about 9.4%, 15.6%, 32.8% and 42.2% had HFS, MFS, LFS, and SFI status respectively. Moreover,

about 51.6%, 45.4 %, and 38.5 % of the households head had a severely food insecure status which indicates those groups are most vulnerable to food insecurity with illiterate, Read and write, and high school and above education status respectively (Table 2).

Table 2: Demographic Characteristics of Household Head by Food Insecurity Status of Selected Households, 2017

Characteristics		Food Insecurity level of Household					Chi Square P,F (p-value)
		Highly Food Secure	Marginally Food Secure	Low Food Secure	Severely Food Insecure		
		Count (%)	Count (%)	Count (%)	Count (%)	Total	
District	Shebel Berenta	52(21.6%)	46(19.1%)	87(36.1%)	56(23.2%)	241	102.7672 (0.000*)
	Machakel	2(0.8%)	29(11.0%)	70(26.6%)	162(61.6%)	263	
Gender	Male	42(10.4%)	62(15.3%)	127(31.4%)	174(43.0%)	405	0.5498 (0.908)
	Female	12(12.1%)	13(13.1%)	30(30.3%)	44(44.4%)	99	
Religin	Christian	54(11.1%)	71(14.6%)	152(31.2%)	210(43.1%)	487	2.8453 (0.416)
	Muslim	0(0.0%)	4(23.5%)	5(29.4%)	8(47.1%)	17	
Marital status	Married	38(9.4%)	63(15.6%)	133(32.8%)	171(42.2%)	405	27.7124 (0.001*)
	Single	3(12.5%)	2(8.3%)	1(4.2%)	18(75.0%)	24	
	Divorced	1(3.7%)	5(18.5%)	12(44.4%)	9(33.3%)	27	
	Widowed	12(25.0%)	5(10.4%)	11(22.9%)	20(41.7%)	48	
Education status	Illiterate	5(5.7%)	10(11.5%)	28(32.2%)	44(50.6%)	87	35.9127 (0.000*)
	Read and write	29(8.8%)	41(12.5%)	109(33.2%)	149(45.4%)	328	
	Elem. completed	14(22.2%)	18(28.6%)	16(25.4%)	15(23.8%)	63	
	≥ High school	6(23.1%)	6(23.1%)	4(15.4%)	10(38.5%)	26	

F= Fisher's exact test, P= Pearson's chi-square

Of the 368 households who replied no saving practice habit, about 9.8%, 13.9%, 33.2%, and 43.2 % had HFS, MFS, LFS, and SFI status respectively. Of the 416 households that had not taken out a loan in the last 12 months, about 8.9%, 13.9%, 33.7%, and 43.5% had HFS, MFS, LFS, and SFI status respectively (Table 3). Alternatively, 432 of a total of 504 respondents had their own toilet access, in which to some extent indicates the existence of good sanitation practice in the study

area. In contrast, most households had low water treatment practice, and pipe and river were the main sources of drinking water (Table 3).

Table 3: Household Food Insecurity Statuses in Terms of Socioeconomic and Access for Infrastructure Characteristics

Characteristics		Highly Food Secure	Marginally Food Secure	Low Food Secure	Severely Food Insecure	Total	Chi-square ^{P,F} (p-value)
		Count (%)	Count (%)	Count (%)	Count (%)		
Source of access to energy	kerosene	15(6.69%)	20(8.93%)	61(27.2%)	128(57.2%)	244	67.5912 (0.000)
	solar panels	12(9.1%)	28(21.2%)	49(37.1%)	43(32.6%)	132	
	G. electric	21(18.3%)	23(20.0%)	43(37.4%)	28(24.3%)	115	
	Other	6(18.2%)	4(12.1%)	4(12.1%)	19(57.6%)	33	
Habit of credit service (saving)	Yes	18(13.2%)	24(17.6%)	35(25.7%)	59(43.4%)	136	3.8169 (0.282)
	No	36(9.8%)	51(13.9%)	122(33.2%)	159(43.2%)	368	
Have you taken a loan, for the last 12 months	Yes	17(19.3%)	17(19.3%)	17(19.3%)	37(42.0%)	88	13.6048 (0.003)
	No	37(8.9%)	58(13.9%)	140(33.7%)	181(43.5%)	416	
Is toilet available	Yes	47(10.9%)	63(14.6%)	126(29.2%)	196(45.4%)	432	7.2103 (0.065)
	No	7(9.7%)	12(16.7%)	31(43.1%)	22(30.6%)	72	
source of drinking water	Pipe	43(13.4%)	53(16.5%)	98(30.5%)	127(39.6%)	321	1.2635 (0.62)
	Pond	2(9.1%)	4(18.2%)	6(27.3%)	10(45.5%)	22	
	River	5(3.6%)	16(11.6%)	48(34.8%)	69(50.0%)	138	
	Other	4(17.4%)	2(8.7%)	5(21.7%)	12(52.2%)	28	
Do you treat water	Yes	17(12.9%)	21(15.9%)	53(40.2%)	41(31.1%)	132	1.7073 (0.785)
	No	37(9.9%)	54(14.5%)	104(28.0%)	177(47.6%)	372	

In the present study, the fertility of agricultural land, irrigation practice, use of improved seed, access to training on agricultural extension package, and use of fertilizer from each household were considered. Most households have had the opportunity to access fertilizer, and they have the opportunity to be trained by professionals on the agricultural extension package (Table 4). The proportion of incidence of food insecurity shows a variation across household's agro-ecological zone. Approximately 20.6%, 54.9%, and 16.5% of households in Kolla, Woina Dega, and Dega agro-ecological zones had a severe food insecure status, respectively. The majority of the respondents, about 417 households didn't have irrigation practice, which could contribute to improving the food security condition. Of those 12.9 %, 17%, 29.7%, and 40.3 % had a HFS, MFS, LFS, and SFI status respectively.

Table 4: Agricultural Environment and Practice Related Characteristics of Household by Food Insecurity Level, 2017

Characteristics		Highly Food Secure	Marginally Food Secure	Low Food Secure	Severely Food Insecure	Total	Chi-square[P,F] (P-value)
		Count (%)	Count (%)	Count (%)	Count (%)		
Agro ecological zone	Kola	3(4.8%)	15(23.8%)	32(50.8%)	13(20.6%)	63	81.6389 (0.000)
	Woina Dega	26(7.6%)	38(11.0%)	91(26.5%)	189(54.9%)	344	
	Dega	25(25.8%)	22(22.7%)	34(35.1%)	16(16.5%)	97	
slope of land	Level	18(24.3%)	21(28.4%)	14(18.9%)	21(28.4%)	74	35.2571 (0.000)
	Medium	31(8.0%)	49(12.7%)	131(33.9%)	176(45.5%)	384	
	Gentle slope	5(11.6%)	5(11.6%)	12(27.9%)	21(48.8%)	43	
land ownership	Private	46(11.6%)	57(14.3%)	123(30.9%)	172(43.2%)	398	7.3372 (0.291)
	Rented	6(7.0%)	13(15.1%)	25(29.1%)	42(48.8%)	86	
	Collaborate	2(10.0%)	5(25.0%)	9(45.0%)	4(20.0%)	20	
fertility of agricultural land	Infertile	5(12.8%)	1(2.6%)	3(7.7%)	30(76.9%)	39	42.0617 (0.000)
	Medium	41(9.4%)	65(14.9%)	149(34.1%)	182(41.6%)	437	
	Fertile	8(28.6%)	9(32.1%)	5(17.9%)	6(21.4%)	28	
Irrigation practice	Yes	0(0.0%)	4(4.6%)	33(37.9%)	50(57.5%)	87	25.2040 (0.000)
	No	54(12.9%)	71(17.0%)	124(29.7%)	168(40.3%)	417	
do you use improved seed	Yes	41(9.1%)	65(14.4%)	142(31.6%)	202(44.9%)	450	13.4292 (0.004)
	No	13(24.1%)	10(18.5%)	15(27.8%)	16(29.6%)	54	
training by agricultural profession	Yes	46(9.9%)	70(15.1%)	141(30.5%)	206(44.5%)	463	6.3471 (0.096)
	No	8(19.5%)	5(12.2%)	16(39.0%)	12(29.3%)	41	
Fertilizer use	Yes	49(10.6%)	71(15.4%)	143(31.0%)	199(43.1%)	462	1.0560 (0.788)
	No	5(11.9%)	4(9.5%)	14(33.3%)	19(45.2%)	42	

Furthermore, the proportion of food insecurity status shows a variation in the slope of agricultural land. Most households around 384 of the respondents had a moderately sloped agricultural land. Among them, 8 percent, 11.6 percent, 33.9 percent, and 45.5 percent respectively had HFS, MFS, LFS, and SFI status. Among them, 8 percent, 11.6 percent, 33.9 percent, and 45.5 percent respectively had HFS, MFS, LFS, and SFI status. Additionally, around 398 respondents had private land ownership with 11.6%, 14.3 %, 30.9%, and 43.2% of respondents had a HFS, MFS, LFS and SFI status respectively (Table 4).

In the present study, the mean monthly income of household for HFS, MFS, LFS, and SFI households was ETB 965.01±774.08, 724.59±560.85, 804.54±791.74, and 741.62±409.99 respectively, comparatively SFI households have low monthly income in typical. The mean landholding in hectare of households for HFS, MFS, LFS, and SFI status was 1.71±0.88, 2.015±1.07, 1.86±1.1, and 1.66±0.86 respectively. The mean family size of households for HFS, MFS, LFS, and SFI status was 4.8±2.14, 4.2±1.56, 4.5±1.78, and 4.78±1.92 respectively. The mean TLU of the household for HFS, MFS, LFS, and SFI status was 4.23±1.62, 2.87±1.47, 2.83±2.17, and 3.2±2.66 respectively, comparatively SFI households have low livestock in average (Table 5).

Univariate Analysis

Before constructing the ordinal logistic regression model for analyzing the categorical data, we first checked the association of each explanatory variable with the response using Pearson and Fisher exact chi - square test (Table 3,4, 6) and the continuous explanatory univariate fit (Table 5) of POM was performed. As a result, POM was fitted together explanatory variables that appear to be important in univariate analysis [40]. Furthermore, TLU was a statistically insignificant, but it is an economically important predictor that is directly related to the households ' food insecurity status [26, 41-43] based on [40, 44] it allows these variable to be included.

Table 5: Summary Statistics Showing the Prevalence of Different Levels of Food Insecurity among Households across Continuous Predictors and Univariate Analysis

predictor	HFS		MFS		LFS		SFI		P
	Mean ± SD		Mean ± SD		Mean ± SD		Mean ± SD		
Age	49.75	14.66	44.9	12.43	44.83	13.93	46.03	13.65	0.576
Family size	4.814	2.137	4.28	1.555	4.504	1.78	4.775	1.924	0.188*
Land size	1.706	0.886	2.015	1.078	1.861	1.102	1.668	0.862	0.055**
Monthly income	965.01	774.08	724.59	560.85	804.54	791.74	741.62	409.99	0.145*
Monthly Expenditure	1905.85	2260.51	974.52	1226.48	1110.83	6806.88	610.11	701.93	0.225
TLU	4.23	1.62	2.87	1.47	2.83	2.17	3.2	2.66	0.390

SD=standard deviation, HFS = highly food secure, MFS = moderately food secure, LFS = Low Food Secure, SFI= severely food insecure; ** Significant at 10% and * significant at 20% level of significance

Multivariable Results of Proportional Odds Model (POM)

The multivariable proportional odds model was fitted for the explanatory variables that appear to be important at univariant analysis with food insecurity level. Maarten Bui's parallel command was employed with the fitted proportional odds model to see if the fitting of a multivariable proportional odds model is appropriate for the data [45]. This command performs five tests a likelihood ratio test, a score test, a Wald test, a Wolfe-Gould test, and a Brant test (Table 6). All tests indicate that our data breached the proportional odds assumption; as a significant test statistics, there is evidence that the parallel regression assumption or proportional odds assumption has been violated. A violation of this assumption indicates that the effects of one or more independent variables significantly vary across cut point equations in the model [46].
In practice, when the proportional odds assumption is violated or difficult to achieve in practice by the data, the standard advice in such situations is to use Partial proportional odds model (PPOM) which is more parsimonious and interpretable than those fitted by a non-ordinal method [47]. In PPOM, the assumption of parallel lines or proportional odds can be relaxed for some explanatory variables while being maintained for others.

Table 6: Overall all Tests of Parallel Regression Assumption (Proportionality Assumption Tests for Multivariable POM)

Tests	Chi2	Df	P>Chi2
Wolfe Gould	164.6	52	0.000
Brant	211.1	52	0.000
Score	155.9	52	0.000
Likelihood ratio	204.2	52	0.000
Wald	93.02	52	0.000

Multivariable Partial Proportional Odds Model (MPPOM)

Multivariable partial proportional odds model with logit function was fitted (Table 7). For the final model, a global Wald test was performed with restricted (constrained) versus the original unconstrained model. The test indicates that the final model does not violate the assumption of parallel lines. As the global Wald test shows, in the final model, ten constraints were imposed, the chi2 (10) = 12.22 with P - value = 0.2705 being insignificant test statistics indicates that the final model does not violate the proportional odds or parallel line assumption.

Table 7: Multivariable PPOM analysis on associated factors of food insecurity adjusted odds ratio and CI estimates

Predictors	Categories	Model 1		Model 2		Model 3	
		Odds ratio (95% CI)	P-value	Odds ratio (95% CI)	P-value	Odds ratio (95% CI)	P-value
District	Machakel	104.2 (12.17,82845.1)	0.000**	1.119 (0.481,2.60)	0.792	3.28(1.73,6.24)	0.000**
ritual status	Married	.002(6.70e-14,6.44e-07)	0.616	0.74(0.118,4.62)	0.748	14.4(3.36,61.58)	0.000*
	Divorced	.037(0.00007, 1.188)	0.065	1.81(0.514,6.34)	0.355	1.13(.36,3.49)	0.833
	Widowed	.119(.0015, 1.094)	0.081	1.558(0.55,4.39)	0.401	2.53(0.026,6.21)	0.064
Family size		0.817(0.416,1.827)	0.0712	1.23(1.012,1.49)	0.037*	1.18(0.01,1.36)	0.083
Education Status	Read and write	169.29(11.64, 2461.39)	0.000**	0.6712(.29,1.52)	0.342	1.31(.68,2.51)	0.422
	Elementary	119.75(8.43,1700.74)	0.000*	0.4422(.161,1.21)	0.113	0.69(0.26,1.83)	0.458
	Illiterate	113.4091(7.02,1832.02)	0.001*	0.383(.099,1.48)	0.164	1.77(0.50,6.26)	0.375
Ecological zone	Woina Dega	0.0021(.00009,.0514)	0.000*	1.82 (0.81,4.127)	0.147	4.75(0.98,11.36)	0.082**
	Dega	0.0323(.002,.5209)	0.016*	0.763(0.29,1.9827)	0.579	1.55(0.52,4.62)	0.431
Landholding		0.767(.605,0.972)	0.028*	0.766(0.61,.97)	0.028	0.76(0.60,0.97)	0.028*
slope£	Medium	0.58(.025,1.597)	0.091	2.74(0.24,6.09)	0.113	0.89(0.40,2.01)	0.794
	Gentle slope	1.53 (0.14,816.84)	0.075	2.88 (.89,9.34)	0.077	1.07(0.36,3.13)	0.903
Access to energy	G-electric	3.98 (0.914,70.73)	0.082	0.243(0.107,0.55)	0.001	0.468(0.23,.94)	0.033*
	solar panels	5.99 (0.039,125.50)	0.085	0.427(.202,0.906)	0.027	0.45(0.25,0.79)	0.006**
Soil fertility	Medium	4.407 (0.92,21.106)	0.063	1.73(.46,6.45)	0.414	0.28(0.12,0.87)	0.010*
	Fertile	11.23 (1.363, 92.59)	0.025*	1.073(.197,5.85)	0.934	0.15 (0.032,0.72)	0.017*
M.Income £		1.0002(0.99,1.0005)	0.550	1.0001(0.99,1.00)	0.550	1.00(0.99,1.00)	0.550
Loan status	No	0.484(0.1153, 2.028)	0.321	2.83(1.36,5.89)	0.006**	1.06(0.564,2.01)	0.844
Toilet access	No	7.63(1.459702,39.78)	0.016*	1.119(0.53,2.37)	0.768	0.77(0.39,1.54)	0.472
seed I.£	No	0.84(0.403946, 1.720)	0.623	0.833(.404,1.72)	0.623	0.83(0.403,1.72)	0.623
Training£	No	0.92(0.397, 2.110)	0.836	0.92 (0.397,2.11)	0.836	0.92(.397,2.11)	0.836
Irrigation	Yes	0.00001(1.85e-06, 0.0001)	0.000**	0.121(.037,0.38)	0.00**	0.94(.505,1.75)	0.850
TLU		0.151(0.0716,0.3189)	0.000**	0.920 (0.79,1.07)	0.286	0.99(0.884,1.10)	0.804

'*****' and '******' statistically significant at 5% and 1% level of significance, **Model 1**: HFS Vs. MFS, LFS, SFI; **Model 2**: HFS, MFS, Vs. LFS, SFI; **Model 3**: HFS, MFS, LFS, Vs. SFI, £ variables that were not significantly associated with food insecurity have been presented in the table.

Test of Overall Model Fit and Goodness of Fit Test

The better - fit model was found among the ordinal logistic regression models considered in this study as a multivariable partial proportional ordinal model, with AIC of 993.5806. In addition, the full PPOM model was compared to the null model (only intercept model) using the likelihood ratio test (LRT) which tests whether the current model predicts better than the intercept only model. The value of the likelihood ratio chi square statistic is $LR\ (68) = 407.04$ with P-value=0.0000 implies that the full model predicts the data better than the intercept only model (Table 8).

Table 8: Likelihood Ratio Test for PPOM

Model		Log likelihood			Information criterion's		Likelihood ratio test	
	obs	ll(null)	ll(model)	df	AIC	BIC	LR chi2	Prob > chi2
PPOM	504	-629.3112	-425.7903	71	993.5806	293.38	407.04	0.0000

The Hosmer and Lemeshow test was conducted on a series of binary logistic regression model to check goodness of fit. All the Hosmer and Lemeshow test of the series of binary logistic regression model are insignificant, showing that the three binary logits fit the data well (Table 9).

Table 9: Goodness of Fit Test for SBLM

Separated binary logit model(SBLM)	Chi-square	df	Sig.
HFS **Vs**. MFS and LFS and SFI	12.752	8	.121
HFS and MFS **Vs**. LFS and SFI	14.379	8	.072
HFS and MFS and LFS Vs. SFI	10.028	8	.263

In the present study, various predictors expected to be the determinants of the households' food insecurity status were considered. The multivariable PPOM analysis on socio - economic, demographic, institutional, agricultural and institutional characteristics showed that district, HH marital status, family size, HH education status, ecological zone, agricultural land size (hec.), source of access to energy, soil fertility, loan status, toilet access, irrigation practice, and Tropical Livestock Unit (TLU) were found to be associated factors for food insecurity of households in the study area (Table 7).

Discussions

This study assessed the prevalence and food insecurity factors in rural households in selected districts of East Gojjam Zone, Northern Ethiopia. Accordingly, out of 504 respondents, the prevalence of food insecurity was found to be 10.71 %, 14.88 %, 31.15 %, and 43.25% to be highly food secure, marginally food secure (food - insecure without hunger), low food secure

(moderately food insecure), and severely food insecure respectively (Table 1). The observed food insecurity prevalence report is high, which may be due to the fact that most households were unable to produce adequate food at the household level, insufficient purchasing power, lack of government subsidies and inappropriate distribution, and an intervention related to a food security program should be addressed in study areas. This result shows a slim difference or inconsistency with the study [42] conducted in Borana Zone, Oromia, Ethiopia. His result of prevalence showed that 23 %, 25 %, 31 %, and 21 % of respondents were food secure, food insecure without hunger, food insecure with moderate hunger, and food insecure with severe hunger, respectively. This difference shows that there is a discrepancy in the magnitude of the level of food insecurity in different neighborhoods within the country.

The risk of food insecurity shows a variation across districts in this finding. Comparing households under HFS and MFS and LFS to SFI, households belonging to Machakel district were more likely to be severely food insecure (AOR=3.28.95% CI: 1.73.6.24, P<0.001) compared to households belonging to Shebel Berenta district (Table 7). This might be due to the fact that there is low agricultural production in the Machakel district due to deprived soil fertility, low livestock production, land shortages, continuing cash income shortages, poor farming technologies, and weak extension services than the Shebel Berenta district. This results in evidence of concern that food insecurity is a multidimensional concept experienced differently by different types of households and population groups [34, 48].

The household head education achievement was found to be a significant factor in households ' food insecurity status. In this study, the various forms of household head education status were tested to investigate their effect on household's food insecurity status, including illiterate, read and write, elementary completed and high school and above. The result showed that when HFS state was compared with MFS, LFS and SFI status, households having household head education status with illiterate, read and write, and elementary completed level of education were more likely (AOR=113.4,95% CI:7.02,1832.02,P=0.001;AOR=169.29,95%CI:11.64,2461.39,P<0.001,AOR=119.75,95%CI:8.43,1700.74, P<0.001 respectively) to be MFS, and LFS, and SFI status than households who have high school and above education status. This finding shows that the head of households with a low level of education had a higher risk of being food insecure (Table 7). This result is supported by studies done in Punjab Pakistan, Ethiopia's Central Zone of Tigrai [26, 30]. This could be explained by education as a tool for accessing information on best agricultural production, nutrition and sanitation, increased efficiency, hence increased production and better decision - making, as well as the pride that comes with education and the active role in developing people's capabilities, this situation can create a positive aspect for fighting food insecurity.

In the present study, ecological zone was found to be a significant factor associated with household food insecurity. Households living in Woina Dega and Dega were less likely to be in MFS and LFS or SFI status (as opposed to HFS status) compared to households living in Kolla agro-

ecological zone (AOR= 0.0021,95% CI: 0.00009,.0514,P<0.000 ; 0.0323, 95%CI: 0.002,.5209, P=0.016) respectively(Table 7). This result is supported by the study conducted in Ethiopia by [49]. This may be due to the fact that frequent production failures occurred mainly due to drought (less rain access). This study suggests that agricultural extension should then take water conservation into account and extends irrigation practices to cope with less agricultural - productive areas, especially kola agro-ecology zone.

The finding of this study indicates having a large family size creates more pressure on household food security. For one unit increase in family size, the chances of being food insecure were 18% higher (AOR=1.18, 95%CI: 1.01, 1.36, P=0.034) than the lower status of food insecurity HFS, MFS, and LFS (Table 7). This finding is supported by the studies done in Nigeria, Ethiopia, Pakistan, and South Africa [50-54]. This may be due to the fact that larger families has a higher chance of possessing a lower income per capita and high need for more food availability and more resources to buy food [55, 56].These findings encourages for implementing community based Education that may lead to lower birth rates, and therefore reducing family size.

In this study, landholding size in hectare of household was found to be a significant associated factor for household's food insecurity status. The finding of this study indicates having larger landholding improves the status of being food secure. The odds ratios of the highest category of food insecurity (severely food insecurity) versus the highly food - secure and marginally food - secure and low food - security status (AOR=0.767, 95% CI: 0.605, 0.972, P-value =0.028) lower given that the other variables in the model are kept constant (the odds of food insecurity would be reduced by 0.766 units for one unit increase in the land size of households) (Table 7). This may be due to the fact that access for a large landholding leads to high opportunities for agricultural production, aggregate tree cultivation practices that can serve as income generation, and sufficient access for livestock grazing. This finding is consistent with study results reported from Ethiopia [54]. This study encourages that due to extremely limited land ownership in Ethiopia, a mixed farming system (integrated elements of both livestock and crop cultivation) should be adopted on the small available land to reduce the prevalence of food insecurity.

Comparing HFS and MFS and LFS with and SFI status, households with source of access to energy government electric and solar panels were about less likely (AOR=0.468, 95% CI: 0.23, 0.94, P=0.033 ; AOR=0.45, 95% CI: 0.25, 0.79, P=0.006) to be severely food insecure compared to households with access to energy are kerosene lamps(Table 7). This may be due to the fact that poor access to energy such as kerosene lamps and fuel wood leads to reallocation of household resources from food production and preparation to fuel procurement, potentially affecting cooking practices and dietary choices. This finding suggests that food security cannot be guaranteed unless access to energy in a better approach is distributed in the form of renewable energy, as access to energy is directly and indirectly embedded in food production and preparation. Hence, government and concerned bodies would pay attention to renewable energy such as electric and solar panels to improve food security for rural households.

Agricultural soil fertility was found to be a significant associated factor for food insecurity in this study. When comparing HFS and MFS and LFS households with SFI status, households with medium and fertile soil fertility status were less likely to be severely food insecure (AOR=0.28, 95 % CI: 0.12, 0.87, P=0.010 ; AOR=0.15, 95 % CI: 0.032, 0.72, P=0.017 respectively) compared to households with infertile (poor fertility) soil (Table 7). This may be due to the fact that farming on a soil with good soil fertility can increase agricultural productivity [57]. This study encourages attention to healthy soil through soil management and awareness of soil condition programs and soil productivity improvement program through farmer field schools such as cover crops that add organic matter to the soil, and green manure or growing legumes to fix nitrogen from the air over the biological nitrogen fixation process.

The tropical livestock unit (TLU) which is the aggregate number of livestock converted to a common unit (livestock owned by the head of the household) was found to be a significant associated factor for household food insecurity. When HFS was compared with MFS and LFS and SFI status, for one unit increase in TLU, the odds of being food insecure would decrease by 84.8% (AOR=0.15195 % CI: 0.0716, 0.3189, P<0.001) (Table 7). This may be due to the fact that, currently in Ethiopia there is an increasing demand for animal products by growing cities and their populations, and the high rapidly need of livestock and their products like meat and milk for consumption and trade serve as a means of generating income by selling these livestock when they faced food shortages. This result is consistent with the studies [26, 29, 42] conducted in Ethiopia. This study advises the concerned body to design approaches with high attention to increase livestock production in the study area, as livestock is a driving force for food security.

The other predictor found to be a significant associated factor for food insecurity in this finding was access to the toilet. When comparing HFS with MFS and LFS and SFI status, households with no access to the toilet were more likely (AOR=7.63, 95% CI: 1.459, 39.78, P=0.016) to be MFS and LFS and SFI as compared to households with access to the toilet (Table 7). This could be due to the fact that food security explained by access to sanitation, then access to the toilet for rural households improves food security. This finding is supported by [58] factors such as knowledge and practices in nutrition and access to quality health care, clean water and sanitation are crucial for ensuring food security. This study enforces healthcare workers to focus on hygiene education or shift in sanitation practice (for sustainable sanitation) with a renewed alliance between the healthcare worker and community leaders.

According to this study, irrigation practice was another associated factor of food insecurity in the household. When HFS and MFS were compared with LFS and SFI status, households practicing irrigation were less likely (AOR=0.121, 95% CI: 0.037, 0.38, P=0.00) to be low food secure and severely food insecure as compared to households not practicing irrigation(Table 7). This could be due to the fact that improved water management and use are fundamental to increasing agricultural yields, and the link between water services for irrigation opportunities for individuals and communities lifts food production, both in quantity and diversity, to satisfy the basic needs of

households and also to generate surplus income. As supported by other studies [59, 60], the efficient use of available irrigation water is an important concern to improve food security. This study enforces the government to pay due attention to small - scale irrigation systems managed by the community that are effective in alleviating rural poverty and eradicating food insecurity by improving yields and crop intensities.

When HFS and MFS compared with LFS and SFI status, households that do not take a loan from any financial institution were more likely (AOR=2.83, 95% CI: 1.36, 5.89, P=0.006) to be low food secure and severely food insecure compared to households that take a loan from financial institutions (Table 7). This indicates that the risk for households who do not take a loan to be food insecure was higher than households who take a loan from financial institutions. This could be due to the fact that households receiving a loan from a financial institution can increase household income by purchasing livestock, inputs for agricultural activities, and make farming households allocate labor more efficiently, which increases the well - being of farming households as well as agricultural outputs. This finding supports the idea of access to finance as a critical piece of food security [61] by increasing household income leading to an increase in household food availability.

Conclusions

The findings from this study show a high prevalence of food insecurity in the study area and different associated food insecurity factors have been identified. Thus, interventions by the bodies concerned on food insecure households should ruminate water conservation and extend irrigation practices to cope with less agricultural-productive areas, especially kola agro-ecology zone, and community-based education to access information on best agricultural production, nutrition and sanitation, as well as lower birth rates, which can reduce family size. As TLU and landholding are significant associated factors of food insecurity, attention should be given to increasing livestock production and mixed farming on the small available landholding to reduce the prevalence of food insecurity. In addition, healthy soil would be accomplished through soil management and awareness of soil condition programs and soil productivity improvement program through farmer field schools. Finally, further study should be conducted to identify mechanisms for addressing food insecurity in the study area that will be adopted for rural households.

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The Political-Economy Agricultural Investment in Ethiopia: Focus on Flower Farms in Amhara Region, Asabu Sewnet Alamineh, Debre Markos University

Abstract

After the recognition of commercial agricultural investment in Ethiopia, a large area of land has been given to investors for the production of different cash and food crops. But oppositions against expropriation for commercial farming and destruction of investment sites have become common episodes in Ethiopia. Cognizant of such a fact, this study examined the political-economy of agricultural investment in Ethiopia: a focus on flower farms in Amhara region. To address research objectives, a mixed research approach with concurrent parallel design was employed. In doing so, both primary and secondary sources of data were gathered via semi-structured interview, Focused Group Discussion, questionnaire and document review. Then, the data were presented, analyzed and interpreted through statistics-by-themes and side-by-side comparison in an integrative manner by way of joint display mechanisms. The study revealed that land expropriation was carried out without genuine public consultation, ascertaining popular consent and written notification whereby the participation of peasants in land dealings was non-existent. It also found that compensation was paid to evictees; however, the process of valuation was full of uncertainty and jumping which produced dissatisfaction and grievance on evictees. Moreover, flower farms negatively affected the livelihood and food security of peasants thereby brought violence and conflict, tenure insecurity, strained government-society relations, distrust and deterioration of government legitimacy. The major conclusion drawn from the finding is the expansion of commercial farming was not made vis-à-vis with empowering the displaced poor. Thus, evictees should be part of the development process for the sustainability and success of farms as well.

Keywords: political-economy, commercial farming, expropriation, compensation, livelihood

Introduction

Agricultural investment or commercialization of agriculture is the development and promotion of profitable agricultural production and marketing system (Pinder and Wood, 2003). It is the production of commodities by using new technology which is aimed to make a profit. As Deininger *et al* (2011) noted the increased pressure on natural resources lead to a shift in use of land from small scale farming to export-driven commercial farming. Nowdays, commercialization of agriculture is one of the driving forces behind privatization and individualization of rights of land; thus, agricultural investment is a key priority by governments of both developing and developed countries in the world (Smalley, 2014; Fonjong and Fokum, 2015). Similarly, agriculture is the mainstay of rural poor in Ethiopia, on which around 85% of the labor force is engaged in this sector. But the sector remains inefficient due to its insistence on small holder agricultural intensification (Samuel, 2006; Diao, 2010). This resulted in the recognition of commercial agricultural investment under a Plan for Accelerated and Sustained Development to End Poverty (PASDEP) document to landslide the daunting poverty in Ethiopia (MoFED, 2006; Diao, 2010;

Nathan, 2013; Yihenew *et al*, 2013; Fana, 2016). This accelerated the expansion of commercial farming in unprecedented speed by dislocating small landholders in Ethiopia (Belachew, 2013; Daniel, 2014; Daniel, 2015; ANRSIC, 2016). However, the expansion of commercial farming brings a mixed repercussion. In one way, it generates hard currency and job opportunities. Conversely, it leads to land dispossession which is a more acute and serious problem despite many of its people are food insecure (Belachew, 2013; Azeb, 2017). As clearly noted in Desalegn (2011) and Belachew (2013) expropriation brings food insecurity on peasants because the crops produced in commercial farming are geared towards export by disregarding home consumption (Desalegn, 2011; Belachew, 2013). This connotes that the rush expansion of commercial agricultural investment via expropriation has a far reaching social, political and economic implication for small operated family farms in Ethiopia. It further marginalizes subsistence farmers, local markets and undermines their own livelihoods by reducing into tenants (Birhanu *et al*, 2006; Desalegn, 2011). These evils of expropriation for commercial farming and unwillingness to dislocation catalyze conflict and violence. Typically, resistance, grievance and conflict against expropriation and commercial farms have occurred in Minjar Shenkora woreda of North Shewa in 2017 (AMMA news, Nov. 12/2017); Bakoo Tibee woreda in 2003 (Desalegn, 2011) and Gambella region (Azeb, 2017). On the same token**,** most agricultural investments in Bahir Dar Zuria Woreda have been destroyed through popular protest in august 2016. Evidently, evictees were involved in violent destruction against farms in the peripheries of Bahir Dar City in August 2016 (Reuters, 10 August, 2016; ANRSIC, 2017). The farms have been partially or fully vandalized through attacks which was an indication of opposition against expropriation for agricultural investment by the government (Reuters, 10 August, 2016). This was an explicit conflict of interest between evictees in one hand and the government and investors on the other hand. The violence was a demand for rehabilitation and justice but it brought destruction awfully both on property and human life. At the time being, *Jovani Alphano* farm has totally burnt out and stopped production since 2016 summer due to this the land has turned to be idle over the last two years. Concomitantly, *Tana Flora*'s fence was partially demolished through attacks. Amazingly, the grievance of peasants' is still continuing in news against expropriation, compensation process and its accompanied economic evils on local communities. This in turn engendered political dissatisfaction and hostility against investment sites. Although many studies have been conducted on the issues of land expropriation and commercial agricultural investment within and outside Ethiopia, oppositions against expropriation and destruction of investment sites have been continuing from time to time. Thus, this study made a systematic inventory on the Political-Economy of agricultural investment in Bahir Dar Zuria woreda by taking *Jovani Alphano* and *Tana Florafarms* as an empirical appraisal.

Objectives of the Study

The overall purpose of the study was to examine the political-economy of agricultural investment in ANRS: a focus on flower farms in Bahir Dar Zuria Woreda. More specifically, it intended to:

- To explore the nature of land expropriation in the study area

- To assess the nature of compensation in the study area
- To identify the economic consequences of flower farms on the locals in the study area
- To appraise the political consequences that flower farms bring about in the study area.

Research Methods

The study employed a mixed research approach with concurrent parallel research design to address the research objectives because the problem under investigation has both objective and subjective aspects of reality. In this regard, the extent of land expropriated, peoples' engagement in land dealings, the amount of compensation paid , property destroyed by violence, number of employees hired and wage paid could easily be known by consulting reports and dispatching survey. Conversely, peoples' perception and feeling about land expropriation, compensation process and its accompanied politico-economic consequences were addressed through qualitative approach. The study employed both primary and secondary sets of data through direct interviews, Focused Group Discussion, document review and questionnaire. The researcher employed purposive sampling to select interviewees, thus, a total of 31 individuals from evictees, Amhara National Regional State Investment Commission, Bahir Dar Zuria Woreda Rural Land Administration and use Office, scholars and compensation valuation committees were selected. Similarly, two focused group discussion was held with evictees. Besides, stratified sampling was employed to choose respondents for survey based on the nature of land status whether expropriated /unexpropriated farmers as a criterion to identify strata groups. After strata groups were identified, the final samples were taken based on stratified random sampling technique for survey in accordance with sample size determination formula. By and large, a total of 160 evictees were selected in the two case study areas. In doing so, both the quantitative and qualitative data were collected simultaneously and independently. Finally, the data were analyzed via simple descriptive statistics and thematic analysis in an integrative manner through joint display mechanisms.

Data Presentation, Analysis and Interpretation

The Nature of Landholdings and Expropriation

Table 1: Distribution of Sample Respondents based on Response about Nature of Landholdings

No	Items	Response	Frequency	Percent
1	Does your household possessed land for crop production and other purposes?	Yes	139	86.9
		No	21	13.1
2	If yes, what is the size of land you hold per hectare?	Below 1 hectare	130	81.5
		1-2 hectare	9	5.6
3	How do you compare the current land size with the land you had before 10 years?	Decreasing	139	86.9
		Nothing	21	13.1
4	If decreasing, what do you think is/are reason/s/?	flower farm	150	93.8
		2, 3	10	6.3
5	Type of land taken	Farmland	160	100

Note: (2, 3) stands to show expropriation to flower farms and sharing to children

KII2 [1]stated that the issue of land access has been the most critical issue and becomes a centerpiece in Ethiopian politics for long because it is the source of everything. Similarly, evicted interviewees witnessed that before the last ten years, they had adequate agricultural land serving for the production of crops and other purposes. But their farmland size was decreased due to expropriation for flower farms and sharing to children's. Thus, shortage of agricultural land and its apparent acquisition for investment becomes the most up-to-date issue in government-society relations in Bahir Dar Zuria Woreda. In relation to landholdings, about 86.9 percent of sample households have possessed a farmland and the rest 13.1 percent have no farmland at all. In the same phraseology, from 86.9 percent of sample households who possessed a farmland, 81.3 percent of survey households have a farmland below one hectare currently which sustains an average household family size of 7.04. This connotes the mean land holding size of surveyed households is below one hectare, which is lower than the national average (1.22 hectare) (Sosina and Holden, 2014). Therefore, shortage of farmland is one of the severe constraints of farming surveyed households to produce enough agricultural production and sustain the basic needs of their family in the study area.

Concerning the nature of land expropriation, both the federal and regional proclamations allowed open public consultation to realize its objectives (Belachew, 2013; Daniel, 2015). Land expropriation was conducted without involving evictees in land dealings in the study area. Government reports revealed that a decision to free land from third bodies was raised by the Amhara Regional Environmental Conservation; Land Administration and Use Bureau with no detailed procedures about peasants' engagement in land dealings. Concomitantly, about 34.4 and 32.5 percent of surveyed households witnessed 'strongly disagree' and 'disagree' respectively concerning the consultation of the public before the conduct of expropriation. Moreover, evicted interviewees stated that expropriation was an imposition of a decision made from above. However, Belachew (2012) noted that a heartfelt welcome of the locals and ensuring their consent determines the success of investment projects through expropriation. In connection to this, nearly two third of sample respondents articulated that they were not asked about their consent before land acquisition. Inversely, one third (35 percent) of sample respondents agreed that government asked their consent after decisions once decided at top level officials. But the consent was ascertained after the government decided to take the land for investment. In this regard, Addisu (2016) opined that community consultation should earn approval from the affected communities before expropriation because ascertaining the consent of evictees about expropriation is helpful to the government to appreciate the concern of landholders and create smooth environment for the farms commenced (Daniel, 2015). By contrast, the study found that expropriators did not provide written notification for peasants' by indicating the time when the land would be vacated and compensation paid. This was an indication about the denial of expropriation of landholdings and payment of

[1] Key informant interview

compensation proclamation No. 455/2005. Thus, the farmland was expropriated without reaching consensus with evictees and providing written notification to them.

The Nature of Compensation and Property Valuation

Compensation is at the centerpiece of land expropriation in contemporary Ethiopia (Belachew, 2013). It is used as a means to keep the balance of social justice and protect the rights of landholders from arbitrary confiscation (Daniel, 2012). To realize this, a careful and proper valuation of properties should be made in payment of compensations (Daniel, 2009). This study revealed that compensation was paid to each evictee in cash without choice of compensation. But evictees were not satisfied on the amount of compensation paid to them. The data obtained from surveyed and interviewed households witnessed that the compensation amount was inadequate for many years and below their expectation. They further viewed that land is a major asset for agrarian communities serving for life whereas cash compensation was perishable and consumable within a short time. Government reports revealed that compensation was estimated by committees composed of four individuals from different sectors and professions without fully preparing necessary information. The compensation payment document witnessed that the valuation committees failed to register the full name and address of evictees. This contradicts Amhara National Regional State regulation No. 5/2010 article 11(1) in which land valuation committees should register the full name of landholders with their address to estimate compensation carefully. Within its ramifications, the valuation committee estimated compensation in accordance with properties situated on the land, by products of crops, natural and man made trees, the loss of the land itself and labor force employed to plough the land. But the valuation process was very rush accompanied with mistakes and jumping because it was undertaken in a time in which summer season was approaching to enter. This contributed its own part in making compensation valuation full of uncertainty and jumping. On the other hand, Belachew (2013) noted that valuation of compensation should be carried out with a careful consideration of ownership details in payment of compensation. In this study, administrative intervention occurred due to the absence of detailed working procedures of compensation valuation. As highlighted clearly in Proclamation No.455/2005 article 10 (4), the working procedures of property valuation committees shall be determined by directives. However, the details of property valuation procedures are not enacted and enforced at the time of property valuation undertakings at both the national and regional level. This connotes that compensation valuation was arbitrary and dictatorial in nature. Hence, the nature of compensation reflected the discrepancy of the theory and actual implementation in the study area.

Economic Consequences of Flower Farms

Table.2: Distribution of Sample Respondents Response about Crop Production after Expropriation

No	Items	Response	Frequency	Percent
1	The land taken to flower farm	Reduced overall crop production	138	86.3
		No change in crop production	22	13.7
2	Albeit land taken, family food system improved	Strongly disagree	96	60.0
		Disagree	38	23.7
		No idea	11	6.9
		Agree	15	9.4
3	Food system not changed after land taken	Strongly disagree	86	53.1
		Disagree	47	29.4
		Agree	25	16.2
		Strongly Agree	2	1.3

Reduction of Crop Production and Deprivation of Alternative Livelihoods

According to evictees, the commencement of farms brought deprivation of local livelihoods and reduction of crop production. They further added that expropriation of land for flower farms created land shortage and thereby reduced crop production of sample households. In this regard, about 86.3 percent of the respondents replied that expropriation reduced crop production. Both evicted and government interviewees witnessed that the expansion of flower farms by dislocation impeded alternative land use arrangement and created shortage of farmland. The data obtained through interview indicated that peasants were suppliers of crops in the market previously but now they become buyers. This exacerbated imbalance of supply and demand as well as price inflation in the local market that strongly undermined peasants who purchased cereals for consumption. Thus, the reduction of crop production made peasants vulnerable to increasing price inflation of crops and problems of food insecurity. Investment expansion by dislocating prior users must focus on food security (VOA, May 13/2018). Investment is good but evictees must be sustainably promoted and be part of the development process to the success of the farms as well. But Getnet (2012) noted that the acquisition of land by investors ultimately threatens smallholder agriculture which in turn harms local livelihoods. By the same token, Aabo and Kring(2012), Desalegn (2011) opined that investors are profit driven aspired to maximize their export with poor coordination to local economic development and food security. Nowdays, the agricultural policies that emphasized commercial agriculture in Ethiopia has faced impediments as a result of local communities' exclusion in the development process (VOA, May 13/2018). This study also found that the production in commercial farming was destined to the external market without careful assessment to the best interest of evictees, national development and food security priorities.

Evictees accentuated that the number of people engaged in land renting increased very radically after expropriation. This made the price of land very costly which strongly undermines the renters; thus, evictees were forced to search cultivated land elsewhere with increasing competition to access land. Concomitantly, government interviewees admitted that shortage of land is the day to

day claims and question of residents in meetings and conferences. Moreover, evictees articulated that alternative livelihood sources have been negatively affected in the area. They further added that the value of share cropping was 1/3 or 1/4 before the emergence of flower farms but after expropriation the value of a shared land became equal with some form of graft. In connection to this, Desalegn (2013) noted that land acquisition by investors exposed peasants to engage in stiff competition over scarce resources. This study also witnessed that local communities in general and evictees in particular involved in warm competition over scarce land for renting and share cropping in Bahir Dar Zuria woreda. However, Addisu (2016) noted that a household head who owned a pair of oxen in Gurra Ferda can secure more farmland for share cropping. But this study revealed that expropriation of land for flower farms exacerbated land shortage and invited peasants to engage in stiff competition to share cropping and renting. Moreover, evictees opined that the introduction of flower farms brought incompatibility of livelihoods. They further elaborated that they were engaged in honey and livestock production to supplement their lives before the commencement of flower farms. But the expansion of flower farms impacted negatively on alternative business activities and land use arrangements. According to Desalegn (2013) livestock production contributes for household food consumption and income generation as a coping strategy to escape from economic misery in Bako Tibee Woreda following expropriation. Unfortunately, evictees in Bahir Dar Zuria woreda were unable to engage in honey and livestock production following the commencement of flower farms. In this regard, Gebre (2017) opined that the expansion of investment increased pressure and incompatibility of livelihoods. The excessive use of pesticides and shortage of crop residue negatively constrained peasants' engagement in honey and livestock production respectively. In connection to this, Elias (2012) indicated that adequately unprotected working conditions and pesticides in flower farms caused disease and affects other livelihood sources of local communities. Thus, the poor environmental assessment and unsafe working conditions of flower farms negatively impacted alternative livelihood activities in the study area.

Creation of Job Opportunities

Table 3: Distribution of Sample Households' Response about Employment Generation in Flower Farms

No	Items	Response	Frequency	Percent
1	Flower farm created employment to me	Strongly disagree	95	59.4
		Disagree	51	31.9
2	Wages paid to employees is enough in farms	Strongly disagree	94	58.8
		Disagree	37	23.1
		No idea	29	18.1
3	Salary paid to employees in the farms is less than daily laborers in community	No idea	24	15.0
		Agree	57	35.6
		Strongly Agree	79	49.4

According to evictees, the farms generated job opportunities for many individuals albeit evictees have not been beneficiaries. The farms created job opportunities only for 8.7 percent of sample households; however, evictees were employed in the farms as daily laborer where as better jobs were allocated to individuals came from town. Inversely, about 59.4 & 31.9 percent of the sample households responded 'strongly disagree' and 'disagree' respectively that flower farms generated job opportunities to them. This connotes that most evictees were not hired in the farms due to inadequate wage; thus, evictees were forced to search better paid jobs in towns compared with the wage of farms. Similarly, the locals were not employed in technical works due to lack of skills. Although flower farms were highly labor intensive, the wage was too low and inadequate to cover the monthly expenses of employees. Consequently, evictees revealed that the increasing price inflation of living and wages paid to employees is unbalanced. This made evictees less interested to work in the farms. In this regard, the inadequate wages of employees caused violence and destruction of farms in Gojeb kebele around Bonga Town (VOA, May 13/2018). Evictees also asserted that the absence of strong coordination in expanding commercial farming vis-à-vis with rehabilitating evictees adversely affected the locals not to be given priority in employment. On the same token, government interviewees accentuated that investors have been motivated to maximize their profit by bringing individuals with a relative skill working at a low wage because investors have no contractual duty to provide priority to evictees. They further added that employment generation was determined by the market force in flower farms. Hence, evictees were unhappy and dissatisfied to work in the farms as a result of inadequate wage. Besides, evictees revealed that the nature of jobs in the farms is too precarious and causal which did not brought stable working conditions for employees. They further added that workers have been dismissed from jobs with no remedies. The study found the absence of a minimum threshold of wage to daily laborers; hence, workers were exploited physically and economically in the farms. The absence of good working conditions and inadequate wage exacerbated high employee turnover. In this regard, Elias (2012) noted that flower farms optimize flexible methods of production and generation of employment. Besides, the natures of jobs in the farms are exploitative which never attuned the current living conditions (VOA, May 13/2018). The wage of employees in commercial farms is not equivalent to the rising living inflations of the market (VOA, May 13/2018). Consequently, the farms ensured neither food security nor job opportunities to evictees.

Inefficient Utilization of Resources

All interviewees opined that inefficient utilization of land was the other economic consequence of flower farms in the study area. A large hectare of land has been inefficiently utilized in both farms. The land appropriated by *Jovani Alphano* became unproductive for the last 11 years. The farm utilized only 12 hectares of land for its intended objectives before two years ago. But, currently, all the land is unproductive which costs local communities and the country. As a result of the inefficient utilization of the land, in 2014 the regional investment commission transferred 75 hectares of land to other investors from *Jovani Alphano.* Similarly, *Tana Flora* farm used only 38 hectares in flower production and around 40 hectares in horticulture investment. But the remaining

60 hectares of the farm's land remained unutilized still now despite its good moves. The complex nature of investment, rent-seeking behavior of investors and government officials, absence of international air flight and local communities' negative attitude to investment sites caused inefficient utilization of allocated land. Hence, the land remained unutilized as a consequence of misguided policy and misappropriation of resources for several years. Nowadays, structural shift to smallholder agricultural intensification is required by accompanied it with expansion of industry to achieve food security (VOA, May 13/2018). Investment projects are planned and commenced to solve societal problems and to achieve all round development but failed to do so (Gebre, 2017). This failure of agricultural investments necessitated the preparation of nationwide supportive framework to ensure productivity (Walta News, May 27/2018). Hence, commercial farms are encountered failure and ramifications practically to achieve their intended objectives.

Technology Transfer and Infrastructural Development

Table 4: Distribution of Sample Respondents' Response about Infrastructural Development by Farms

No	Items	Response	Frequency	Percent
1	Roads are constructed to communities	Strongly disagree	160	100
2	Electricity provided to communities	Strongly disagree	160	100
3	Clean water availed to residents	Strongly disagree	160	100
4	Economic-linkage created	Strongly disagree	160	100
5	Technology transfer made	Strongly disagree	160	100

As highlighted in the figure, infrastructure has not been constructed to local communities by flower farms. The farms are engaged in flower production where economic linkage and technology transfer to local communities remained impossible. Technology could be transferred if the farms engaged in production of crops and fruits produced in the area. However, technology transfer and economic linkage between peasants and the investor remained a mere talk by the government. In this regard, Desalegn (2011) opined that investors have no legal and contractual obligation to provide social services to local communities and meeting the food security needs of the country. Concurrently, technology transfer and economic linkage cannot be ascertained in Ethiopia by investors due to absence of legal contractual obligation (VOA, May 13/2018). Hence, the farms brought neither infrastructural development nor economic linkage and technology transfer to local communities. But the farms' contribution in generation of hard currency remained less promising compared with the land appropriated. Despite the farms contribution in export item diversification, the Ethiopian Horticulture Producers and Exporters Association in its statement to House People Representative's agricultural regular committee announced that the performance of floriculture and horticulture investment in generation of hard currency is below the planned level in its annual investigation (Kana news, May 11/2018).

The Political Consequences of Flower Farms on Local Communities and the State

KII3 asserted that expropriation of land for flower farms brought various political consequences. The informant further added that expropriation is uncommon and considered as anti-people in the eyes of residents in many investment sites. Thus, it demanded wider public consultation and consensus; otherwise it could fail to meet its intended objectives. On the same token, KII2 revealed that the mere imposition of development policy without wider public consultation is exposed to failure and susceptible to violence. This indicates that dislocated landholders must be part of the development process and a consensus should be reached. According to Dr. Aklog Birara, evictees should be part of development and continuously rehabilitated when investments are expanded by dislocation (VOA, May 13/2018). Similarly, Belachew (2012) noted that any development project commenced by dislocating prior users should ensure benefits to everyone including evictees. But the unfair distribution of resources accompanied with economic vulnerability and exclusion grieved excluded sections of a society (Collier and Hoeffer, 2002). This study witnessed that the government expropriated land without making open public discussion in land dealings and reaching consensus with peasants. Generally, the commencement of flower farms brought the following political consequences.

Table 5: Distribution of Sample Households by Their Responses on the Political Consequences of Farms

No	Item	Response	Frequency	Percent
	Flower farms are painful to local communities	Yes	159	9 9.4
		No	1	.6
	Conflict due to flower farm	Yes	160	100
	People participated during d transfer	Evictees	136	85
	Measures taken if similar instability occurs	Yes	53	33.1
		No	3	1.9
		Unknown	104	65

Destructive Violence and Conflict

As indicated in the above table, almost all surveyed households pointed out that flower farms are painful to local communities; thus, flower farms engendered conflict and violence in the study area. Evictees revealed that the land acquisition process was strongly resisted for *Jovani Alphano* and *Tana Flora* farms in 2006 and 2007 E.C respectively**.** They further added that strong resistance and opposition against land acquisition were made with no violence in both farms. In this regard, about 85 percent of sample households confirmed that evictees participated in the conflict at the time of land acquisition. The violence occurred after farms began actual operation which

galvanized political instability and destruction of investment sites because all residents were major participants at this phase. In this regard, Smalley (2014) opined that a land expropriated from smallholder farmers without their consent and engagement in the land deal process exacerbates potential local resistance and political opposition. Similarly, Desalegn (2011) found that peasant protest has occurred in Bako Tibee woreda during the land acquisition process and after the commencement of farms. In this regard, Belachew (2012) claimed that the success of development induced farms requires voluntary cooperation and heartfelt welcome by dislocated people. But the confusion of the public about the merits of farms and compensation package aggravated violence and conflict (Daniel, 2015). Similarly, Anyanwu (2004) noted that people engaged in violence in seeking justice when they are mistreated and discriminated. Besides, inadequate wages of employees and dislocation caused a pandemonium to occur against investment farms in Gojeb kebele around Bonga (VOA, May 13/2018). Therefore, the study witnessed that conflict and violence was demonstrated during land acquisition and after the commencement of farms respectively in the study area. Furthermore, all interviewees accentuated that the violence brought human death, disability of few, physical violence and destruction of huge assets in both farms. This in turn brought unnecessary cost to the country to insured the destructed assets of investors.

A similar incident happened in Adolla town by opposing Legedembi Gold Mining's environmental pollution and devastative impacts but the violence ended in death of dozens, disability and social disorder (VOA, May 10/ 2018). On the same token, interviewees articulated that the future prospect of investment sites is uncertain because the society would take measures if similar instability occurred. Furthermore, KII1 revealed that as long as evictees are not part of the development process, similar attacks would avail. The key informant further added that a society feeling marginalized and excluded is buying fertile conditions to sabotage investment sites. This proved that unrest and unpredictability of security became far reminders in the area after farms commenced. Thus, the future sustainability of the farms was unpredictable and full of uncertainty. Furthermore, interviewees noted that the violence was transplanted by continued deep grievance, feeling of neglect and unequal level of development. In this regard, one evicted interviewee explained the causes as "War is better than famine in which problem of bitterness, hopelessness and economic waning caused the violence" (EI005, Feb. 08/2018*)*. In this regard, Aabo and Kring (2012) noted that vague promises of benefits and closed land deal negotiation caused conflict and instability in agricultural investments. Similarly, inequitable sharing of resources and benefits of developmental projects creates resentment and discontent which breeds violence (Guo, 2001; McCandless and Karbo, 2011). Evidently, the absence of balanced development between evictees and investors caused violence against large scale farms in Oromia and SNNPRS (VOA, May 13/2018). Hence, it is fair to say that the violence was galvanized by the devastative economic evils of farms, dissatisfaction of evictees on expropriation and compensation process.

Tenure Insecurity

Evicted interviewees accentuated that the expropriation of land for flower farms created a sense of distrust and frustration on peasants on their remaining farmlands in the study area. It degraded

the confidence of peasants about their farmland. The declaration of the constitution and its operating proclamations, rules and decrees about expropriation of land for public purpose created a sense of fear and insecurity on peasants. Vividly, the expropriation of their land for flower farms degraded the confidence of the locals in Bahir Dar Zuria Woreda. This fear forced peasants' to plant eucalyptus on their remaining farmland on the belief to increase compensation in the future. But the expansion of eucalyptus on a farmland was spontaneous and unplanned which aggravates food insecurity. Contrastingly, Mesfin (2013) accentuated that tenure security provides an incentive to smallholder peasants to develop more efficient land use management and productivity. Seemingly, USAID (2004) vindicated that efficient land policy and administration encourage peasants to produce more and improve their land management without reducing their livelihood security. But as clearly stated in the constitution, peasants in Ethiopia have conditional right subject to subrogation at any time (FDRE, 1995). This inadequate land tenure security affected the way peasants managed and allocated their land. Similarly, the study witnessed that tenure insecurity constrained agricultural growth and livelihood resources of the locals. Thus, the planting of eucalyptus was the consequence of tenure insecurity in Bahir Dar Zuria woreda.

Strained Government-Society Relations

The expropriation of land for flower farms strained government-society relations in the study area. Evictees argued that the evils of expropriation made peasants' attitude to the government bad mannered and unfriendly. They have developed a sense of animosity and exclusion since the establishment of flower farms in Bahir Dar Zuria woreda. The previous amicable government-society relations has changed in to hostility and hatred as a consequence of unclear land deals, breaking of vague promises, inefficient utilization of appropriated land and lack of job opportunities and rehabilitative measures in the study area. Expropriation and its accompanied economic crisis inculcated suspicion, mistrust and a feeling of neglect in the minds of the locals. In the study area, local administrators imposed and executed what they were ordered from higher officials without safeguarding the land rights of their people. This makes woreda administrators to be perceived as demagogue politicians who have failed to struggle for the rights of the people. In the views of residents, woreda officials wrongly oriented evictees about the advantages of farms and compensation to get appreciation from higher government officials. Evictees asserted that the jobs created could not meet their expectations. This worsened and made government-society relations in Bahir Dar Zuria woreda bad mannered and unfriendly. In this regard, Addisu (2016) noted the presence of antagonistic relations between local community and the government in Gura Ferda woreda as a result of competition over land resources. Alongside, Borrass and Franco (2013) noted that top-down approach of expropriation policy and insignificant engagement of landholders in land deal negotiation caused conflict and spoiled government-society relations. Desalegn (2011) also argued that a land expropriated and give to investors without proper consultation and compensation is vulnerable to criticism and violence. This study revealed that a government-society relation has been spoiled due to the domino effects of flower farms in Bahir Dar Zuria woreda.

Conclusion

Commercial agricultural investment is recognized in Ethiopia since the PASDEP document to accelerate economic growth and eradicate abject poverty. To realize this, proclamations and regulations are formulated and enforced as a stepping stone for the expansion of commercial farming on both arable and used lands of peasants. But the demand to expand flower farms brought dislocation of prior users. On the same vein, the peasants in both *Workemla Achadir* and *Atangusa Chicha kebeles* in Bahir Dar Zuraia woreda were dislocated from their farmland in 2006 and 2007 respectively. The farms have commenced without peasants' genuine engagement in land dealings, proper notification and consent. This connotes that the issue of land ownership is remained unanswered in Ethiopian politics. Expropriation practically added economic evils on both evictees and the country. The study witnessed that most of the land appropriated has remained unutilized and the justifications of optimum utilization and public purpose for expropriation have failed in practice. By contrast, the ongoing outcomes are in contradiction to the interest of the masses. The farms created incompatibility of livelihoods and impacted negatively on the food security of the locals. Government-society relations, grievance and deterioration of government legitimacy have been developed since expropriation. Besides, massive appropriation of land in a land stressed society for flower farms eroded the confidence of peasants over their remaining farmland. This in turn breeds tenure insecurity and unplanned management and utilization of land. These lead to the road to the most violent pandemonium against farms in August 2016. The violence resulted in destruction of huge wealth, death and disability. In this regard, the country insured investors in millions. The targeted objectives of expropriation for public purpose and best utilization of land have failed in practice. Vividly, the expansion of commercial farming was not made vis-à-vis with empowering the displaced poor in their former status.

Recommendations

Based on the major findings of the study, the researcher forwarded the following recommendations to different stakeholders to be done to balance expansion of agricultural investment and the wellbeing of evictees. These are:

- The government should undertake expropriation after carefully investigating the local contexts and its aggregate politico-economic effects on local communities and the state.
- The government must carefully see the sites and alternative rehabilitative measures before the commencement of projects and make peasants to be part of the development projects and share the benefit to the extent possible.
- The government should facilitate conditions for evictees to the extent possible to be benefited in accordance with regulation No. 26/2008 E.C on rehabilitation of rural landholders evicted from their land for public purpose and administration of landholdings.

- The government should also bargain on the salary of employees working in private farms so as to ensure a balanced development.
- The government should follow up investors to efficiently utilize the land appropriated for investment for the benefit of the whole.
- Investors should efficiently utilize the appropriated land for its intended objectives.
- Investors should benefit the locals in their operation and giving byproducts, grass for the locals to engage in livestock production than burning.

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The Cost Efficiency of Private Banks in Ethiopia (2015-2018), Getnet Zemene Muche, Berhan Bank S.C.

Abstract

The main focus of every financial system is financial intermediation, which is mobilizing financial resources from the surplus sector and lend to the deficit outlets to facilitate business transactions and economic development based on the monetary and fiscal policy of the country. In doing so, Banks need to allocate scarce resources efficiently when providing their products and services since they particularly employ highly skilled human capital, actor monetary instruments and their inefficient intermediation crowds out of the use of productive factors in other sectors that could potentially foster economic growth and development. The main objective of this study was to analyse the cost efficiency of private commercial banks in Ethiopia over the period from 2015-2018. For this purpose, the study used secondary data from the annual reports of banks under study. To estimate the technical, allocated and cost efficiency score, data envelope analysis (DEA) model was employed on the four inputs variables: deposit, number of employees, fixed assets and number of Branches. The outputs are loans and advances. The input prices are calculated as ratio of interest expenses to deposits, personnel expenses to number of employees, depreciation expenses to fixed assets, and branch expense to number of branches, respectively. The estimated cost efficiency using the method of data envelope analysis (DEA) model indicates that overall (cost)efficiency score of private banks in Ethiopia ranges between 0.80 (2015) and 0.88 (2018) with an average equal to 0.85 over the period of the analysis. Thus, Ethiopian private banks could improve their cost efficiency by 15% on average or, banks could have used only 85% of the resources actually employed (i.e. inputs) to produce the same level of outputs. Moreover, in all years, allocated inefficiency was higher than technical inefficiency. This problem of selecting the optimal mix of inputs, given the prices, can be associated with leader's ability to use the optimal mix of inputs while aggressively moving for resource mobilizations. On average, the sample banks could improve allocated efficiency by 10% and technical efficiency by 6%. This implies that the source of cost inefficiency was leadership problem and leaders of banks were not good at selecting the optimal mix of inputs given the prices. In terms of trends, the cost efficiency scored showed an improvement while in relative sense, Awash Bank is the best cost-efficient bank from the big six banks, and Enat Bank and Debub Global bank are better cost-efficient banks from the emerging banks. It is also confirmed that, Buna Bank, Abay Bank, Oromia International Bank, and Berhan Bank are less cost-efficient banks under study. Based on the findings, the study recommended that cost inefficient banks should critically evaluate their strategic planning process and evaluate their marginal product with its corresponding marginal cost (additional input mix for additional resource), increase productivity of their functional units, especially branch productivity, by focusing on branch opening strategy, service standardization and technology dynamism.

Keywords: allocate, technical efficiency, cost efficiency, intermediation approach, data envelopment analysis, private commercial banks in Ethiopia

Introduction

Ensuring efficiency is critical for banks to continually play their core role of financial intermediary in mobilizing financial resources and channelling them towards productive investment ventures. Cognizant of the fact that the good performance of the financial sector is a crucial factor for sustained economic growth, studying the level of efficiency of banks working to improve efficiency has paramount importance. Besides, in a competitive banking system, only strong, technically efficient and profitable banks can promise a realistic return to their stakeholders and reduce the probability of bankruptcy. For banks to effectively play the aforesaid role, they should be efficient in transforming their expensive inputs into various financial products and services with a higher return.

The socio-economic environment wherein Banks are operating in Ethiopia is characterized by the existence of multitudes of unbanked population, continuously growing the national economy and expanding infrastructure necessary for banks operating at macro level. Moreover, at sectorial level, banks are highly competing for financial resources to serve the growing demand for loans. In these regards, banks pursue branch expansion as a major source of resources mobilization. Banks are opening a growing number of branches with continuously escalating cost of office rent and human resource. This means that banks are operating at an increasing cost of rent and other inputs. In light of this, it is found necessary to study the cost efficiency level of the banks operating in the industry.

Statement of the Purpose

Banks need to allocate scarce resources efficiently when providing their products and services. Since banks in particular employ highly skilled human capital, their inefficient intermediation crowds out the use of productive factors in other sectors that could potentially foster economic growth and development. Some banks tend to register a better output using similar inputs, while others do not. Thus, its various performance levels (efficiency) of banks in the industry can be observed as a problem. Hence, it is necessary for banks to measure their efficiency level, identify the benchmarking of banks, and learn the best experience from the efficient banks.

Objective of the Study

Estimation of banks efficiency is among the concepts that have received greater emphasis over time in the rest of the world although it has been overlooked in Ethiopia. The overall objective of the study is to analyse the efficiency level of private commercial banks in Ethiopia.
More specifically, it aims:

- To scrutinize the efficiency level of private commercial banks, benchmark from the best performers, and imitate the experience of benchmarking banks in the industry.
- To identify weak performance indicators of the bank and adopt the best strategy from the relatively efficient banks.

Significance of the Study

The study helps to identify relative cost efficiency of banks with their corresponding source of inefficiency. Moreover, the findings of the study can be helpful to policy makers, top management in the banking sector, and researchers.

Scope of the Study and Limitations

Performance of all private commercial banks, except Zemen bank is incorporated from 2015-2018 in the bank level efficiency measurement. Zemen bank is excluded due to its unique model (one branch service model). Moreover, the study did not examine the impact of ownership on cost efficiency between private and government commercial banks.

Methodology

Variables Definition and Measurements

The first step in measuring efficiency using DEA is to specify the inputs and outputs of banks. In this study, the intermediation approach is adopted, which assumes that banks act as financial intermediates that collect purchased funds and use labor and capital to transform these funds to loans and other assets. The four inputs are: deposits (X1), number of employees (X2), fixed assets (X3), and number of Branches (X4). The outputs are loans (Y1). The input prices are calculated as interest expenses to deposits (P1), personnel expenses to number of employees (P2), depreciation expenses to fixed assets (P3), and branch expense to number of branches (P4).

Table 1: The Bank Level Study Variables in the Input and Output Measurement (DEA Model)

Input Variables	**Measurement**
Deposit (X1)	The sum of demand, time and saving deposit
Number of employees (X2)	Clerical and non-clerical employees
Fixed asset (X3)	(PPE)
Branches (X4)	Total Number of branches in the bank
Input prices in Birr	**Pricing Formula**
Deposit	P1= Total interest expense /Deposit
Number of employees	P2= Salary & benefit /total number of employees
Fixed asset	P3= Depreciation on fixed asset /total fixed asset
Branches	P4= total rent paid /number of Branches
Output Variables	
Loan	Y = Outstanding loan

Method of Data Analysis

The technical efficiency score of each private commercial bank under study is estimated using the DEA.

This study measures efficiency by analysing the actual performance of banks, that is, the actual input and output under best-practice that produces identical output under the same conditions. The study measures cost efficiency- the reduction in cost that could be achieved if what banks allocated and is technically efficient are analysed. As cost functions are not directly observable, inefficiencies are measured in comparison with an efficient cost frontier (Hermes et al, 2008).

Literature Review

Bank Efficiency Measurement

According to Sherman and Zhu (2006), overall productivity of a bank depends on four components of efficiency classification. They are:

1. Technical efficiency: Also known as global efficiency measures the ability of banks to produce actual outputs with fewer inputs, or less resources used indicate higher efficiency;
2. Scale efficiency: Refers to the optimal activity volume level whereby inefficiency may arise if goods or services are produced above or below optimal level that resulted in added fixed cost;
3. Price efficiency: A bank could increase its efficiency if it could purchase the inputs (human capital and material) at lower price without sacrificing the quality;
4. Allocate efficiency: Measure the optimal mix of several inputs in order to produce products or services, such as banks incorporate automatic teller machines (ATM) and Internet banking for capital labour trade-offs to increase efficiency (Sherman and Zhu, 2006).

In addition, by definition, technical efficiency refers to the firm ability to maximize output with the given inputs, or produce same level of outputs with minimization of inputs, while allocated efficiency refers to the optimum arrangement of inputs and output at a specific price (Cooper et al., 2006). Technical inefficiency may arise in the conditions where banks produce more outputs with the actual inputs or when banks produce actual output with fewer inputs (Sherman and Zhu, 2006), or generally speaking technical inefficiency exists when banks are wasting some of the inputs (Mester, 2003).

In the literature of banking, the measurement of efficiency has been approached from a variety of dimensions. The traditional approach has used a variant of ratio analysis using a number of financial ratios (e.g., ROA, ROE).

Financial ratios can measure the overall financial soundness of a bank or branch and the operational efficiency of its management (Chen and Yen, 1997). Ratio analysis was used for both normative and positive reasons (Whittington, 1980). The normative approach compares a company's ratio to a benchmark to judge its performance, while the positive approach uses ratios

to predict future performance and bankruptcy, and assess the riskiness of the company. Both approaches had some success. However, there have been many methodological problems (Barnes, 1987; Smith, 1990; Fernadez - Castro and Smith, 1994) that have pointed out the numerous weaknesses of the ratio analysis. Its main weakness is that the choice of a few or a single ratio does not provide enough information about the various dimensions of performance. As a result, a bank that is poorly managed on certain dimensions may appear to be performing well as long as it succeeds in the other dimensions.

Furthermore, it is a short run analysis that may be inappropriate for describing the actual efficiency of the bank in the long-run since it fails to consider the value of management actions and investment decisions that will affect future performance. Another problem that may arise is the choice of a benchmark against which to compare a univariate or multivariate score from ratio analysis. Commonly used performance ratios fail to consider multiple outputs (services and/or transactions) provided with multiple inputs.

The problems in financial ratio analysis have prompted researchers to new ways of measuring efficiency in the banking sector. For example, researchers have shifted to measure efficiency that refers to the ability of the bank to control costs and generate revenue.
Indeed, in order to minimize the above-mentioned limitations of Ratio Analysis Method, this study used the Data Envelopment (DEA) approach developed by Charnes, Cooper and Rhoades (1978).

Overview of Data Envelope Analysis (DEA)

DEA was first developed by Farrel in 1957, which later been modified by Charnes-Cooper-and Rhodes (CCR) in 1978, and (Klimberg et al., 2009). It is a non-parametric method that utilizes linear programming to measure the level of efficiency of comparable decision-making units (DMU) by employing multiple inputs and outputs (Klimberg et al., 2009). This technique of measuring efficiency was first introduced by Farrel in 1957 based on the basic theory of production on single input and single output such as "output per work hour" in a form of ratio (Ayadi et al, 1998; Cooper et al., 2006; Sherman and Zhu, 2006).

Efficiency = Output/Input

However, this measurement does not entirely represent efficiency as commonly multiple inputs are used to produce single or more outputs, which lead to the modification of original equation to include multiple inputs and outputs.

Efficiency = Weighted sum of output/ Weighted sum of input

In DEA, methods to measure efficiency of DMUs are referred to a group of firms under study such as banks, hospital etc. DEA is a most accurate technique to measure efficiency given limited number of DMUs (i.e., banks). DEA occasionally called frontier analysis, a performance

measurement technique that can be used for analysing the relative efficiency of productive units in the case of banks with the same multiple inputs and multiple outputs.

DEA as Bank Efficiency Measurement Tool

In DEA, methods to measure efficiency of DMUs are referred to a group of branches under study such as banks, hospital etc.
The importance of efficiency measurement is to enable managers to benchmark bank performance and define areas of inefficiency for future improvements (Mostafa, 2007). The areas of inefficiency are not limited to the result of poor management performance alone; instead it might be due to managerial, technological and socio-economic (Sherman and Zhu, 2006).

Basic types of DEA Model

DEA efficiency scale was calculated using both Constant Return to Scale (CCR) and variable Return to Scale (VRS) model. CRS efficiency scores are less than or equal to the corresponding VRS efficiency score, due to the difference scale size of each DMUs.

Return to Scale in the DEA Model

Efficient frontier in DEA can be derived using the alternative of Return to Scale assumption, in which each describes the rate of substitution between inputs and outputs either to be increasing, constant, or decreasing within each segment of the frontier (Sherman and Zhu, 2006)

$$\max \frac{\sum_{j=1} v_{mj} y_{mj}}{\sum_{i=1} u_{mi} x_{mi}}$$

Such that

$$0 \le \frac{\sum_{j=1} v_{mj} y_{nj}}{\sum_{i=1} u_{mi} x_{ni}} \le 1; n = 1,2,\ldots,N$$

$v_{mj}, u_{mi} \geq 0$; *i=1,2,…,I; J=1,2,…,J*

Where:

N: Total number of DMUs *J*: Weighted sum of outputs *I*:

Weighted sum of inputs

M: The base DMU (calculating m^{th} DMU)

N: DMUs

I: Inputs

J: Outputs

v_{mj}: Weights for output

u_{mi}: Weights for input.

Since the above equation is in the fractional function, it is difficult to compute, thus, CCR(1978) transform the equation into linear programming equation by setting the denominator of the ratio to one or unity to form a liner programming equation Model 2 or equally known as output-maximization CCR model(Cooper et al.,2006; Sherman and Zhu,2006;Ramanathan,2007;Chen et al.,2008)

Interpretation of the Result

Overall Industry Result

The study aimed at examining the relative cost efficiency level of commercial private banks in Ethiopia except Zemen Bank which is excluded since it adopts a different business model. We estimate separate annual efficiency frontiers rather than a common frontier across time. Isik and Hassan (2002) point out the following two advantages of this approach. First, it is more flexible and thus more appropriate than estimating a single multiyear frontier for the banks in the sample. Second, it alleviates, at least to some extent, the problems related to the lack of random error in DEA by allowing an efficient bank in one year to be inefficient the another, under the assumption that the errors owing to lack or data problems are not consistent over time. Table 1 below presents the average efficiency scores by year.

The overall (cost) efficiency score ranges between 0.80 (2015) and 0.89 (2018) with an average equal to 0.86 over the period of our analysis. Thus, Ethiopian private banks could improve their cost efficiency by 14% on average. In other words, banks could have used only 86% of the resources actually employed (i.e. inputs) to produce the same level of outputs. In all years, allocated inefficiency was higher than technical inefficiency. This problem of selecting the optimal mix of inputs given, the prices can be associated with the industry's aggressive movement in resource mobilizations.

On average, banks in the sample could improve allocated efficiency by 10% and technical efficiency by 5%. This implies that the source of cost inefficiency was that managers of banks were not good at using the minimum level of inputs at a given level of outputs and they were not that good at selecting the optimal mix of inputs given the prices.

Table 1: Overall Efficiency

Year	# Banks	Technical efficiency	Allocative efficiency	Cost efficiency
2015	15	0.93	0.86	0.80
2016	15	0.96	0.93	0.89
2017	15	0.98	0.89	0.87
2018	15	0.95	0.92	0.87
Mean (2015-18)		**0.95**	**0.90**	**0.86**

Relative cost efficiency

As shown on the table 2 below, based on the comparison from six big banks in the industry, Awash Bank is the highest ranking bank in efficiently allocating the mix of its inputs and producing its feasible output with given minimal inputs, and Enat bank is the relative cost effective bank from the emerging banks, while the relative cost inefficient banks are Oromia International, Berhan, Abay ,Lion, and Bunna bank, respectively.

Table 2: Relative Efficiency Comparison

	Banks	**2015**	**2016**	**2017**	**2018**	**Mean**	**Ranking**
		CE	**CE**	**CE**	**CE**		
1	AIB	1	1	1	1	1.000	1
2	DB	1	0.87	0.86	0.792	0.881	8
3	BOA	0.589	0.763	0.867	0.852	0.768	9
4	WB	0.69	0.875	0.865	0.907	0.834	7
5	UB7	0.747	1	0.941	1	0.922	5
6	NiB	0.889	0.937	0.907	0.81	0.886	6
7	CBO	1	0.935	0.924	0.946	0.951	4
8	LIB	0.601	0.829	0.744	0.725	0.725	12
9	OIB	0.647	0.566	0.701	0.765	0.670	15
10	BUNNA	0.651	0.841	0.814	0.825	0.783	10
11	BRIB	0.58	0.888	0.707	0.716	0.723	14
2	ABAY	0.707	0.878	0.675	0.719	0.745	13
13	ADDIS	0.931	0.927	0.994	0.949	0.950	3
14	ENAT	1	1	1	1	1.000	2
15	DGB	0.996	1	1	1	0.999	3
	Mean result	**0.80**	**0.89**	**0.87**	**0.7**		

Optimum Projections

Projections of targets for cost minimizing inputs were made for inefficient banks in mobilizing fund and converting to loans and advances.

Deposit

In the study period, each year banks had an idle fund of Birr 13 billion that could be converted to loans and advances. During this period, Awash Bank, Enat Bank, and Debub Global bank have effectively converted the deposit resource to loans and advances, while Dashen, Oromia International, and Nib bank were inefficient banks with large amount of idle fund. See summary of input minimizing quantities from annex table I -IV for each year.

Personnel

In the existing market for human capital, banks are employing the relatively skilled workforce of the country. Therefore, they should effectively utilize this scarce resource. Otherwise, their ineffective use will have a crowed effect on the productivity of other sectors. The result of the study reveals that the banks under study have congested around 10,000 employees (total from 15 branches) with idle capacity relative to the output achieved. In the study, Awash bank has effectively utilized its human capital, while Dashen Bank, Lion Bank, Berhan Bank, and Buna Bank were inefficient in human resource allocation. See summary of input minimizing quantities from annex table I -IV for each year.

Branches

The National Bank of Ethiopia has limited the minimum number of branches opened each year. Accordingly, the directive expects each private bank to increase by per cent of their existing number. Besides, banks pursue aggressive branch expansion as a major source of resources mobilization. Due to this, office rent is the second expense next to salary and benefit of banks under study. In terms of allocation, around 600 branches are above optimum relative to the deposit mobilized and converted to loan. The inefficient banks that expand branches without optimum allocation were Oromia International bank, Abay Bank, Cooperative Bank of Oromia, and Berhan Bank.

Conclusions

The overall (cost) efficiency score ranges between 0.80 (2015) and 0.87 (2018) with an average equal to 0.86 over the period of study. Thus, Ethiopian private banks could improve their cost efficiency by 14% on average. In other words, banks could have used only 86% of the resources actually employed (i.e. inputs) to produce the same level of outputs. Debub Global Bank, Enat Bank, and Awash bank scored relatively better cost efficiency by managing their scarce resources (inputs) to attain a fixed output, while the relative cost inefficient banks were Oromia International Bank, Berhan Bank, Buna Bank, Abay Bank, and Lion Bank. In each year, allocated inefficiency is always higher than technical inefficiency, suggesting that the dominant source of cost inefficiency of banks was allocated rather than technical. On average, the banks could improve technical efficiency by 5% and allocated efficiency by 10%. This implies that the managers of the banks were relatively good at using the minimum level of inputs at a given level of outputs, while

it is unequivocal that the banks were not strategically selecting the optimal mix of inputs given the prices.

Recommendations

- The sources of cost inefficiency for the banks dominantly came from improper allocated efficiency (un optimal input mix and corresponding price). Therefore, each bank is advised to critically evaluate its strategic planning process and evaluate the marginal product of the bank with its corresponding marginal cost (additional input mix for additional resource), and increase productivity of its functional units, specially branch productivity by focusing on branch opening strategy, service standardization and technology dynamism
- The banks should benchmark the strategy of better cost-efficient banks, especially Awash Bank.

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Determinants of Farmers' Adoption of Sustainable Agricultural Practices: The Case of Kafa Zone, Gimbo District, Ethiopia, Yohannes Bekele, St. Mary's University

Abstract

Sustainable agricultural practices (SAPs) that lead to an increase in productivity are central to the acceleration of economic growth; this will alleviate poverty and help to overcome the recurrent food shortages that affect millions of households in Ethiopia. However, the adoption rates of SAPs remain below expected levels. This paper analyzes the factors that facilitate or impede the probability and level of adoption of interrelated SAPs, by using recent data through observations. Sustainable Agricultural Practices (SAP's) is a set of practices that increase productivity while conserving soil, which put on firm foundation of conservation tillage, use of compost, fallowing farm, legume intercropping and crop rotation. This study therefore assessed factors that influencing farmer's adoption on SAPs' in Gimbo district, South Region, Ethiopia. In this study descriptive statistics such as frequency, mean, standard deviation, T-test and chi-square were used to summarize the data while binary logit model used to identify the most important factors that determine household's decision to adopt in SAPs'. Among total sample respondents 80% were adopter the rest 40% were non-adopters. Sex, Age, Educational status, participation in local Kebele Administration, farm size, plot distance, Labour availability, Livestock owned, Number of Plot, Soil fertility Status, and Land Tenure were had significant mean difference between non-adopters and adopters, to adoption in SAPs'. Results of binary logit model indicate that, Farm Size, Educational Status, Soil Fertility Status, Slop of the Plot, Total Livestock Owned and Walking distance from the Residences to the plot, had significant influence on farmers' adoption of Sustainable Agricultural Practice. Generally, the result of this study indicates that Agricultural Land Management Practices is the aggregate of many factors which should be given due attention in the innovation and transfer of agricultural technologies like SAP's.

Keywords: sustainable agricultural practices, Gimbo district, binary logit

Introduction

Ethiopian Economy is based on agriculture. Which accounts, the share of agriculture in gross domestic product (GDP) was 34.12 percent and 85 percent of total employment (MOA,2017). Moreover, agriculture is a single most important source of food for the nation (World Bank, 2013). In countries where agriculture is the mainstay of the economy, land degradation in smallholder farming is one of the fundamental consequences of environmental problems causing low agricultural productivity. Coupled with fast growing population, erratic rainfall and poverty; land degradation poses a serious threat for declining of agricultural Productivity of the nation (Bekele and Holden,1998).This sector also suffers from poor farming practices and frequent drought (Genene. 2006; Mesfin , 2010). In the last four decades there were a significant progress has been made in increasing production, however, productivity has not increased significantly (Pretty et al..2011). The major increase in production comes from expansion of land under cultivation and

shorter fallow periods, Population growth is continuing, however, arable land is shrinking in many areas (Birhanu and Swinton, 2003). Thus, the extensification path and the practice of letting the land lie fallow for long periods are rapidly becoming difficult, making continuous cropping a common practice in many areas. This leads to land degradation, low productivity and poverty in the nation.

The new agricultural paradigm concerns on save and grow strategy compatible with idea of sustainable agriculture system. The principles of sustainable agricultural practices (SAPs') are environmentally friendly, resource conserving, technically viable, economically and socially acceptable (FAO, 1989). SAPs' is not a single practice instead have multiple components such as reduced tillage, fallowing of land, use of manure or cattle dung and leguminous cropping (Ibid). Among multiple components of SAPs' reduced tillage, legume cropping, fallowing farm and use of compost get focus in this study. This agricultural practice helps to arrest land degradation problems and curb to productivity. Hence, use of SAPs' has deserved the environment, increase soil fertility, and increasing agricultural productivity has been well recognized all over the world. Different stakeholders' linkage includes researchers, extension workers and farmers work without or with weak cooperation and consideration of local situation introduction of new technology that exacerbates the problem instead or minimizing the problem (Isaac *et al.*. 2009; Oreszczyn *et al.*, 20I0). Nevertheless, SAPs' is optionless and hospitable to land, water, livestock husbandry and crop management practices that aim to improve productivity, profitability and sustainability. Cognizant the potential benefits that SAPs' may preserves advocacy for stakeholders specially, the lion-share, smallholder farming households involve in this sector.

Moreover, introduced technology package are disseminated as blanket for all areas without considering agro ecology and farmers participation but should be smart, flexible and adaptable to local conditions (Moti, Bekele and Menale, 2012). Farmers' decision to accept and implement (adopt) multiple components of SAPs' which are interrelated activities may be impede by land tenure, farm size, labor, cattle holding and the like. According to (Haiymanot, 2012), findings, a soil fertility status of agricultural land had affect the farmers' to adoption of SAPs. Similarly, labor availability and extension services had also affect the farmers' adoption of SAPs. In other studies according to (Akililu, 2006 and Getachew, 2005), findings, a farm size and Distance of the plot affect the farmers' to adopt in SAPs.

Meanwhile, most of the researches conducted were only focused on land degradation and soil water conservation. Moreover, similar studies were not conducted in the study area. On the other hand, the previous studies didn't attempt to further illustrate the multiple components of sustainable agricultural land management (SAPs), such as, reduced tillage, use of fallow, constructing SWC structures with regular maintenance, use of manure and legume cropping etc. Given this reality and the importance of the research, the study explored the detrimental factors that affect the farmers' adoption of sustainable agricultural technologies and practices.

Research Methodology

Survey Design and Sampling

For this study a multistage stratified sampling technique was applied by a researcher. In the first stage, purposive sampling was used to select Gimbo district because of the researcher preference. In the Second stage, the 31 rural Kebeles administrative (RKA) this district were stratified based on the previously implemented more than two SAP components. Accordingly, two Kebeles were selected. In Tulla and Kutti Kebele the number of total households was 320 and 430 respectively. Out of these, 140 and 260 households were selected based on their on-farm activities, the rest of households' livelihood depend on off-farm activities. Finally, 120 sample households were selected using Gender and random sampling technique; from the two RKAs according to proportion to size the sample were taken.

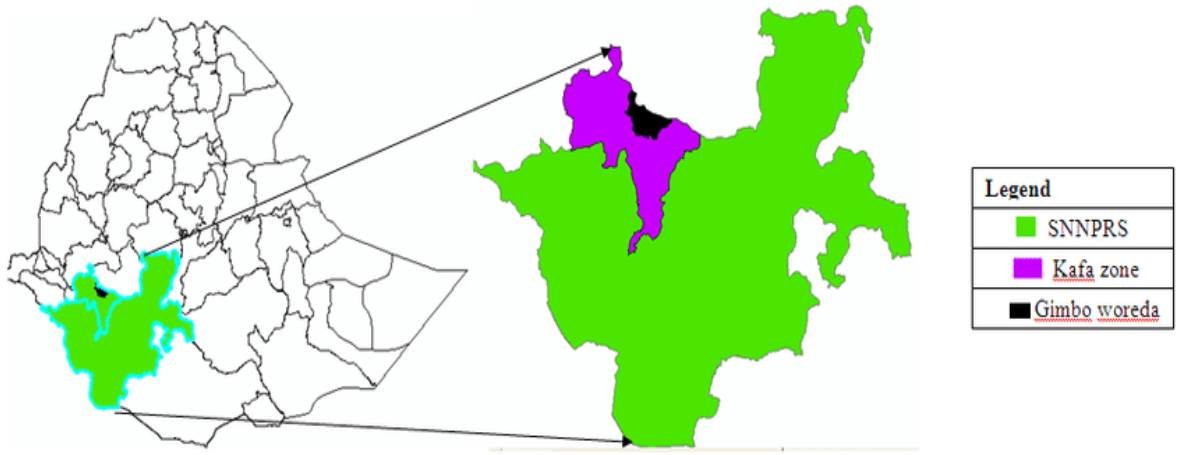

Figure 1:Map of Gimbo District Adopted and Modified from Topographical Map of EMA (1987)

Primary and Secondary Data Collection

Primary data were collected through face to face individual interview through structured questionnaire, transect and focus group discussion to generate both qualitative and quantitative data. Individual interview was done after a couple of days training to enumerators about the questionnaire details and how they administer the structured questionnaires used to collect primary data from selected sample households. At house hold level, the necessary data related to the personal information, socio-economic, plot characteristics and institutional factors that explain farmers level of understanding and attitude towards land degradation and attributes that facilitate or hinder investment in SAPs were collected using structured questionnaire through interviewing the household heads. Interviews were conducted in early morning and late afternoon and full working day during holiday between March-April, 2019.The enumerators were selected using criteria which included their educational status, local knowledge, colleagues, close to farmers in their work, etc..

To investigate deeply and get adequate information on the farmers' decision to invest in SAPs', the researcher employed focus group discussions. A total of 7 discussants (Gimbo District Agricultural Experts) were selected on the basis of their educational status and work experiences. The discussion took place at Gimbo District Agriculture Office. The researcher made informal (on- site observation) of sample Kebeles land use and patterns, cropping system, animal husbandry, vegetation, landscape and biophysical conservation structures made previously by local farmers through systematic walking. Secondary data were reviewed and collected from sources related to institutional, Bio physical and socio-economic features of the trend SAPs'. Hence, to get such valuable data the researcher collected information on SAPs from Gimbo District Agriculture Office, Kefa Zone Agricultural Office, Ministry of Agriculture Library (both documentation and internet) as well as published and unpublished documents and other pertinent documents.

Data Analysis

Both Descriptive Statistics (frequency, percentage, mean, standard deviation, t-test, and x^2 -test,) and Econometric model were used. A binary logit model was applied to explain factors impede to adoption of SAPs and help to identify key variables to determine farmers' decisions to adopt in this practice with the support of SPSS software used to analyze the data.

Model Specification

The logit model was selected for the following reasons: 1) Probit and logit models are nonlinear (in the parameters) statistical models that achieve the objective of relating the choice probability Pi, to explanatory factors in such a way that the probability remains in the (0, 1) interval (Griffiths, etal.1993). 2) The logistic function is used because it represents a close approximation to the cumulative normal and it is simpler to work with. The close similarity between the logit and probit models is confined to dichotomous dependent variables and; 3) In many cases logistic regression is preferred to the probit due to its link to other models such as linear probability model, and its simpler interpretability as the logarithm of the odds ratio and its eminence effort to retrospectively collected data analysis (Mcculaah and Nelder, 1998). Whether or not a farmer invests a new technology assumes a yes or no answer, a typical case of dichotomous variable. For such type of response, a discrete model is a popular tool of analysis. In this model, the dependent variable is a binary assuming two values, 0 and 1. Hence, for a farmer who adopter, the SAPs', the value (y= 1) and for a farmer who does not adopt , a value (y=O) is assigned.

Several models such as simple correlation, linear probability function, etc., can be used to analyze adoption behavior of farmers. But these models have limitations in that the t-ratios are incorrect, exhibit hetero scedasticity, non -normality, their estimated probabilities (Pi) may be greater than one or below zero, and assume Pi increases linearly with X (Maddala, 1983; Gujarati, 1995). The logit and probit models overcome these problems since both are based on a cumulative distribution function.

Following (Gujarati, 1995; Aldrich and Nelson,1984) the logistic distribution for the investment of SAP's can be specified as ;

Pi= $\frac{1}{1+e^{-zi}}$---------- (1)

Where, Pi is the probability of farmers invest in SAPs' for the i^{th} farmer, e represents the base of natural logarithms and Zi is the function of a vector of n explanatory variables (X's) which is an underlying and unobservable index for the i^{th} farmer (when Zi exceeds some threshold level (Z*), the farmer is observed to be an investor; otherwise he is a non-investor when Zi falls below the threshold value), and ex pressed as:

Zi=a+ $\sum BiXi$..---------- (2)

Where a is the intercept, Bi is a vector of unknown slope coefficients and XI, X2 . .. Xn represent the n explanatory variables.

The logit model assumes that the underlying stimulus index (Zi) is a random variable which predicts the probability of investment of SAPs'. The slope tells how the log-odds in favor for adoption of SAPs' change as independent variables change.

One way of approaching the (0, 1) constraint problem that is imposed on the probability is to transform P to eliminate one or both constraints (Aldric and Nelson,1984) in a ratio form. If p is the probability of adopting on SAPs then 1- Pi represents the probability of not adopting and can be written as :

1 -pi = 1- $\frac{1}{1+e^{-zi}}$ = $\frac{e^{-zi}}{1+e^{-zi}}$ - ($\frac{1}{1+e^{zi}}$)---------- [3]

Dividing equation (1) by equation (4) and simplifying gives

$\frac{pi}{1-p}$ = ($\frac{1+e^{zi}}{1+e^{-zi}}$) = e^{zi}----------[4]

Equation (4) shows the odds ratio, which defines the probability of investing relative to non-in vesting.

Finally, the logit mode l is obtained by taking the logarithm of equation (5) as follows:

Li = In {$\frac{pi}{1-pi}$} ----------(5)

Where, Li is log of the odds ratio in favor of SAPs' adoption, which is not only linear in Xj. but also linear in the parameters. Thus, if the stochastic disturbance term, (Ui), is introduced, the logit model becomes:

Zi = β+ β1Xi + β2$X2i$ ..+ ... + $\beta nXni$ + ui ---------- [6]

Variable Definition

Table 1: Definition and Units of Measurement of the Explanatory Variables

Variables	Definition and Units of Measurement
SEXHH	Sex of household head (1 =Female , 2=Male)
AGEHH	Age of household head in years
EDUHH	Educational status of household head (0=illiterate, 1=literate)
PARTADMIN	Household head's role in kebele (0=no, 1 =yes)
DISTPLOT	Distance from residence to the plot (in minute)
FARM1ZE	Farm size in hectare
LAN DTENURE	Land tenure (O= insecure , and 1 =secure)
SOILFERT	Soil fertility status (O =non-fertile, 1 =less fertile and 2=fertile)
TLU	Respondent's owned livestock (in tropical livestock unit)
SLO PEPLOT	Slop of the plot (0= flat 1= Gentle 2= moderate steep slope 3= steep slope)
PLOT	Number of plots (in number)
EXTENS ION	Extension agent visit (O =not-visited and I =visited)
LABOR	Labor availability (O =not-available an d I =available)
Source: from Theory and Empirical.	

Analytical Finding and Discussion

This part is concerned with the description and interpretation of the findings. As already noted, a structured questionnaire was administered to 120 sample households in Gimbo district. The questionnaire was designed in such a way that it enables to collect data on demographic, socio–economic, plot characteristics and institutional support of farm households' decision to adopt components of SAPs'. This chapter is categorized in two sections. In the first section, the descriptive analysis made use of tools such as percentages, mean and standard deviation. T-test and $\chi 2$ were used to assess the factors that influence farmers to adopt in different agricultural land management practice. The respondents were categorized as adopter and non- adopter to compare the factors affecting farmers to adoption in SAPs'. In the second section, the results of econometric model for the farmers' decision to adopt in sustainable land conservation and agricultural yield maximizing practices were discussed in detail.

Descriptive Statistics of Sample Households

Sex of the Respondents

Gender of house hold head can influence adoption of new technology either being female headed or male headed. Male headed households have better chance for practicing on-land conservation because of the position they have and access of information as compared to their counter parts in the study area. Out of the sample of respondents, female headed households accounted for only 20%, while the rest 80% were male headed household. Accordingly, from the total sample respondents, 66.7% were adopter and 33.3% were non-adopter. Chi-square tests revealed that,

there is a significant and positive association between male headed household with the probability of the decision to be adopter of SAPs' in the study area (Table: 2).

Table 2: Distribution of Household Heads by Gender in Adoption Categories

SEXHH	Adopter		Non- Adopter		Total	
	Number	Percent	Number	percent	Number	Percent
Female	8	6.7	16	13.3	24	20.0
Male	72	60.0	24	20.0	96	80.0
Total	80	66.7	40	33.3	120	100.0
Chi-square	15.00					
P-value	.000					

Source: Computed from survey data 2019,

Age of the Respondents

The mean and standard deviation age of sample respondents were 50.81 and 12.3, respectively. The age composition of sample respondents was revealed significant difference of the adopter, and non- adopter, 54.28 and 43.8 mean of years, respectively. The maximum age observed was 89 and the minimum was 28 years (Table 3). Increased age of farmers already engaged in farming operation, it gives time for farmers to learning from directly observed and evaluate problems and profits of the crop produce. As the mean of age revealed that adopters in SAPs were relatively older than non-adopters among multiple components of SAPs. The t-test results indicate that age has positive and significant difference with adopter of SAPs and, otherwise. (Table 3).

Table 3: Distribution of Sample Household Heads by Age Categories

AGEHH	Adopter		Non- adopter		Total	
	Number	Percent	Number	Percent	Number	Percent
20-40	10	8.3	18	15.0	28	23.3
41-64	53	44.2	19	15.8	72	60.0
>65	17	14.2	3	2.5	20	16.7
Total	80	66.7	40	33.3	120	100.0
Mean	54.28		43.8		50.81	
Maximum	89		70		89	
Minimum	28		28		28	
SD	11.73		10.54		12.3	
T-value	4.01					
P-value	.000					

Source: Computed from survey data, 2019

Educational Status of the Respondents

As education status of house hold head increases, it is considered to increase the transfer of relevant information, awareness and mutual understanding about new idea, technology and innovation and as a results increase farmers' knowledge about the benefits, constraints and opportunities gain from implementing sustainable agricultural practices. Education provides something for farmers to arrest loss of soil fertility using various ways of soil fertility improving practices, maximizing productivity at the same time keeping soil health, traditional and improved soil conserving technologies, compost and agronomic practices. Out of total respondents 38.3% were illiterate and 33.3 were able to read and write and 28.4% were educated from grade 1 up to grade 8 (Table 4). This means as sample respondents not educated it may increase the possibility of farmers' rejection of new technology and innovation and if educated more, otherwise is true. The T-value result revealed that there is positive and strong positive relationship between education and farmers adoption in SAPs'(Table:4).

Table 4: Distribution of Sample Household Heads' by Educational Status

EDULEVEL	**Adopter**		**Non- adopter**		**Total**	
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Illiterate	21	17.5	25	20.8	46	38.3
Read and write	31	25.8	9	7.5	40	33.3
Grade 1-4	15	12.5	2	1.7	17	14.2
Grade 5-8	13	10.8	4	3.3	17	14.2
Total	80	66.7	40	33.3	120	100.0
Chi-square	15.548					
P-value	.001					

Source: Computed from survey data, 2019

Role in Local Kebele Administration

According to the survey results shown in (Table 5), 26.7% of the respondents assumed some responsibility at their village or kebele level. Among the non-participants 29.2% and 44.2% were non-adopter, and adopter respectively. The higher the figure for respondents may indicate that as the household head assumed some responsibility, the chance of getting information and hence, understanding about uses of SAPs' will increases. This contributes to the decision to implement SAPs'. The result of chi-square indicated that household heads that had positions in kebele administration have significant and positive association with the probability of farmers to be adopter in SAPs' on their farm plot.

Table 5: Distribution of Respondents the role in Local Kebele Administration

PARTADMIN	Adopter		Non- adopter		Total	
	Number	Percent	Number	Percent	Number	Percent
Yes	27	22.5	5	4.2	32	26.7
No	53	44.2	35	29.2	88	73.3
Total	80	66.7	40	33.3	120	100.0
Chi-square	6.158					
P-value	.013					

Source: Computed from survey data, 2019

Farm Size

The land size holding of the sample farmers ranged from 0.5 to 7 hectares. The average land holding is known to be 1.98 hectares with a standard deviation of 1.2 hectares. The survey results indicated that about 29.4% of the respondents had a farm size of 1 hectare or less. 39.5% of respondents had a farm size ranges 1.1-2.0 hectares and the rest 31.1% of respondents had farm size of greater than 2 hectares of land. On the average, adopters hold more land 2.4 hectare, and non-adopters 2.0 hectare of land, respectively (Table 6). The t-test results revealed that there is significant mean difference between non-adopter and adopter households at 1% significance level. This illustrates as household own more unit of land, the household inspired to make decision to adopt a new agricultural technology alternative.

Table 6: Distribution of Respondents in the Land Size

FARMSIZE	Adopter		Non- adopter		Total	
	Number	Percent	Number	percent	Number	Percent
0.5-1.0	6	5.0	29	24.4	35	29.4
1.1-2.0	37	31.1	10	8.4	47	39.5
2.1-3.0	22	18.5	-	-	22	18.5
3.1-7.0	15	12.6	-	-	15	12.6
Total	80	67.2	39	32.8	119	100.0
Mean	2.47		0.96		1.98	
Maximum	7		2		7	
Minimum	0.5		0.5		0.5	
SD	1.2		0.4		1.2	
T-value	9.5					
P-value	.000					

Source: Computed from survey data, 2019

Labor Availability

Due to the fact that, SAPs have multiple components, it requires different agricultural practices. As a result, this practice requires (consumes) more labor. As is indicated in table 8, majority of adopters (40.8%) replied that they can get labor, while 25.0% of non-adopter could also get labor. However, as the chi-square test result indicated that labor availability did not have a significant difference between adopter and non- adopter (Table: 7).

Table 7: Distribution of Respondents by Labor Availability

LABOUR	**Adopter**		**Non- adopter**		**Total**	
	Number	**Percent**	**Number**	**percent**	**Number**	**Percent**
Yes	49	40.8	30	25.0	79	65.8
No	31	25.8	10	8.3	41	34.2
Total	80	66.7	40	33.3	120	100.0
Chi-square	2.241					
P-value	.134					

Source: computed from survey data, 2019

Livestock Owned

Livestock in the study area have been kept for different purposes. They are kept to provide food, draught power, sharecropping, threshing, transportation, wealth status, fiber, as a means of saving due to farmers regard livestock as safeguard for sudden cash requirement as they are considerable liquid resources. These animals are sold in time of need for food, credit repayment, to pay taxes and other expenses. Oxen are kept both for plough and fattening purpose, whereas cows are kepi for dual purpose of give birth of calf, plowing and fattening. As animals are used in farm operations, supplementary between crop and livestock enterprise is a common practice for smallholder farmers of the study area. They interact with each other in that animals offer farm power and cattle dung in exchange for fodder from the crop residues and byproducts. The availability of cash from the sale of' livestock and livestock products *serve* as a source of cash when farmers are in urgent need of cash for their crop production activities. These animals are reared in both kebeles due to the suitability of the environment, presence of better feed and farmers' preference. On average, in both kebeles, farmers kept 3.75 cows, 2.71 0xen, 1.94 bulls, 2.08 heifers. 1.58 calves, *3.09* goats, *3.66* sheep and 1.51 donkeys, 1 mule, 1.27 horses and *7.57* chickens. The result of t-test indicated that there is significant difference between non-adopters and adopters of SAPs' components. In other words, as a household has more livestock, it increases the probability of become adopter of SAPs and, otherwise. This was so because more livestock demand more grazing and pastures land (Table: 8).

Table 8: Mean Difference between Total Livestock Owned and Adoption

Livestock owned	Adopter		Non- adopter		Total	
	Number	percent	Number	Percent	Number	Percent
<10	2	1.7	16	13.7	18	15.4
11-20	22	18.8	17	14.5	39	33.3
>21	56	47.9	4	3.4	60	51.3
Total	80	68.4	37	31.6	117	100.0
Mean	22.43		12.05		19.15	
Maximum	30		24		30	
Minimum	6		5		5	
SD	5.4		5.55		7.3	
T-value	9.494					
P-value	.000					

Source: computed from survey data, 2019

In the study area, the main sources of feed for livestock are communal grazing, crop residues and byproducts, purchase of feed from local farmers and use of farm plot before sowing and after harvesting of crops as grazing and source of feed. Accordingly, 45.8% of the respondents reported that they use communal grazing, 30.8 % of them said they use crop product, 10.0% said they use fallow, 8.0% reported they use other source of feed and 5.0% said they purchase from neighbors and/or other farmers. Similarly, the types of crop residues used as fodder in the survey results indicated that, 56.7 % used hay, 20.0% used straw, 14.17 % used maize husk, 5.8 % used Atella and 3.3% mowed grass.

Table 9: Types and Main Source of Cattle Feed

Source of feed	N	%	Types of crop residues used as fodder	N	%
communal grazing land	55	45.8	Hay	68	56.7
Fallow	12	10.0	Straw	24	20
crop product	37	30.8	Mowed grass	4	3.3
Purchasing	6	5.0	Maize Husk	17	14.17
Other	10	8.3	Atella	7	5.8
Total	120	100.0		120	100.0

Source: own survey 2019

In the survey result, the availability of feed is serious constraint to livestock production. Furthermore, shortage of grazing land fodder, supplementary feed and animal disease in convenience grass for cattle *Wajima* parasite (Alekit) and were common and terrible problems. Among total respondents in both kebeles accordingly, 37.5%, 17.5%, 15%, 7.5%, 6 7%, 5.8%,5.0 % were respond as shortage of grazing land, supplementary feed ,disease, Barn, Clinic , water , shortage in feed and lack of shepherd are the main constraints, respectively.

Number of Plot

As the number of plot increases, it has the advantage to protect land from intensive cultivation, used for crop rotation, inter-cropping and possibly to make fallow land for farmers. As shown in table 10 below, investors and non-investors had an average of 3.61 and 2.43 number of plots respectively. Similarly, out of the 72 sample respondents, 47.9% of investors and 13.7% of non-investor had 3-4 number of plots on in their farm respectively. The chi-square test revealed that, there is a significant difference between adopter and non- adopter at 1% significance level regarding the number of plots on their farmland.

Table 10: Distribution of Sample of Respondents by the Number of Plot

Number of plot	Adopter		Non-investor		Total	
	Number	percent	Number	percent	Number	Percent
1-2	10	8.5	21	17.9	31	26.5
3-4	56	47.9	16	13.7	72	61.5
5	14	12.0	-	-	14	12.0
Total	80	68.4	37	31.6	117	100.0
Mean	3.61		2.43		3.24	
Maximum	5		4		5	
Minimum	2		1		1	
SD	0.92		0.89		1.06	
T-value	6.494					
P-value	.000					

Source: computed from survey data, 2019

Slope of the Plot

Slope is one of the farm attributes that aggravate soil degradation. Based on the Natural Resource Management Department classification for construction of SWC technology, plots based on slopes (which is measured in degree) were classified as *) meda* for Flat (0 - 2) and Gentle sloping (3 - 6) plots, *Zekzaka* for moderately steep sloping (6 - 15), and, *Kulkulel* for steep slopes (15- 30) and *Gedelama* for very steep slopes and mountain (>30). According to field observation and sample respondents' reports shown in the Table;13, 33.3% of plots were moderately steep slope, 25.5% of the plots were steep slope, 21.7% of the plots were flat and the rest 20.0% were gentle. The highest portions of investors' and non-investors' plots were moderate steep slope (25.8%) and flat (10.8%) respectively. However, the chi-square result indicated that (Table13), there is no statistically significant difference between adopter and non-adopter regarding degree of slope and SAPs.

Table 11: Distribution of Sample of Respondents by the Slope of the Plot

Slope of the plot	Adopter		Non- adopter		Total	
	Number	percent	Number	percent	Number	Percent
Flat	13	10.8	13	10.8	26	21.7
Gentle	15	12.5	9	7.5	24	20.0
Moderate Steep slope	31	25.8	9	7.5	40	33.3
Steppe slope	21	17.5	9	7.5	30	25.0
Total	80	66.7	40	33.3	120	100.0
Chi-square	5.700					
P-value	.127					

Source: computed from survey data, 2019.

Distance of the Plot from the Residence

With reference to distance, land users traditionally classify their plots into two. Plot near to homesteads called backyard, whereas the farm stead plots are referred as *Ersha*. Plot distance from the residence of the farmer affects management attention of the farmer by affecting the average time need to travel for applying manure and cattle dung, tree planting, and for SWC construction and timely maintenance. The survey result indicated that some plots were located at a considerable distance from homestead, that will take up more than 140 minutes walking and the minimum was located at the garden which is 2 minute far. About 67.5% of the plots were located at one-way walking distance of less or equal to half an hour. The average time for non-adopter and the dwelling was 54.40 minutes and for adopter and their dwelling was 17.24 minutes. The t-test result revealed that there is significant mean difference between non- adopter and adopter with respect to plot distance.

Table 12: Distribution of Number of Plot from Dwelling Residence

Distance to the plot in minute	Adopter		Non- adopter		Total	
	Number	Percent	Number	percent	Number	Percent
0-30	68	56.7	13	10.8	81	67.5
31-60	12	10.0	16	13.3	28	23.3
>61	-		11	9.2	11	9.2
Total	80	66.7	40	33.3	120	100.0
Mean	17.24		54.40		29.63	
Maximum	60		140		140	
Minimum	2		2		2	
SD	13.26		37.37		29.73	
T-value	-6.100					
P-value	.000					

Source: computed from survey data, 2019

Soil Fertility Status

In the study area, farmers' perception to new technology can be seen with knowledge and understanding of soil fertility status, especially they compare with crop produce either increases or decreases. Farmers perceive and rate soil fertility of their land as fertile, less fertile and not fertile in the study area. For this reason, farmers reach such decision on soil fertility depletion with the amount of fertilizer they use, compost and other organic matter adding nutrient application and the type of crop grown and yield obtain. Gimbo Woreda Agriculture Office's experts explained during focus group discussion that, less fertile and non-fertile land are used for cropping of pea, bean and *Boloke* and gives better yield if the soil color is close to red and less moisture land. On the other hand, the experts revealed that, the position and knowledge of the farmers on soil erosion and nutrient depletion by actions they will ready for adoption of any soil improving and maximizing crop produce if the soil is highly depleted and decrease crop yield. This indicates that farmers' perception on their environment is good to keep soil fertility as the reaction they took to keep the produce in a way they want to produce the amount and type of crop. The survey results indicated that out of total respondents, 29.2% replied their soil as fertile, 44.2% as less fertile and 26.7% replied as non-fertile. The chi-square result (10.43) indicated that there is positive and significant association between soil fertility decline and investment of sustainable land conservation activities at 1% probability level.

Table 13: Distribution of Soil Fertility Status

Soil fertility Status	Adopter		Non- adopter		Total	
	Number	Percent	Number	Percent	Number	Percent
Fertile	27	22.5	8	6.7	35	29.2
Less fertile	39	32.5	14	11.7	53	44.2
Non-fertile	14	11.7	18	15.0	32	26.7
Total	80	66.7	40	33.3	120	100.0
Chi-square	10.43					
P-value	.005					

Source: computed from survey data, 2019

In the study area, sample respondents ranked heavy rainfall with improper farming practice (cultivation of gentle and steep slopes with high soil disturbance) was the first cause of soil erosion, intensive cultivation without fallow was the second cause of soil erosion, cultivation of steep slope was the third cause of soil erosion, overgrazing (free grazing of communal grazing land) was the fourth cause of soil erosion, wind (wash away powdered soil and uncovered with crop residues at the time of dry land preparation season) was the fifth cause of soil erosion and lack of ownership feeling was the last ranked cause of soil erosion among the respondents.

Table 14 Distribution of Sample Respondents by Cause of Soil Erosion

Cause of soil erosion	Frequency (n=120)						Mean	Rank
	1st	2nd	3rd	4th	5th	6th		
High rainfall	48	21	2	2	18	5	2.33	1st
Intensive cultivation without fallow	16	32	33	7	6	2	2.59	2nd
Cultivation of steeply slope	18	24	17	25	9	3	2.92	3rd
Wind	7	2	13	16	15	39	4.60	5th
Overgrazing	5	6	25	22	25	13	3.99	4th
Lack of ownership feelings	1	8	6	25	19	33	4.70	6th

Source: computed from survey data, 2019

Distribution of Sample of Respondents by Land Tenure

Land tenure security is important not only for the development of efficient land markets, but also for investment in land improvement (Dessalegn, 1994). Land in the study area was subject to periodic re-distribution with government substitution. The government re-distributed the rural land in the study area in 1997. Farmers' perception to soil erosion and the measures they take will depend on their feelings of security of land tenure. According to the survey results, 78.6% of the respondents feel secure and the rest 21.4% feel insecure about tenure right**,** respectively. The chi-square (27.46) test revealed that, the investors feel secure on their land than non-investors. And this is significant at 1% level.

Table 15: Distribution of Sample of Respondents by Land Tenure

LANDTENURE (feeling of land tenure)	Adopter		Non- adopter		Total	
	Number	Percent	Number	percent	Number	Percent
Secure	73	62.4	19	16.2	92	78.6
Insecure	6	5.1	19	16.2	25	21.4
Total	79	67.5	38	32.5	117	100.0
Chi-square	27.46					
P-value	.000					

Source: computed from survey data, 2019

Share cropping, rent-in, rent-out with (different type of renting system), inherited from family and own land are the most common land holding arrangements. In addition, sharecropping and rent-in were important means of land acquisition for young and small farm holders in the study areas. As population increases, the only option for young farmers for acquisition of land is share cropping/ rent-in arrangement from their family members and other households. Land transaction (sharecropping and fixed rent) was widespread in the study area. Out of the 233.93 ha holdings of the sample farmers, 198ha was cultivated in own plot and 26.8ha was rented in and the rest 8.9ha

had rented out. From the focus group discussion, it was understood that it could be expected that land quality and expected yield of grains and straw may affect the terms of share cropping arrangements. However, share cropping serves as a balance.

Extension Service

The agricultural extension service in the study area mainly focused on providing basic agricultural education, teaching, and demonstration about the use of agricultural inputs, forestry development, soil conservation and livestock production aspects. The result indicated that 60.8% of the respondents had access to agricultural extension agents. The Agricultural Desk under Department of Agricultural and Rural Development was the main government institution responsible for implementation, monitoring, and evaluation of the agricultural extension services at zonal level. It has a technical expert (SMS) both at the zonal and district level to provide technical assistance and trainings for Development agents (DAs) and supervisors. Development Agents are responsible for the actual implementation at the extension program at grass root level. Extension service is provided by extension workers and to some extent by nongovernmental organizations. Three development agents were assigned at each Kebele to give frequent and continuous technical support and advice. Almost all sample households of the survey had responded that development agents were assigned, but most of them complained that they did not get sufficient agricultural extension services. The chi-square test result also shows there is a significant difference between households visited by extension agents and investor of SAP's status in the study area (Table 16).

Table 16: Distribution of Sample Respondents by Extension Services

EXTENSION	**Adopter**		**Non- adopter**		**Total**	
	Number	**Percent**	**Number**	**percent**	**Number**	**Percent**
Yes	54	45.0	19	15.8	73	60.8
No	26	21.7	21	17.5	47	39.2
Total	80	66.7	40	33.3	120	100.0
Chi-square	4.477					
P-value	.034					

Source: computed from survey data, 2019

Sustainable Agricultural Practices

Types and Common Agronomic Practices

These agronomic practices help the soil to fix nitrogen and increase soil fertility level. On the basis of this practice, the sample respondents reported the following commonly implemented agronomic practice. 83.33% practiced crop rotation, 82.5% used inorganic fertilizer, 75.83% practiced mixed cropping, 67.5% used mulching, 64.17% implemented inter-cropping, 59.17% prepared and used compost, 45% burn farm and 39.17% allocated their farm plot for fallow land.

Table 17: Distribution of Sample Respondents by Agronomic Practices

Types of Agronomic Practice	Frequency (N=120)		% of share applied multiple components of SAP(Agronomic)
	Yes	No	
Crop rotation	100	20	83.33
Inorganic fertilizer	99	21	82.5
Mixed Cropping	91	29	75.83
Mulching	81	39	67.5
Inter cropping	77	43	64.17
Compost	71	49	59.17
Burn farm	54	66	45
Fallow land	47	73	39.17

Source: computed from survey data, 2019

Sample respondents had been practicing crop rotation; the sequence of practice was still in question. This was, as Gimbo Woreda agriculture office experts explained, due to the reason that farmers did not practice crop rotation properly in exchange of crops season, type of crop and terms of exchange. According to Ministry of Agriculture's guideline, at maximum, one cereal crop can be grown for two cropping season consecutively yet in third season it must be replaced or changed by either pulses or oil seed crops. Among sample respondents experienced in crop rotation, 62.5% did rotate cereal to cereal, 19.2% cereal to legume cropping and the remaining 18.3% were practicing leguminous to cereal cropping in the survey year, 2019.

Table 18: Distribution of Sample Respondents by Crop Rotation Sequence

Crop rotation sequence	% share
Cereal after cereal cropping	62.5
cereal after legume cropping	19.2
legume after cereal cropping	18.3

Source: computed from survey data, 2019

Conservation Tillage Practice

The farmers had not been practicing minimum tillage selectively on the basis of type of crop, especially for leguminous crops. As presented in the Table 23, 50.8% had been practicing minimum tillage in their plot; whereas 49.2% of the respondents had not been practicing in their plot.

Out of the total sample respondents (61) had been observing changes in crop productivity; 37.7% said it brought increment, 9.8% said it brought decrement, 14.8% said there was no change and 36.1% reported they do not know the changes brought in crop productivity.

Table 19: Distribution of Sample Respondent by Experience in Minimum Tillage

Minimum tillage practice		Frequency	Percent	Change observed in crop productivity after MT		
				Change	Frequency	Percent
Valid	Yes	61	50.8	Increased	23	37.7
	No	59	49.2	Decreased	6	9.8
	Total	120	100.0	The same	9	14.8
				Do not Know	22	36.1
				Total	61	100.0

Source: computed from survey data, 2019

Conservation tillage instrument were not known by most of the farmers other than the local moldboard named */ Maresha/* in the study area. Those farmers inherit it from their parents or spent decades ploughing using Maresha. Among the sample farmers who had not been practicing minimum tillage, they indicated their reasons as the tillage instruments reduce immediate crop produce (25.42%), difficult to control weed (22.03%), because insect-pest outbreak (10.17%), because of labor shortage(13.56%), land shortage (16.95%) and because of other reasons (11.86%), such as the land provider may cancel the sharecropping agreement. Farmers put these reasons in sequential orders: reduce productivity, difficult of control weed, others (cost of technology), land shortage, labor shortage, and in sect-pest outbreak, respectively. These factors either individually or interdependently impeded farmers from implementing minimum tillage in their plots in the study area.

Table 20: Reasons for not Practicing Minimum Tillage

Reasons not practicing minimum tillage	Not practiced(59)		Rank
	Frequency	Percent	
Reduce productivity	15	25.42	1st
difficulty of control weed	13	22.03	2nd
Insect-pest outbreak	6	10.17	6th
Labor-shortage	8	13.56	4th
Land- short age	10	16.95	3rd
Other	7	11.86	5th
Total	59	100.0	

Source: computed from survey data, 2019

Soil and Water Conservation Practices

According to reports of Gimbo District Agriculture Office, during the previous four consecutive years (2015-2018) out of 11977.75ha of terrace 3216.9 were maintained; 636 km covered diversion ditch made of which only 29.5 km maintained; 50.445 km trench constructed of which 7.55 km maintained and 478.45km mask broad bed maker (BBM) were done.

Table 21: Soil and Water Conservation (SWC) Majors Done in the Past Four Years

Year	Terrace (ha)	Maintained	Diversion ditch (Km)	Maintained	Trench (Km)	maintained	BBM (KM)
2015	1137.5	1389.2	234	-	9	-	125.0
2016	120.0	380.0	108	-	3	4.6	91.8
2017	127.0	321.0	156	-	9.25	3.0	125.5
2018	10593.3	1126.8	138	29.5	29.4	-	136.3
Total	11977.8	3216.9	636	29.5	50.6	7.6	478.5

Source: Gimbo District Agriculture Office, 2019

According to the information obtained from focus group discussion held with Gimbo District Agriculture Office experts, the previously constructed SWC structures were destructed. The main responsible causes of destruction were shortage of farm land, expected reconstruction by government, poor quality construction, difficulty in turning oxen, places of rodents and others like not fenced.

Agriculture Production

Major Crops Produced and Comparison with adoption of SAP's

The survey results revealed that, in average, sample respondents produced Maize (38.6%), Coffee(14.71%), Boleke (11.76%), bean (10.29%) and Teff (9.93%). And millet produced in different plot (Table 22).

Table 22: Major Types of Crop Produced in the Study Area

Types of crop	% share
Maize	38.60
Teff	9.93
Fava Bean	10.29
Pea	4.78
Haricot Bean	11.76
Coffee	14.71
Millet	9.93

Source: computed from survey data, 2019

Based on the survey result, the amount of production was changing due to implementing of SAPs' before the last 2 years from 2017/18. As it is indicated in (Table 23),56.3% and 32.8% of investor and non-investor respectively gained 1-50 quintals of total production. This indicated that, investors gained an average of 36.11 quintals of total crop production, whereas non-investors gained an average of 12.99 quintals of total crop production. The independent t-test was used to check whether there is significant mean difference between non-investors with that of investors. The results of t-test indicated that there is significant mean difference between non-investors and investors in crop production at 1% probability level. Hence, this tells investment of multiple SAPs'.

Table 23: Mean Comparison of Total Production and Adoption of SAP's

Total production(Quintal)	**Adopter**		**Non- adopter**		**Total**	
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
1-50	67	56.3	39	32.8	106	89.1
51-100	11	9.2	-	-	11	9.2
101-50	1	0.8	-	-	1	0.8
>151	1	0.8	-	-	1	0.8
Total	38	32.8	80	67.2	119	100.0
Mean	36.11		12.99		28.5	
Maximum	204		24		204	
Minimum	5.4		4.30		4.30	
SD	27.8		5.4		25.4	
T-value	7.157					
P-value	.000					

Source: computed from survey data, 2019

Econometric Result and Discussion

Binary logit model was used to identify potential variables determine farmers adoption decision on sustainable agricultural practices or sustainable agricultural land management practices.

Education Status: Educational level of the farmers and farmers' decision to adopt in SAPs' was found to have significant and positive relationship. This positive and significant relation implies that the more educated the farmers are, they are more likely to make a decision to adopt SAPs' than their counterparts with low level of education attainment. All other things being constant, the odds ratio suggests that the more educated farmers have the probability of 0.851 more likely to adopt in SAP's than the farmers who are less educated.

Soil Fertility Status: These variables were significant at 5% significant level and positively affected adoption of SAP's in the study area. This implies that, assuming other things being constant, as the soil fertility status increases by one unit the probability of the farmer's decision to adopt SAPs' increases by 0.844 and vise versa. This is due to major factors such as applying crop rotation, by using inorganic fertilizer and by practicing mixed cropping.

Plot Distance from the Residence: This variable was significant at 10% significant level and negatively affected adoption of farmers. This implies that, the remaining things being the same, as the distance of the plot to the resident increases by one minute the probability of farmers adopting SAPs' on his/her plot is likely decreases by 0.488 as compared to non- adopter farmers. The farm found at far distant may not be frequently getting visited, difficult to transport compost and manure and overall management. Farmers managed better the nearer plot than distance plot to the close observation of changes on nearer plot as well as the additional time and labor required to reach distant plot.

Farm Size: Total farm size of the households was found to have significant relation with the adopter in SAPs'. Hence, there is sufficient evidences to reject the null hypothesis and can be concluded that farmers having large farm size were more likely to become adopter in SAP's than smaller farm size. Similarly, the model result indicated that, as the more farmers farm size increase by one unit, the probability of the farmer's decision to adopt SAPs' increases by a factor of 0.962 and the vise versa.

Slope of the Plots: This variable was significant at 5% probability level and positively affected the adoption of farmers. This implies that, the remaining things being constant, as the slope of the plot increases by a unit the probability of the farmer adopting among multiple components of SAPs' increases. As slope of the plot increases by one unit the probability of respondent farmers to become adopting SAP's by 0.81 as compared to non-adopters.

Livestock Owned: Livestock owned was found significant at 5% probability level and positively affected the household's adoption of SAPs in the study area. The positive sign of coefficient indicated that when livestock owned increases by one unit, the probability of a household to become adopter of SAPs' also increases by a factor of 0.576.The possible explanation for this result is that as farmers have large number of livestock (Ox, Cow, Heifer, Calf, Donkey, Goat, Sheep and Chicken) they become in a high position to be adopter than farmers who have few livestock.

Table 24: Result of Binary Logit Model

Explanatory variables	Coeff.	Odd Ratio	S.E.	Wald	Sig.
SEXHH	1.397	0.802	1.521	.843	.359
AGEHH	.100	0.525	.066	2.315	.128
RKA	-4.399	0.012	4.313	1.040	.308
EDULEVEL	1.742	0.851	.740	5.538	.019**
SOILFS	1.686	0.844	.736	5.248	.022**
PLOTDISTANCE	-.048	0.488	.028	2.943	.086*
FARMSIZE	3.226	0.962	1.211	7.099	.008***
SLOPEPLOT	1.452	0.810	.639	5.158	.023**
TOTALLIVESTOCK	.308	0.576	.153	4.035	.045**
LABORSHORTAGE	2.671	0.935	1.645	2.638	.104
EXTENSIONSERVI	-1.126	0.245	1.233	.835	.361
NUMBEROFPLOT	1.274	0.781	.788	2.618	.106
LANDTENURE	-1.162	0.238	1.678	.479	.489
Constant	-24.390	.000	11.928	4.181	.041

Source: own survey, 2019

Summary and Conclusion

This research was conducted with the objectives of identifying which types of SAPs' that the farmers' commonly implement and assess the factors that influence farmers to adopt in different agricultural land management practice (SAPs') in Gimbo district area on Kutti and Tulla kebeles. Although Agriculture is the leading sector in the Ethiopian economy, it was and still is characterized by low productivity in general and low yield per unit area in particular. Many people attribute the problem to population explosion, immense environmental degradation, limited accessibility and use of technology, insufficient infrastructure, poor traditional practices and ill-thought-out polices.

Outdated practices and major bottlenecks characterize the agriculture sector, on top of that, the sector is challenged by high population growth rate, soil fertility depletion and decrease of crop yield. This demands the adoption of multiple sustainable agriculture practices which can bring short term and/or long term solution to the sector.

This study attempted to look at personal factors, socio-economic, plot characteristics and institutional factors, which can influence farmers' decision of investment in SAPs' components. The data were collected from 120 farm households drawn randomly by considering purposive inclusion of female headed households from Gimbo district in Kutti and Tulla kebeles. The primary data were collected using questionnaire and focus group discussion. Secondary data were

collected from Gimbo District Agriculture Office to supplement the data obtained from survey. Thirteen variables were hypothesized to determine farmers' decision to adopt SAPs'.

Evidences from descriptive analysis indicated that adopter farmers having more age, being male, better educational status, participated in kebele or village administration , own greater size of farm land, feel secure on their land, minimum distance between the residence and plot, less fertile soil, own moderately steep slope plot, own more number of plots, own more number of livestock and better accessed extension services, on the other hand, non- adopter farmers were affected by those cited variables. Meanwhile, majority of the farmers in the study area were implemented crop rotation practice of SAP's. This is due to the fact that, it helps them in improving the soil structure and fertility, and control weeds, pests and diseases.

The results of binary logit model analysis indicated that six variables were significantly affecting the farmers' decision to become adopter in SAPs'. Out of which, one variables at ($p<O.01$), four variables ($p<O.05$) and one variable at ($p<O.1$) were found to significantly influence farmers adoption on SAPs'.

Educational status was found to have positive and significant impact on farmers' decision of adoption SAPs' at 5% level of significance implying that farmers who had a better educational status had more information on new agricultural technologies and this had increased their chance to become investors.

Farm size was found to positively affected the farmers' decision to become adopter at 1%. As, the number of farm land increase, farmers found adopter in SAPs increases. Soil fertility status was positive and significant to affect farmers decision on adoption of SAPs' at ($p <0.05$) level of significant and associated with, as soil fertility level changes from less fertile to fertile farmers to be found adopter would be increases. Distance from home to the plot was negative and significant impact at ($p <0.1$) level of significant that indicated as the distance from resident to plot increases, farmers to be found adopter of SAPs' decreases, This means too much nearby and backyard plot is more advantageous to accept and implement SAPs' components: such as transporting compost and cover soil, to make proper crop residue management and top land cover crops and to integrate with soil and water conservation measures.

Total livestock owned was positive and significant to affect adoption of SAPs' at ($p<O.05$) level of significant implying that as farmers own more number of livestock, farmers decision to be found adopter of SAPs' increase. Slope of the plot was found to affect adoption of SAPs' positively and significant at 5% probability *level.*

Some implications for this study were found to be relevant. Promoting the adoption of sustainable agriculture practices or sustainable agricultural land management practices is important for smallholder farmers for sustainable development of Agricultural Sector through expanding

environmental health practices which needs cooperation and integration work by various stake holders especially farmers, development workers, experts, researchers and political leaders.

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Investigating the Level of Aflatoxins in Edible Oils Commercially Available in Debre Markos Markets, Ethiopia, Mamaru Bitew Alem and Kaleelias Agmuas, Adama Science and Technology University

Abstract

Aflatoxins are highly toxic and number one carcinogenic secondary metabolites of Aspergillus which can strongly affect the relationship cycle between trade, agriculture and health. They are found in different food constituents including edible oils. In this work, a comparison was made among oil samples of locally produced (not branded), imported, and locally branded and packed edible oils marketed at Debre Markos town, Ethiopia in terms of aflatoxin. The most commonly consumed oil types have been surveyed. A total of twenty (20) samples of various source of oils from Debre Markos town were collected. They were subjected to assess for Aflatoxin B 1, Aflatoxin B 2 , Aflatoxin G 1 and Aflatoxin G 2 , at Bless Agri-food laboratory service, Addis Ababa, Ethiopia, using High Performance Liquid Chromatography. All aflatoxin types were detected ranging from (zero) 0 (Non detected) to 247.44 µg/kg. Sixteen samples (80%) were found to be free from Aflatoxins. The remaining four (20%) samples with more pronounced aflatoxin amount were detected in locally branded and packed oil samples. The levels of Aflatoxins determined was found to be much higher than the maximum tolerable limit regulated by European Union (4 µg/kg) and WHO (15µg/kg). Oil samples which either imported or imported and distributed at Kebele Centers were found to be free from aflatoxins. Similarly, all oil samples which are locally produced by Debre Markos merchants were found to be free from aflatoxins. The results revealed that oil samples which are locally manufactured and distributed with different brands are at high risk of aflatoxin. However, the majorities of oil samples marketed at Debre Markos were safe.

Keywords: aflatoxin, cancer, edible oil, high performance liquid chromatography.

Introduction

Oils are an essential part of our diet, supplying nutrients, improving flavor, aiding in the absorption of vitamins, and providing concentrated sources of energy for our body(Banu & Muthumary, 2010). They have always been an integral part of human foods, being essential for health. Industrially, oils play an important role in the development of different areas of chemical products, pharmaceutical, cosmetics, paints and most importantly, food(Al-Attar, 2010). Due to its extensive human consumption, it is essential to monitor oils to ensure a safe, non-toxic, and regulatory-compliant product(Anwar, Kazi, Saleem, & Bhanger, 2004)**.** The aflatoxins (AFs) in foods are a current and future problem especially with the increasing global population and maximization of food production using poor methods of harvesting, processing and storage of foods(Bbosa, Kitya, Odda, & Ogwal-Okeng, 2013). The problem has been recognized as one of the biggest challenges to food and nutrition security, and trade. Lack of detection, monitoring and regulating measures to safe guard the food supply are some of the reasons that makes AFs contamination a significant

food safety issue in developing countries. It is estimated that approximately 4.5 billion people living in developing countries are chronically exposed to largely uncontrolled amounts of aflatoxin that severely results in changes in immunity and nutrition (Williams et. al., 2004 as cited in(J. Yu, 2012)). Aflatoxins(AFs) are lipophilic and could be present in oils extracted from contaminated oil seeds (Wang et al., 2015 as cited in(X. Yu et al., 2019)). Thus, analysis of edible oils in terms of aflatoxins and consequent awareness among peoples is found to be important for the sake of our community. The objective of this work was determining the levels of aflatoxins in edible oils commercially available in Debre Markos markets, Ethiopia.

Aflatoxins: Types and Health Impact

Aflatoxins (AFs) are a group of mycotoxins that are derived as fungal metabolites ((Reid, Sparks, Williams, & Brown, 2016) and Anfossi et al., 2016 as cited in (Freire & Sant'Ana, 2018). They are naturally occurring bio-chemical substances produced from different species of fungi especially *Aspergillus species (Bbosa et al., 2013).* Chemically, Alatoxins are difuranocoumarin molecules synthesized through the polyketide path way (Wacoo, Wendiro, Vuzi, & Hawumba, 2014).

AFs are among the most harmful mycotoxins and are found in the soil as well as in grains, nuts, dairy products, tea, spices, cocoa, corns, wheat, rice, macaroni, condiment, milk and vegetable oil and edible oil ((Kilicel, Karapinar, & Cimen, 2017) and (Geng, Wang, Gao, Ning, & Guan, 2018)). They are of great concern because of their detrimental effects on the health of humans and animals, including carcinogenic, mutagenic, teratogenic and immunosuppressive effects (Delmulle, De Saeger, Sibanda, BarnaVetro, & Van Peteghem, 2005 as cited in (X. Yu et al., 2019)). What is worse is Aflatoxin blue one (AFB_1) is the most potent hepatocarcinogen known in mammals and is classified by the International Agency of Research on Cancer as Group one carcinogen (IARC, 1993)**.** A similar report was released by IARC in 2012 and it is a cause of human primary hepatocellular carcinoma (IARC, 2012 as cited in(Blankson & Mill-Robertson, 2016))**.** United Nations-Food and Agriculture Organization (FAO) and World Health Organization (WHO) regulates the maximum allowed content is 30 ng/g for total AFs in human foods. The European Union (EU) suggests the upper limits as 5 ng/g for total AFs and 2 ng/g for B_1. Among the four major AFs, B_1 is the most toxic form, whose toxicity is 60 times higher than arsenic(Geng et al., 2018).

The aflatoxins in foods are a current and future problem especially with the increasing global population and maximization of food production using poor methods of harvesting, processing and storage of foods(Bbosa et al., 2013).

There are various types of aflatoxins, but the most important types are of six forms: AFB_1, AFB_2, AFG_1, and AFG_2 are found in plant-based food, while AFM_1 (metabolite of AFB_1) and AFM_2 are found in foods of animal origin. AFB_1 and AFB_2 fluoresce blue under UV light while aflatoxin AFG_1, and AFG_2 fluoresce green in the presence of UV light (Reid et al., 2016), (Wacoo et al.,

2014) and (Negash, 2018)). AFB_1 is the most potent liver toxin and classified as class I carcinogen for humans ((Wacoo et al., 2014) and (Negash, 2018)).

AFBs are characterized by the fusion of a cyclopentenone ring to the lactone ring of the coumarin structure, while AFGs contain an additional fused lactone ring. AFB_1 and to a lesser extent AFG_1, are responsible for the biological potency of aflatoxin contaminated feed (Lizárraga-Paulín, Moreno-Martínez, & Miranda-Castro, 2011).

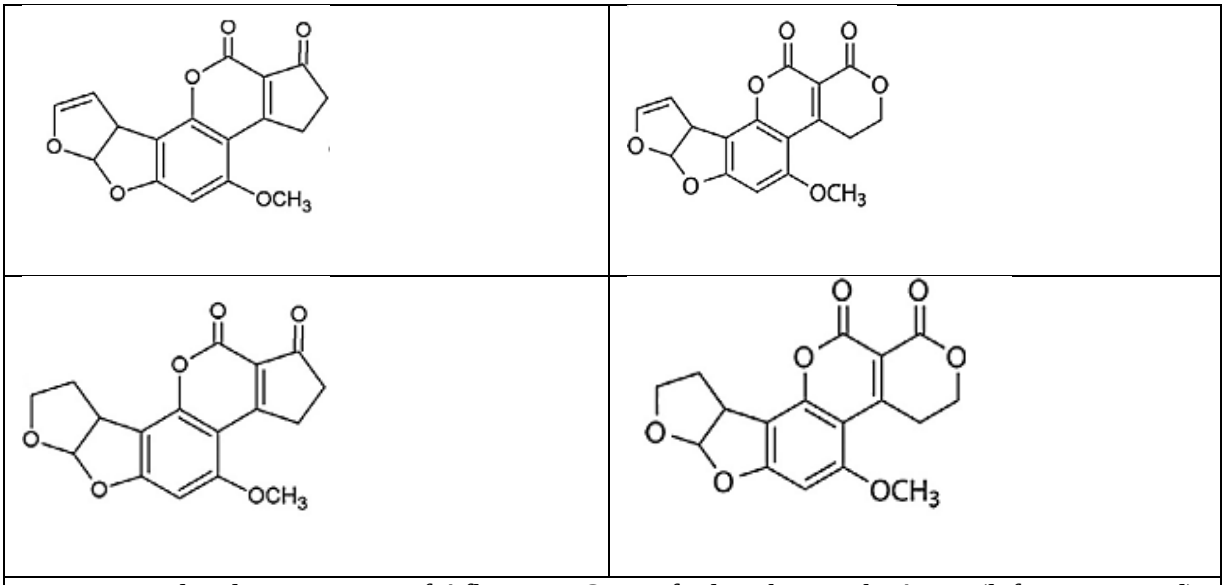

Figure1: Molecular structures of Aflatoxins Quantified in this work: AFB_1 (left upper panel), AFB_2 (left lower panel), AFG_1 (right upper panel) and AFG_2 (right lower panel) adopted from (Marin, Ramos, Cano-Sancho, & Sanchis, 2013)

Aflatoxin B_1, the most abundant (prevalent) aflatoxin usually found in cases of aflatoxicosis, and is responsible for acute toxicity, chronic toxicity, carcinogenicity, teratogenicity, genotoxicity and immunotoxicity (Kabak, 2016). It has been designated as a major risk factor for human liver cancer and an important contributor to nearly 700 000 cancer deaths per year (Groopman & Wogan, 2015; Lizárraga-Paulín et al., 2011). Importantly, in experimental systems, it also induces pleiotropic toxic effects such as growth retardation and immune suppression(Groopman & Wogan, 2015).

AFs have shown to be extremely potent carcinogens in all animal species investigated, i.e. mice, rats, hamsters, fish, ducks, and monkeys, and in several organs, the liver being the primary target (Marin et al., 2013). The most distinguished human health impact of aflatoxins is hepatocellular carcinoma (HCC). It is recognized worldwide as the 9th and 7th leading type of cancer in women and men, respectively.

In human beings, chronic consumption of aflatoxin contaminated foods has been linked to various diseases: liver cancer, effects on the reproductive system, effects on the immune system, encephalopathy with fatty degeneration of viscera, resembling reye's syndrome (Dvorácková et al., 197; Dvorácková and Píchová, 1986; CAST, 2003; Jiang et al., 2008; and Wu and Santella, 2012 as cited in (Marin et al., 2013).

Safe limit of Aflatoxin

The carcinogenic and other health problems of aflatoxins force many countries to establish the maximum limit or the safe limit of aflatoxin in food and feed. However, it is found to vary from country to country, ranging from 0.025-30 µg/kg (Campagnollo et al., 2016; Ismail, Akhtar, et al., 2016 as cited in (Ismail et al., 2018; L. Wu et al., 2016). United States regulations have specified the maximum acceptable limit for AFs to be 20 g/kg (F. Wu, 2006). Among countries regulated their maximum tolerable limit, the higher tolerable limit is belongs to India (30 µg/kg). From African countries, South Africa set the limit to be 10 µg/kg. In addition, the world health organization (WHO) has set it to be 15 µg/kg. European Union and Singapore are very restricted to AFs and they regulate the safe limit as 4 µg/kg and 5 µg/k, respectively (Ismail et al., 2018). The maximum tolerable limit is very small in these countries (0.01 µg/k) for baby foods. Hence, it depends on the type of aflatoxin, type of food product, the country's level of economic development and extent of consumption of high-risk crops (Kendra & Dyer, 2007 as cited in(Udomkun et al., 2017)). The problem is which country's safe limit will be adopted worldwide. Even though, the case is expected to be pronounced in our country Ethiopia, the safe limit is still not regulated.

Materials and Methods

Chemicals and Reagents

All chemicals used were HPLC grade. HPLC grade methanol, distilled water and hexane were purchased from Sigma Aldrich through Bless Agrifood laboratory service. Aflatxin B and Aflatoxin G standards were purchased from USA through Bless Agrifood Laboratory Service. A buffer solution was prepared at Bless Agrifood laboratory service from sodium dibasic anhydrons (HNa_2O_4P) and sodium monophosphate monobasic monohydrate ($H_2NaO_4P.H_2O$).

Edible oils (locally milled, locally produced and branded, and imported oil brands) were purchased from Debre Markos Market. The Oils were transported to Addis Ababa without any treatment and stored at Bless Agrifood laboratory service laboratory room. All type aflatoxin standards and quality control solutions were prepared at Bless Agrifood laboratory service. Working solutions were prepared by appropriate dilution in methanol: water (80:20 v/v).

Extraction and Analysis of Aflatoxins

Sample Preparation

The oil samples were given codes according to Bless Agri-food and laboratory service sample labelling system. The oil matrix was shaked before measurement. From each sample, 20g of oil was taken and transferred to 250 mL conical flask. A calibrated Electronic beam balance was used for mass measurement. 2.0 g NaCl was added for moisture absorbance. The sample solution was filtered with suction filtrations to remove impurities.

Aflatoxin Extraction

A solution of methanol-water was prepared (80mL: 20mL). 100mL of the prepared solution was added to a conical flask to the first solution that contain the sample. Following this 50mL of haxane was added for defating the sample. The conical flask was covered with alumunium foil and shaked at 640 rotational speed for fifty minutes. The sample being shaked was allowed to filter through a vacuum pump filtration to remove wastes. After filtration, it was allowed to stand in a separatory funnel and until clear separation is observed between the methanol extract and the hexane extracts as shown in figure 2. The methanol extract was separated and transferred to a beaker and stored for further analysis.

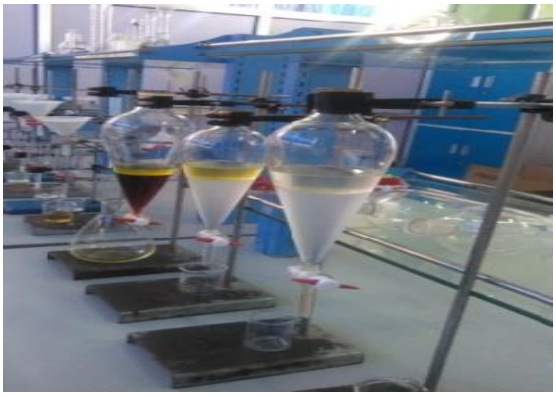

Figure 2: Separation of the methanol extract (the bottom) and hexane extract (top) of the oil samples

Preparation of Stock Buffer Solution for Aflatoxin

A buffer solution compatible to the pH of aflaclean/ immuno affinity column was prepared. The aflaclean was stored in a temperature below 30 °C before use.

The first solution was prepared by dissolving 50.14 g of sodium phosphate dibasic amhydrous (HNa_2O_4P) in 700mL distilled water. The second solution was prepared by dissolving 9.66g of sodium phosphate monobasic monohydrate ($H_2Na_2O_4P.\ H_2O$) in 350 mL distilled water. The two solutions were mixed and 42.5 g of NaCl was added resulting a color less stock buffer solution.

The working buffer solution was prepared by dilution (200:800 v/v). The pH of the solution was maintained at 7.2. HCl and NaOH were used to adjust the required pH.

Preparation of Working Buffer Solution for Aflatoxin

The working buffer solution for aflatoxin was prepared by further dissolving the stock buffer solution. 200mL of the stock buffer solution was taken and diluted by adding 800mL distilled water resulting one litre working buffer solution. The pH of the solution was adjusted with the help of NaOH and HCl. The pH of the working solution was maintained to be 7.2. A solution of Tween 20 (polyoxyethelene 20, $C_{58}H_{114}O_{26}$), that effectively suppresses unspecified reactions between antibodies, antigens and other molecules was prepared from Tween 20 stock solution. A third solution was prepared from Tween 20 and working buffer solution in a ratio of (92:8 v/v). 43 mL of the third solution was re-filtered and allowed to pass through the immuno affinity column together with the 7mL of methanol extract.

Separation of Aflatoxin from Methanol Extract

This stage is purification and clean-up stage. In order to quantify the amount of aflatoxin present in a given sample the methanol extract assumed to contain aflatoxin has to pass through aflaclean that contain aflatoxin antibody. If the sample has aflatoxin it will bind to the aflaclean (Immuno Affinity Column, IAC).

For each sample of analysis, 43 mL of working buffer and 7mL of methanol extract were mixed and poured to clean up set up in which the Afalaclean is present. Syringe was used to take the required 7mL of methanol extract. The buffer solution initially present in the aflaclean was remved to undergo the clean-up process. At this stage the afalatoxin is expected to bind with the antibody of the aflaclean via antigen (Afs)-antibody interaction (IAC). After the clean-up is completed, the aflaclean antibody was washed with 10 mL of H_2O. The IAC was allowed to air dry. After air dry, 2mL of Methanol was added to the aflaclean (IAC) and allowed to stand for 5 minutes. This was done to break the antigen-antibody interaction between the Afs and the IAC.

Derivatization

In this work neither pre-column derivatization nor pre-column derivatization was done due to the enhanced detection obtained from the current technology used by Agilent.

High Performance Liquid Chromatography (HPLC) Analysis

Qualitative identification and quantitative determination of aflatoxins were performed on HPLC-system (reverse phase) in the Mycotoxin laboratory, Bless AgriFood Laboratory Service, Ethiopia. The methanol eluate was taken for HPLC analysis. 20µL of methanol eluated aflatoxin was taken using vial. The vial was injected to sample injection port of the HPLC instrument. The HPLC instrument was calibrated for Aflatoxin measurement using quality standards. The blank HPLC grade methanol was used as quality control solvent.

All type aflatoxins were analyzed simultaneously using HPLC (Agilent 1200 Infinity series, USA) equipped with florescent light detector set at 365 nm and 440 nm exitation and emission wavelengths, respectively (Fan et al., 2013; Ghali et al., 2009). A reversed phase ZORBAX SB-C18 column (4.6 mm x 250 mm was used at a temperature of 39ºC. Acetonitrile/water/methanol (15:60:25 v/v/v) were used as the mobile phase pumped at a flow rate of 1.2 mL/min. The injection volume of both samples and standards used was 20 µL. The aflatoxin concentrations in the sample extract were determined from the retention time and peak areas. The concentration of the aflatoxin in µg/Kg were calculated according to the following the equation.

Aflatoxin (µg/Kg) = M x β

Where M is the quantity of aflatoxin (µg/Kg) obtained from HPLC reading multiplied by volume of eluate injected in to HPLC divided by thousand and , β is a conversion factor (1.4286).

Results and Discussion

The samples were purified by immunoaffinity columns and analyzed for aflatoxins (B_1,B_2,G_1, and G_2) by high-performance liquid chromatography (HPLC) with fluorescence detection according to the methodology adopted by Bless Agri-food Laboratory Service, Ethiopia.

The levels of Aflatoxins found in edible oil samples marketed at Debre Markos, Eastern Gojjam, Ethiopia showed that aflatoxin analysis of four samples from 20 most commonly used were highly contaminated. All types of aflatoxins (B_1, B_2, G_1 and G_2) were detected in three samples except one sample in which G_2 was not detected. The total aflatoxin values found were in the range of 5.58 µg- 247.44 µg/kg in the area. Among four types of aflatoxin, aflatoxin B_1 was found to take the maximum account. Its value ranges from 3.76 -132.38 *µg/kg.* It was found that aflatoxin B_1 is predominant in all samples followed by G_1, B_2, and G_2. The values obtained were above the Maximum Acceptable Limit (MAL) recommended by the European Union (4µg/kg) for total aflatoxin and AFB1 (2µg/kg). The results revealed the presence of the highest level of Aflatoxin in the area.

Table 1: Oil categories considered and the extent of AFs in oil samples

Oil Category	Number of samples	AFs	Number of samples with AFs
Imported	7	ND	0/7
Locally branded and packed	8	D	4/8
locally produced	5	ND	0/5

AFs= Aflatoxins, ND= not detected, D = Detected

As indicated in table 1, half of the oil samples which were locally produced and packed were found to have AFs. On the other hand, oil samples which were either imported or locally produced were

free from aflatoxin level. The result revealed that Edible oils which were produced by Debre Markos Merchants and were sold to the nearby community had equivalent quality with those of imported edible oils in terms of AFs. However, special attention has to be given to edible oils which are produced in different parts of the country with a brand name.

Table 2: Oil category and their aflatoxin level

Sample code	Oil Category	Aflatoxin Type				
		AFs	AFB_1	AFB_2	AFG_1	AFG_2
343	Imported	ND	-	-	-	-
335	Imported	ND	-	-	-	-
3084	Imported	ND	-	-	-	-
3086	Imported	ND	-	-	-	-
3082	Imported	ND	-	-	-	-
336	Imported	ND	-	-	-	-
334	Imported	ND	-	-	-	-
337	Locally branded and packed	D	132.37	10.37	100.44	4.49
340	Locally branded and packed	ND	-	-	-	
346	Locally branded and packed	D	8.61	1.45	3.88	ND
3083	Locally branded and packed	ND	-	-	-	-
345	Locally branded and packed	ND	-	-	-	-
3085	Locally branded and packed	D	3.76	0.6	1.49	ND
338	Locally branded and packed	D	26.68	1.55	17.76	.75
341	Locally branded and packed	ND	-	-	-	-
3080	locally produced	ND	-	-	-	-
339	locally produced	ND	-	-	-	-
3679	locally produced	ND	-	-	-	-
342	locally produced	ND	-	-	-	-
3081	locally produced	ND	-	-	-	-

AFs= Aflatoxins , ND= not detected , D = Detected, AFB1= aflatoxin blue 1, AFB2= Aflatoxin blue 2, AFG_1 Aflatoxin green 1 and AFG_2= aflatoxin green 2.

The levels of AFs were detected with Fluorescence detection in an emission wavelength of 435 nm and an excitation wavelength of 365 nm. A fast and simultaneous determination of four AFs with retention times of less than 10 minute were achieved with reverse phase C18 column (fig 3-4). The elution order of individual Aflatoxins was in the order of G_2, G_1, B_2 and B_1 with retention time of 4.61, 5.41, 6.14 and 7.36, respectively. Peak identification was achieved with the retention times of each AF types.

A methanol solvent was employed as blank whereas infected maize powder with all AFs were used as quality control (Figure 3).

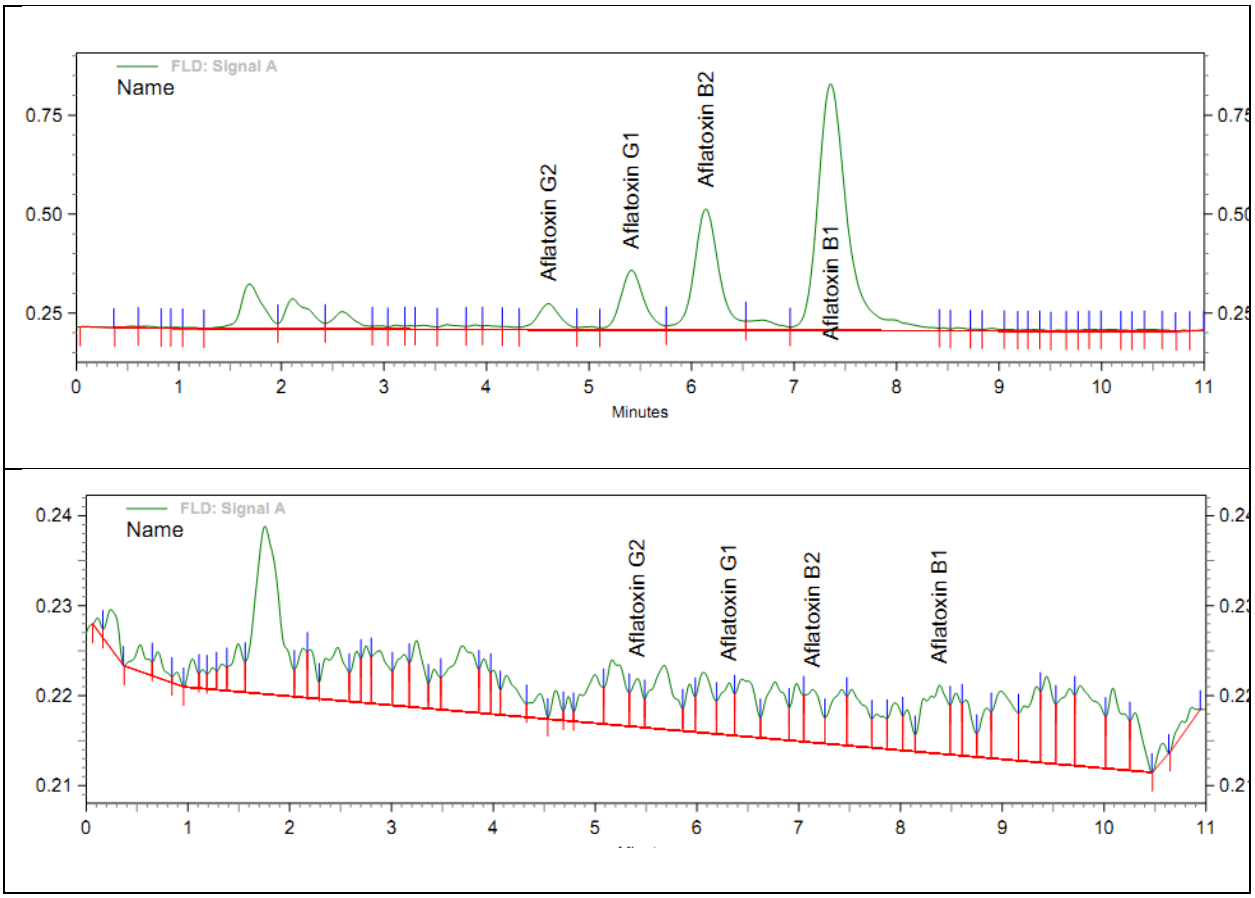

Figure 3: A model chromatogram for Quality control (upper panel) and blank (lower panel) used in the HPLC analysis.

The chromatogram for sample code 3081 (locally produced oil) shows aflatoxin level below the limit of quantification (<0.5 µg/Kg). A similar procedure and quantification was carried out for locally branded and packed oil of sample code 3085 (figure 4). The later has found to have aflatoxins B_1, B_2, G_1 and G_2 with (3.76, 0.6, 1.49) µg/Kg and ND, respectively.

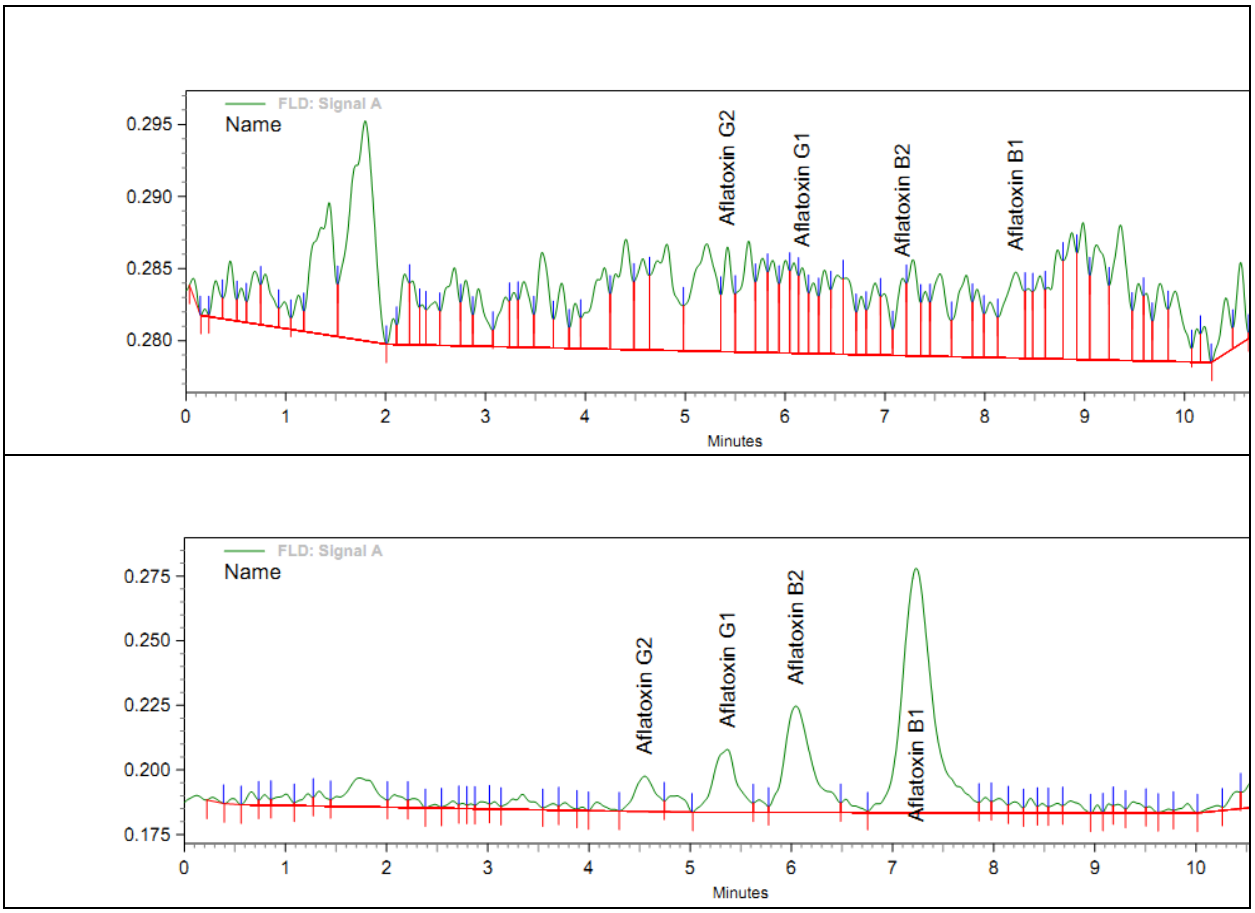

Figure 4: A sample chromatogram for for oil sample 3081 (upper panel) and 3085 (lower panel). The chromatogram data was converted to numeric form.

Conclusions

In this work the level of aflatoxin in edible oils commercially available in Debre Markos Market were determined using High Performance Liquid Chromatography techniques. A comparison was among oil samples of imported oils, locally produced oils, and locally packed and branded oils samples. Oil samples which were produced by Debre Markos Merchants were found to have comparable quality with those of imported oil samples in terms of aflatoxin. In this regard, none of imported and locally produced oil samples were found to show/exceed the value for limit of quantification (0.5 µg/Kg). Therefore, it can be concluded that the quality of locally produced oils samples are fit to the requirement of all country regulations including the European Union maximum tolerable limit of aflatoxin. But, half of the oil samples from locally produced and packed oils samples were found to be positive to aflatoxin in the range of 5.85-247.44 µg/kg. In all samples analyzed, Aflatoxin B_1 was found to be the most dominant type.

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Incidence and Predictors of Tuberculosis among Adult Diabetic Patients, Debre Markos Referral Hospital, Northwest Ethiopia, 2018: A Retrospective Cohort Study, Mihretie Gedefaw, Debre Markos University

Abstract

Tuberculosis is caused by mycobacterium tuberculosis that mainly affects the lungs and occurs in every part of the world. The link between tuberculosis and diabetes mellitus have long recognized but underappreciated. This study aimed to investigate the predictors of tuberculosis among diabetic patients at Debre Markos referral hospital, Northwest Ethiopia. A retrospective cohort study was carried out at Debre Markos referral hospital Amhara region, Ethiopia from January 2013 to December 2017. Data were extracted from Medical records and analyzed using Kaplan Meier survival and Cox proportional hazard model to identify independent predictors of tuberculosis. The total time contributed by the study participants was 1101.5 person-years (PY).The overall incidence rate of this cohort was 2.4 per 100 PY. History of alcohol (adjusted incidence ratio 4 (95% confidence interval 1.2 - 13), p-value 0.02) and past history of tuberculosis (12 (3 - 39), 0.01) were independently 'associated with a higher rate of TB. But body mass index of normal and above (>=18.5) was associated with a rate reduction (0.34(0.14, 0.80), 0.03 for tuberculosis in multivariate analysis. The overall incidence of tuberculosis was high and factors that affect the incidence were having history of alcohol, past history of tuberculosis and low body mass index. Early screening and treatment for tuberculosis were highly recommended at diabetes mellitus follow up for patients with the above risk factors.

Keywords: diabetes mellitus, incidence, predictors, tuberculosis

Background

Tuberculosis (TB) is the ninth leading cause of death worldwide and the leading cause of a single infectious agent, ranking above HIV/AIDS[1]. It occurs in every part of the world but the dynamics of the transmission varies geographically and with personal immunological response. In 2016, the largest number of new TB cases occurred in Asia and Africa with 45% and 25% respectively. Globally around 10.4 million people fell ill with TB and 1.7 million died from the disease [2, 3].

The association of tuberculosis and diabetes mellitus is a concern for the health sectors as the coexistence of those two highly prevalent diseases has made the already existing treatments very complex[4]. The link between TB and DM is considered to be more prominent in developing countries where TB is endemic and the burden of diabetes mellitus is increasing. In 2015 an estimated of 1.6 million deaths were directly caused by diabetes and 1.69 times more likely to develop TB than none DM individuals [5, 6].

The worldwide prevalence of DM has been increased more quickly than ever (11.7 percent) and increases the incidence of TB disease as the treatment outcome is poor in diabetic patients[7] The prevalence of DM in Ethiopia was found to be 6.5 % and the incidence of TB was 164/100,000 population[1, 8]. In addition to this, more than one-third of tuberculosis patients initiated care with health extension workers and referred to health care facilities [9] Therefore, the study was aimed to determine incidence and predictors of TB among diabetic patients at Debre Markos referral hospital, northwest Ethiopia.

Methods

Study Area and Period

After submitted and approval was obtained from Debre Markos University, Health Science College of ethical review committee, this retrospective cohort study was conducted at Debre Markos referral hospital from January 2013 to December 2017 to assess the incidence and predictors of TB among adult DM patients.

Study Population

The study population were all adults(>=18 years old) Diabetic patients who were registered in Debre Markos referral hospital chronic follow up care from January 1st, 2013 to December, 30/2017.

Inclusion Criteria and Exclusion Criteria

All Diabetic patients who fulfilled the inclusion criteria and registered from January 1st, 2013 to December, 30/2017 in chronic care follow up clinic of Debre Markos referral hospital were included in the study but gestational diabetic patients, patients with incomplete data, patients with unavailable medical records, patients who were transferred in and patients who had been with TB at the time of DM diagnosis were excluded from the study.

Data Collection Procedures

A five-year institution-based retrospective follow up study was conducted by chart review at Debre Markos referral hospital on adult diabetic patients at chronic care follow up clinic who had been registered from January 1st, 2013 to December, 30/2017. All diabetic patients were already registered at the hospital during data collection paired and all eligible patients (by census method) were included in the study. The medical record number (MRN) of the patients was identified from electronic database and health management information system (HMIS) registry books that had been used for the routine care of DM from January 1st, 2013 to December, 30/2017). Then by using the MRN of the diabetic patients, their medical records were identified and their status were assessed for the development of TB starting from the date of DM follow up initiation (first follow-up visit) to the end of the study paired by using validated data collection checklists.

Study Variables

The dependent variable of the study was incidence of TB among DM patients and the independent variables were socio-demographic factors (age, sex, and residence), personal behaviors **(**smoking, alcohol use and both smoking and alcohol) and clinical characteristics (type of DM, BMI, duration of DM, glycemic control, anti-diabetic medications, past history of TB treatment, cancer, chemotherapy, organ transplantation, close contact with TB patients, history of renal failure, steroids and other immune suppressors).

Data Analysis

Data collection checklists were used which were adopted from the previous study in Ethiopia [10].The tools consisted of both closed and open-ended checklists that was prepared in English version. Data were collected from the patients' medical records. The data were entered into Epidata3.1 and exported to stata14 for analysis. Descriptive statistics such as frequencies, proportions and, medians were calculated. The risk of developing TB among patients on DM cohort was assessed by using the person time method and the incidence rate of tuberculosis was calculated as the number of tuberculosis cases per 100 person-years observed. TB-free survival was calculated by years and calculated from the date of DM initiation to the last follow-up visit. The Kaplan-Meier curve was used to estimate the median duration of TB occurrence and the Log-rank test was used to compare survival curves between different categories of explanatory variables. Cox proportional hazards models were used to examine independent factors associated with time to TB development after initiation of DM follow up. The proportionality hazard assumption was tested graphically goodness of fit test and log rank test. To estimate the association between predictors and tuberculosis among diabetic patients, hazard ratio (HR) with 95% confidence intervals (CIs) was used. The finding was expressed with (95% CIs) together with the size of the effect estimate (relative strength). Variables which did not found in the medical records like, history of cancer, chemotherapy, adherence, organ transplantation, and steroids and, other immune suppressor drugs were not included in this analysis.

Results

Socio Demographic Characteristics of Study Participants

Four hundred thirty-three (433) records of people living with diabetes mellitus (PLWDM) were analyzed. Figure1.

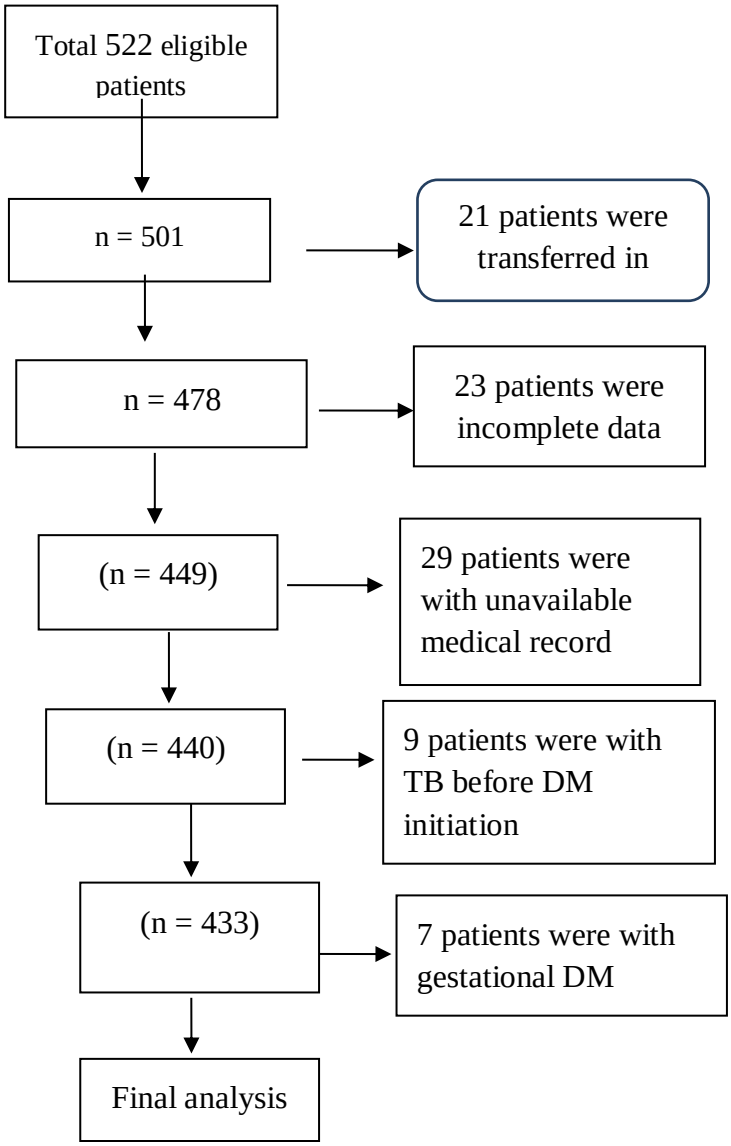

Figure1: Flow Diagram of the Diabetic Patients at Debre Markos Referral Hospital, Ethiopia 2018.

From the study, about 187 (43.2%) and 157 (36.3%) of patients were under the age category of 18-35 and 36-50 years respectively. The median age of the patients was 39 years with minimum

and maximum age of 18 and 79 respectively. In addition, about 241 (55.7%) participants were males and 270 (62.5%) were rural residents.

Clinical and Behavioral Characteristics of the Diabetic Patients

This study revealed that about 33(7.6%) of the patients were positive for HIV and 34 (7.9%) had a history of renal failure. The duration of DM in all patients varied from date of initiation to 5 years of follow up. In the study, 53 (12.2 %) of the participants had a family history of DM and 224 (51.7 %) were with type-I DM. About 197 (45.5%) of the patients were on oral hypoglycemic agents and 362(83.6%) were normal and overweight. About 8(1.9%) were smokers, 16(3.7%) had alcoholic history and only 5(1.2%) of the study subjects had both histories of alcohol and smoking.

Table 1: Baseline Socio Demographic, Clinical and Behavioral Characteristics of People Living with Diabetes at Debre Markos Referral Hospital from January 1st, 2013 to December 30/ 2017

Variables	Characteristics	Frequency	Percent (%)	PY	TB	TBID
Sex						
	Male	241	55.7	55.7	15	0.27
	Female	192	44.3	44.3	11	0.25
Age						
	18-_35	187	43.2	489.9	14	0.03
	36-50	157	36.3	385.2	9	0.02
	>50	89	20.6	226.4	3	0.02
	Median	39.9				
Place of residence						
	Urban	163	37.6	441.3	10	0.02
	Rural	270	62.4	660.2	16	0.02
BMI	< 18.5	71	16.4	212.5	13	0.06
	>=18.5	362	83.6	889	13	0.01
HIV Sero-status						
	Positive	33	7.6	79.4	3	0.04
	Negative	400	92.4	1022.1	23	0.02
Type of DM						
	Type I	224	51.7	593.1	19	0.03
	Type II	209	48.3	508.4	7	0.01
blood glucose level(mg/dl)						
	≤ 70	14	3.2	47	1	0.02
	70-130	165	38.1	417.3	8	0.02
	≥ 130	254	58.7	637.2	17	0.03
Past history of TB						
	Yes	9	2.1	23.5	5	0.21
	No	424	97.9	1078	21	0.02
History of close contact						
	Yes	5	1.1	10	3	0.3
	No	428	98.8	1091.5	2	0.15

Duration of TB since DM diagnosis						
	≤ 1year	12	46.2	27	12	0.44
	1-3 year	14	53.9	63.5	14	0.22
DM medications had been/being used						
	OHA	197	45.5	492.3	6	0.01
	Insulin	226	52.2	580	18	0.03
	Both OHA insulin	10	2.3	29.2	2	0.07
History of smoking						
	Yes	8	1.9	22	1	0.05
	No	425	98.2	1079.5	25	0.02
History of alcohol						
	Yes	16	3.7	47	5	0.11
	No	417	96.3	1054.5	21	0.02
History of both smoking and alcohol						
	Yes	5	1.2	10	0	0
	No	428	98.9	1091.5	26	0.02

*BMI: body mass index, DM: diabetic mellitus TB: tuberculosis, OHGA: oral hypoglycemic agents, HIV: human immune virus

Incidence of Tuberculosis among Diabetic Patients

There were 26 new TB cases (events) in this study with the overall incidence rate ratio of 2.4 per 100 PY. From those 15 (57.7%) were males, 20(76.9%) were with pulmonary. From those with PTB patients, only 4(20%) had a past history of TB. From the total study participants, 9(2%) had past history of TB (7(77.8%) PTB, 2(22.2%) EPTB) and all were cured before DM follow- up initiation. A relatively higher proportion of TB 14(53.6%) was diagnosed among the age group of 18-35. The incidence was higher among rural residents 16 (61.5%) and among those patients who had a duration of 1-3 years 14 (53.8%). More than half 19(73.1%) of the TBDM patients were with type I DM.

Tuberculosis Incidence Density

Four hundred thirty- three (433) study participants were followed for different periods in five years and produced 1101.5 PY of observation. The mean, median and range of the Follow-up time was 2.5, 2 and 4.8 years with (IQR=3). Within the Follow-up period, 26 patients were found to have post DM TB (new cases) with the overall TB incidence density (ID) of 2.4 per 100 PY.

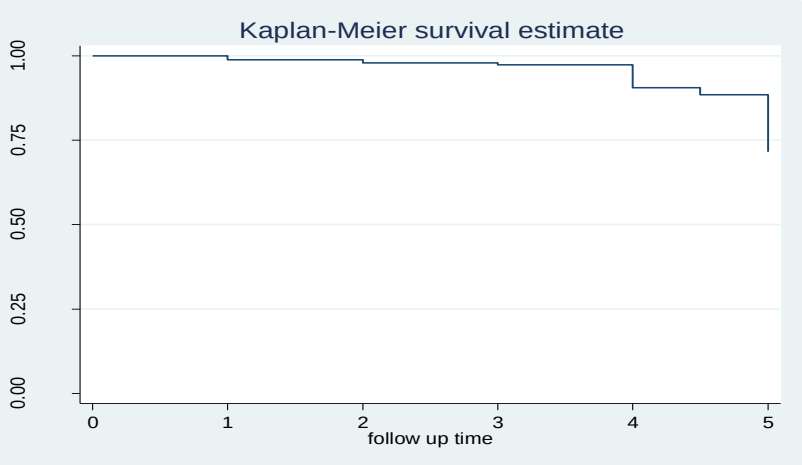

Figure 2: Kaplan-Meier curve of tuberculosis survival proportion for Diabetic patients at Debre Markos referral hospital from January 01/ 2013 to December 30/ 2017.

Clinical and Behavioral Characteristics of Diabetic Patients at Debre Markos Referral Hospital January 1st 2013 to December 30, 2017.

Table 2: Tuberculosis Incidence Density Rate Stratified by Socio-demographic

Variables	**Frequency**	**PY**	**TB**	**TB IDR**	**CHR(95%CI)**	**AHR(95% CI)**	**p-value**
Sex							
Male	241	55.7	15	0.27	1.8(1.2-3.2)		
Female	192	44.3	11	0.25	1.00		
Age							
18-_35	187	489.9	14	0.03			
36-50	157	385.2	9	0.02			
>50	89	226.4	3	0.02			
Place of residence							
Urban	163	441.3	10	0.02	1.00		
Rural	270	660.2	16	0.02	0.72(.04- 11)		
Clinical characteristics							
HIV sero-status							
Positive	33	79.4	3	0.04	1.00		
Negative	400	1022.1	23	0.02	0.52(.15-1.7)		0.32
History of renal failure							
Yes	34	78.1	2	0.002	1.00		0.99
No	399	1023	24	0.02	1.1(.24-4.3)		
Family history of DM							
Yes	53	89.4	4	0.003	1.00		
No	380	1011.7	22	0.02	1.1(.35-3)		0.96
Type of DM							
Type I	224	593.1	19	0.03	1.00	1.00	
Type II	209	508.4	7	0.01	0.4 (0.2-1	1.6(0.29 -8.4)	0.24

BMI							
<18.5	71	212.5	13	0.06	1.00	1.00	
>=18.5	362	889	13	0.01	0.2(0.1-0.6)	0.34 (0.14 - 0.80)	0.03*
Blood glucose level (g/dl)							
< 70	14	47	1	0.02	1.00		
70-130	165	417.3	8	0.02	1.1(.12 -8.1)		0.99
≥ 130	254	637.2	17	0.03	1.00		
Past history of TB							
Yes	9	23.5	5	0.21	24(6.6-52)	12 (3-39)	0.01*
No	424	1078	21	0.02	1.00	1.00	
History of close contact with TB							
Yes	5	10	3	0.3			
No	428	1091.5	2	0.15			
Duration of TB since DM diagnosis							
≤ 1year	12	27	12	0.44	1.00		
1-3 years	14	63.5	14	0.22	0.4(.2- 1.1)		
DM medications							
OHGA	197	492.3	6	0.01	1.00		
Insulin	226	580	18	0.03	2.7(1.1- 6)	2.8(0.46-16)	0.26
OHA +insulin	10	29.2	2	0.07	8(0.8- 54)	6(0.8 -46)	0.08
BMI							
<18.5	71	212.5	13	0.06	1.00	1.00	
>=18.5	362	889	13	0.01	0.2(0.13-0.6)	0.34 (0.1- 0.8)	0.03*
Behavioral characteristics							
History of smoking							
Yes	8	22	1	0.05	1.00		
No	425	1079.5	25	0.02	0.6(0.1-4.3)		
History of alcohol							
Yes	16	47	5	0.11	8.5(1.4-11)	4(1.2-13)	0.02*
No	417	1054.5	21	0.02	1.00	1.00	
History of smoking and alcohol							
Yes	5	10	0	0			
No	428	1091.5	26	0.02			

*BMI: body mass index, DM: diabetic mellitus TB: tuberculosis, OHGA: oral hypoglycemic agents, HIV: human immune virus

Predictors of Time to TB Occurrence among Diabetic Patients

Univariable and Multivariable Analysis

Unavailable analysis was used to assess the relationship between the independent variables and the risk of developing TB. At the unavailable analysis HIV Sero status, history of renal failure, family history of DM, blood glucose level, body mass index, type of DM, diabetic medication, past history of TB and history of alcohol were interred in to the multivariable analysis (Table 3).

To identify the independent predictors of TB, a multivariable Cox-proportional hazard adjusted model was fitted after the proportional hazard assumption was checked with (global test = 0.94) log rank test for significantly associated variables at the multivariable analysis (body mass index =0.02, Past history of TB= 0.001, history of alcohol =0.001) and by graphically assessment method. Finally, only history of alcohol, past history of TB and body mass index remained significant predictors for TB ($p<0.05$). Accordingly, PLWDM who had a history of alcohol were 4 times at higher risk of developing TB as compared to those who had no history of alcohol (incidence rate ratio (95% CI: 4(1.2, 13), p: 0.02) and patients who had past history of TB were 12 times at higher risk of developing TB as compared to those who had no past history of TB (incidence rate ratio (95%CI: 12(3,39),p: 0.01). Patients who were normal and overweight (BMI >= 18.5) were less likely to develop TB (Incidence rate ratio (95%CI: 0.34(0.14, 0.80), p: 0.03) than those who were underweight (less than 18.5).

Discussion

In this study, the incidence of tuberculosis was 2.4/100 PY among diabetic patients and pulmonary tuberculosis was accounted the high proportion. History of alcohol and past history of TB were independent predictors' of TB but body mass index (BMI, >=18.5) was associated with a rate reduction (0.34(0.14, 0.80), 0.03 for tuberculosis.

The overall incidence of TB among DM patients was 2.4/100 PY. This was greater than the studies done in Texas (0.31/100PY), China (0.30/100PY, 0.22/100PY) and Tanzania (1.7/100 PY) [11-13]. This distinction could be due to the development of screening and diagnostic techniques for early testing and detection prior to disease progression, which was shown in other research as sophisticated DM contributes significantly to TB infection in China and Texas[7, 14] and study population difference in Tanzania. However, this study finding was consistent with the study done in India (2.2/100 PY) [15] but inconsistent with the study in North India(0.655/100 PY)[16]. This could be due to the difference in population in the study layout and survey (prospective research was conducted on patients with type II DM) in North India. Type II DM Patients had comparatively decent insulin secretion and glycemic control which could prevent complications and co-infections from developing. But study finding was less than studies done in Australia (5.8) and Ethiopia at

Black lion (3.8/100PY) [17] and Dessie referral hospitals (6.2) [18, 19]. This might be due to the study design and socio-demographic characteristics difference as type II DM is more common in advanced ages in which relatively with minimal complications because of having relatively good insulin secretion for glycemic control[11]. Most respondents in this research came from rural regions that could have socio-economic and demographic factors to visit the health organization.

Furthermore, this research recognized some significant variables that determined the incidence of TB among DM patients. It has been discovered that patients with a history of alcohol and previous history of TB are risk factors for growth of TB. However, normal and overweight (BMI > = 18.5) were preventive variables in the growth of TB in patients with DM (incidence rate ratio (95 percent CI: 0.34 (0.14, 0.80), p: 0.03). Patients with a history of alcohol were four times more likely to develop TB than patients with no history of TB (incidence rate ratio (95 percent CI: 4(1.2, 13), p: 0.02)). This is consistent with study in Texas (AHR(95% CI:12.7(0.2,0.6)[20], Australia (AOR(95%CI:2.6 (1.9,4.5)[21] India [22] and Ethiopia [23] but inconsistent with the studies done in the US [24], UK [25] and China [26]. Furthermore, one of the most significant predictors for the incidence of TB among diabetic patients was previous history of TB. Patients with a history of TB were 12 times more likely to develop TB than those without a history of TB (incidence rate ratio (95% CI: 12(3, 39), p: 0.01) consistent with studies conducted in Australia (OR (95 % CI: 2.6, (2.13,3.3)[21], systematic review study in Ethiopia[23], Northeast Ethiopia (AOR(95%CI:13.4 (2.74,65.73)[19] and Oromia (AOR(95% CI: 4.11 (2.18,7.77) [17] .

Also, BMI was the other major factor in the development of TB in diabetic patients. Normal and overweight (BMI > = 18.5) were less likely to develop TB than underweight (BMI <18.5) (incidence rate ratio (95%CI: 0.34 (0.14, 0.80), p: 0.03) consistent with research in south-eastern Amhara[27], systematic review in Ethiopia[23], Egypt[28], US[24, 29] and China (AHR (95%CI: 0.89 (0.76,1.03) [26] but inconsistent with the study done at Black lion hospital in Ethiopia [10]. This could be due to the difference in socio-demographic features as more than half of the respondents in this research were rural residences and underweight.

Limitations

This study was retrospective follow-up and depends on medical records so; TB incidence might be underestimated due to excluded of charts with incomplete data. Some important variables like a history of Cancer, chemotherapy, adherence status, glaciated hemoglobin, and organ transplantation were not recorded and investigated. This research took five years to complete, during which several modifications in clinical practice were probable to occur.

Conclusion

In five years of diabetic cohort, the overall incidence of tuberculosis was high among diabetic patients in Debre Markos referral hospital. Pulmonary tuberculosis was accounted the high proportion. History of alcohol and past history of TB were independent predictors' of TB. But being normal and overweight (BMI, >=18.5) was found to be an independent positive factor associated with decreased risk of TB occurrence. Special attention should be given on health

education for patients who have a history of alcohol, past history of TB and low body mass index to reduce the risk of TB incidence by improving modifiable risk factors. All diabetic patients should be screened for tuberculosis in clinical practice to prevent the occurrences of TB among DM patients as early as possible. Further prospective cohort study should be conducted to make clear relations between predictors and TB incidence.

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Federalism and Exercising Regional Autonomy: A Case of Three Federated Units in Ethiopia, Girma Defere and Getahun Alemayehu, Jimma University

Abstract

According to some observers, the recent political upheavals (since 2014/15) in some regions of Ethiopia have been regarded as the product of the federal system. Others, in contrast, argue that it is not the federal system, but, rather, implementation failures which have caused the problems. The rift between the federal government and some regions also attracted our attention. Why has this rift between the center and the main regions occurred? This study, therefore, aimed at assessing center-region relations regarding whether regions enjoy full autonomy or not in their jurisdictions. The study employed a qualitative approach. Interview was the main primary data collection method. The findings of the study showed that the federal government through the incumbent party, the EPRDF network, severely undermined regional autonomy more seriously before 2016. There have been dramatic changes observed in the post 2016, particularly, in the Oromia region. With the coming into power of the reformist leader within the EPRDF coalition on April 02, 2018 various reforms have been introduced that can strengthen the practices of democratic federalism in Ethiopia. This study, accordingly, recommends among others that the federal government should respect constitutional jurisdictions given to regions and encourage a democratically negotiated autonomy between the federal government and the federated units; there should be negotiation among the ruling EPRDF coalition members on the basis of equality, respect and trust; there should be separation between the party and the state administration (replacing democratic centralism ideology by participatory democracy); and titular and non-titular national minorities should get fair representation in their respective regional councils.

Keywords: federalism, regional autonomy, Oromia, SNNPR, Tigray, Ethiopia

Introduction

The federal political system appeared to be a tool of nation building following the demise of European colonial empires after the end of the Second World War (Watts 1994a as cited in Asnake 2013). Most of the post-colonial states of Asia and Africa then implemented federalism, though many of the federations were futile without ignoring its continuity in India, Malaysia and Nigeria (Rothchild 1966 cited in Asnake 2013).

A growing demand to seek federalism as a solution to a state problem intensified in the 1990s (Watts, 2007). Asnake (2013) pointed out two opposing factors which contributed to this. The first was the collapse of the USSR, Yugoslavia and Czechoslovakia which revitalized fears about the stability and durability of multiethnic federations as well as the political deadlock in Canada over the question of Quebec's secession and the constant political dispute of federal Belgium which reinforced doubts a sustaining of a multi-ethnic federation. The second was that, despite such political problems, statesmen considered federalism as a solution to address multi-ethnic

diversity, for example, federalism was opted for the establishment of the Russian federation to maintain the remaining Soviet members.

What defines a federal political system? Guzina states that there is no uniform criterion to define federations because federations differ in many respects: number of regional units, degree of centralization, role of the constitution, allocation of taxing powers and the degree of regional, economic, and social diversity (Guzina 2010).

Watts stated that a federal system structure should comprise the following features: (i). two or more tiers of government in which each tier acts to be responsive to their citizens (ii) a formal constitutional distribution of legislative and executive authority, and share of revenue resources between the different tiers of government ensuring some areas of genuine autonomy for each order; (iii) authorizing the upper chamber of the parliament to engage in federal public policy making ; (iv) a supreme written constitution whose amendment requires the engagement of the federal government and regions, (v) the interpretation of constitution by courts, and (vi) institutions should exist to coordinate intergovernmental cooperation in joint responsibilities areas (Watts 2007, see also Elazar 1987). Guzina argues that not all federal states incorporate those elements and mentions Belgium, for example, its federated units do not have a right to amend federal constitution, the other is the Canada whose upper chamber, the Senate, is not a policy- making body (Guzina 2010).

Ethiopia adopted a federal like system of government in 1991 after the demise of the socialist led regime. The source of Ethiopia's ethnic based federalism can be traced to Marxist-Leninist ideology which was linked with the identity or nationality question during the Ethiopian student movement activities (Habtu 2003). Habtu stated that the EPRDF (a coalition of four political parties, TPLF, ANDM, OPDO and SPDM) employed the model of the former USSR and Yugoslavia. The EPRDF government in 1991 introduced a federal-like state structure along ethno-linguistic lines by adopting the transitional period charter (see TGE 1991).

The transitional period charter allowed the nations, nationalities and peoples of Ethiopia self-determination and encouraged them to preserve and promote their various languages, cultures and histories. The proclamation established fourteen national/regional self-governments along ethnic lines. During the transitional period charter, the regional self-governments were subordinate to and financially dependent on the central government (see TGE Proclamation No.7/1992). "Legally, the Councils of the Regional Governments were not only accountable to the people of their respective regions that elected them but they were accountable to the Council of Representatives of the central government" (Hashim 2010). The transitional period charter did not allow a fully-fledged federal system to exercise regional autonomy and was, therefore, referred to as a federal-like state structure.

In 1994/95, a clear federal political system was declared by the constitution that shared political power between the federal government, nine federated units and two city administrations was

introduced by the FDRE. The right to self-rule including a secession article was incorporated into the FDRE constitution by article 39.

Unlike the transitional period charter, in which the secession article was conditional on certain factors, such as, the failure to exercise self-rule, promote ones' own culture, history and language and representations to the federal government; in the FDRE constitution, the right to secession is allowed with no preconditions which makes it absurd (Art. 39 of the FDRE Constitution, 1995). Moreover, the constitution allows both regional autonomy and shared rule. Regions have the right to enjoy regional autonomy but this does not mean that there is no constitutional ground for the federal government to intervene. In fact, and as stipulated in the constitution, there are four grounds for the federal government to intervene in regions: (i) on the request of a federated state when there is a lack of security which goes beyond the capacity of regions (Article 51\14); (ii) by the decision of both Houses of the Federal Parliament when the federated state concerned fails to handle human rights violations (Article 55\16); and (iii) by the order of the House of Federation (Article 62\9). And the other is, when a nation-wide state of emergency is declared as per article 93 of the FDRE constitution.

This study, therefore, investigated regional political autonomy (political executive and legislative autonomy) before and after the incumbent government's *deep political renewal* (2016), taking into account the practices of the three federated states of Ethiopia: Oromia, the SNNPR and Tigray.

Materials and Methods

This study employed a qualitative approach as this method enables us to comprehend issues, questions or problems by providing rich and holistic information (Tray 2013). The study employed descriptive case study design to discuss the pre-2016 federation experimentation in reference to regional autonomy in Ethiopia as the research in this respect involves historical issues. And exploratory design was employed to discuss the post 2016 as there is insufficient study in this matter. Research Strategy is a multiple–case study design which allows the study to explore phenomena through the use of a replication strategy (Zach 2006). Data were gathered at two tiers of government institutions and multiple data sources were collected from various bodies to triangulate.

Qualitative data were collected primarily from the Oromia, the Southern Nations Nationalities and Peoples and the Tigray National Regional State Governments. The offices of the individual regions including the House Speaker's Office, the President's Office and the Public Relations Office were contacted for interviews. From the federal government, long serving members of the House of People's Representatives and members of the House of Federation were also contacted for interviews. Members of the opposition, the MeDReC, and other experts were also consulted in the study.

Data Type and Data Sources

The study employed both primary and secondary data. This diversification of data sources helped to reach valid conclusions. And also helps to maintain a higher degree of confidence in the data that would further help to establish the validity of the research findings. Accordingly, primary data were collected using interview from government authorities, opposition parties, expert and ordinary people to come up with a balanced data. In order to support the results of the primary data, secondary sources from relevant institutions public documents that exist in the form of conferences, newspapers, official records, publications, and audio-video were utilized including, books, relevant academic journals, and conference papers.

Major Findings

Although the FDRE constitution allows self-rule for the federated units, in practices, it suffered from lack of practical implementation in the past 25 years. In this regard, Tigray region enjoyed a relative high degree of autonomy before 2016 compared to others; whereas, Oromia region has started to exercise its autonomy well in the post 2016. Basing the results of the interview data and document analysis, the following are factors that inhibited exercising regional autonomy and the practices of democratic federalism particularly in the pre-2016 in the studied regions. These are:

(i) Informal, rent seeking political behavior and unconstitutional practices;
(ii) Single party dominance in both federal and regional governments;
(iii) Ethnic based federalism merely to serve for divide and rule than to promote ethnic democratic federalism;
(iv) Unequal partnership in the ruling party coalition;
(v) Fusion of party and government activities;
(vi) Narrow space for multi-party and civil society activities;
(vii) Unfair representation of ethno-national groups in the security and key national defense Posts;
(viii) The national security and defense served as party tool than guarding the constitution;
(ix) top-down policy making in which the party channel surpasses over government structures and functions; and
(x) Absence viable institution (s) that regulates intergovernmental relations.

This study argues that in the absence of a genuine democratic federalism and regional autonomy, ethnic federalism is a breeding ground for all forms of violence that endangers state survival. Now the new EPRDF leadership has taken different measures as part of the reform to widen space for multiparty democracy and civil society and to practice democratic federalism.These reforms should be implemented and supported by institution building as the presence and function of these institutions is a foundation for the healthy functioning of democratic federalism which enables regional autonomy to be respected.

The quest for autonomy continued with the recent political development with the decline of TPLF dominance within the EPRDF particularly some regional states like Oromia and Amhara to enjoy

high degree of autonomy in their jurisdiction which has also posed OPDO and ANDM to have revisited their party inner being that also influence the Southern Peoples Democratic Movement to undergo similar reforms to a certain degree. Accordingly, by the 9th party conference held on September21, 2018 at Jimma, OPDO, Oromia regional ruling party changed its name to Oromo Democratic Party (ODP) with a new party logo. Likewise, by the 12th party meeting held on October 2, 2018 at Bahir Dar, ANDM, Amhara regional ruling party similarly changed its name to Amhara Democratic Party (ADP) with a new party logo. The ideology shift is a direct antithesis of the party bylaws which urges all EPRDF party members should pursue revolutionary democracy. This reflects that the quest for autonomy is believed to be the will of the people.

All this shows how the asymmetric power relation within EPRDF has undermined regional autonomy in the federation experiment of Ethiopia. In the interview with senior TPLF party member and the regional president chief of cabinet and advisor to the president told us EPRDF is 'now weak' in the future if it strengthened it may address the different national problems prevailing now. Similarly, other research participants in the interview in the region echoed the same mentioning the unaddressed different inter-region administrative border dispute as a sign the EPRDF weakness. The fact is when Amhara and Oromia ruling parties have become assertive in their regional administration, TPLF dominated EPRDF has played a counterproductive role. Lately, the TPLF leadership has threatened the federation by not cooperating with the federal authorities.

That means the friction within EPRDF party members arise from the claim to come to equal partnership, and fair representation and fair power as well as resource sharing posed by wave mass demonstration as previously discussed, which challenged the old established party doctrine of revolutionary democracy. Gleason (1992) when discussed about the federal structure in the former Soviet Union, he observed the federal system failed to take into account local realities rather to subordinate them to central authorities. He further discussed that Lenin, the father of the state, did not like federalism but accepted it for the sake of political expediency to save the state from collapse.

As Gleason mentioned, this study revealed that TPLF/EPRDF formulated ethnic federalism in Ethiopia for the sake of power control by promoting the politics of ethnicity to divide and rule tactics (see Aregawi n.d). Ordinary people interviewed on the street in all study areas (Tigray, Oromia and SNNPR) also shared this view by saying, "Ethiopian federalism promoting ethno-linguistic and cultural diversity by disregarding Ethiopian citizenship and common values and history". Meaning, according to the research participants, the federal experimentation in the past 27 years has failed to balance ethno-national identity and Ethiopian citizenship at large. Moreover, all non-titular communities in all federated units of the state are not represented in their respective regional councils to make their voice and felt-interests heard this has caused the spirit of alienation and non-belongingness in the federated units.

Bhattacharyya (2001) discussed that when federalism is genuinely implemented in multinational states it is the best device to attain political stability and security. In contrast, the in proper implementation of federalism could be a cause for state disintegration. It is the inappropriate implementation of federalism in the nation for the past 27 years not only undermined regional autonomy but now threatening state survival by causing thousands of non-titular communities to be internally displaced across the different federated units of the country.

Research respondents in the interview from the Southern Nation Nationalities and Peoples Region, Tigrai and Oromia National Regional State Government stated that they have fear on the rise of ethno-nationalism at large as a threat to the federal system. Likewise, archival sources of EPRDF party members also confirmed that. In the interview with the expert of federalism, Ethiopian federal system lacked an institution to regulate intergovernmental relations. Hence, there should be an institution that regulates intergovernmental relations, because, when there is conflict of the law or a confusion of practices or other relevant issues, this institution will serve to regulate the matter, accordingly, cooperative federalism can function properly in the federal system of the nation. Above all, the process and function of federalism involves negotiation, cooperation and bargaining among the bodies of the federation to arrive at common agreement or failure to reach on an agreement should defend the common interests of all members of the federation. Accordingly, the federated units of Ethiopia including Oromia, Tigrai and SNNPRs should cooperate and negotiate in all common matters. Otherwise, the federal system cannot function in a healthy manner as we observe now.

Conclusion

A federal system of government divided political power constitutionally whereby federated units enjoy autonomy in their jurisdiction. The central tenet of federation is to ensure both self-rule and shared rule in which both sides enjoy a degree of freedom. The Ethiopian federal formula was based on Stalinist ideology which bases its foundation on Marxism. TPLF/EPRDF being influenced by the Soviet Stalinist ideology introduced ethnic federalism based on notion of revolutionary democracy that believes there has been inter-nation oppression not class oppression in Ethiopia. This view of federalism contradicts the notion of democratic federalism that gives attention to individual liberty and freedom. The federal political system has created the opportunity for the varied national communities to foster their history, culture, language and religion. This study deals with the extent of federated units exercising political autonomy in their jurisdiction. The federal practices show that there is domination by the federal government over the federated units.

The experience of Ethiopia's federal experiment in the past 25 years clearly showed with some variation across regions that federal structure existed without federal functions and democracy which shares commonality with the communist states. The incumbent party, the EPRDF party apparatus, sternly undermined regional autonomy and democratic institutions as the federal government influenced regional governments through the ruling party channel; this scenario was

more significant before 2016, but, after 2016 the federal government party apparatus influence significantly declined mainly in Oromia region which has started to exercise its autonomy rights as per the constitution. The other issue that this study revealed that regional presidents in all studied regions are practically not elected by regional legislatures but are assigned by the party and this has made the role of the legislature weak in challenging the executive.

As Aalen (2002) citing Riker (1964) discussed party systems organization could foster or deter the federal share of power. Meaning in the condition where one party controls both the federal and regional level government, regional autonomy cannot be ensured. In contrast, if the political party operating at regional level is autonomous from the party in power at the federal government level; the prospect of ensuring regional autonomy is high. Aalen (2002) further argued that the EPRDF prevails in all regional governments through its party channel which made regional governments to be subordinate to the federal government. Compared to the pre-2016 federal practices, regional autonomy within the federal system has showed significant improvement, after 2016 predominantly in the Oromia region. The incumbent government leader's ongoing political reform that has been introduced after April 2018 is promising and will bring positive impact on the practices of genuine democratic federalism, particularly in ensuring equal partnerships among the EPRDF coalition.

Recommendations

Since most of the findings of the study were generable to Ethiopia, the recommendations are also. Based on the findings, the study suggests that the federal government of Ethiopia should respect constitutional jurisdictions given to regions and encourage a democratically negotiated autonomy between the federal government and the federated units because such autonomy promotes unity in diversity. Moreover, it promotes political stability and contributes for economic growth as peace is a panacea for development. In this regard, Ghai (2000) stated democratically negotiated and managed autonomy thwarts secession interests (as cited in Guzina 2010). Hence, regional autonomy should be respected and promoted so long as it does not threaten state unity and survival. Taylor (2007) also discussed that if the federated units are too powerful, the federation may face the threat of secession or collapse, on the other hand, if the central government is too strong, it may make the federation meaningless.

The federal government and federated units government should inform citizens with regard to the process and functions of the federal political system so as to defend the rights of the titular and non-titular national minorities. As clearly stated in the FDRE constitution of article 32(2) that allows the right to liberty of movement and freedom to choose own residence. The ruling EPRDF government should keep on implementing federalism properly. There should be viable democratic institutions, multiparty politics and genuine democratic elections. This requires a paradigm shift, as Bassi (n.d) also discussed democratic centralism ideology that EPRDF pursues is against the principles of democratic federal political system which requires the materialization of freedom of assembly and political pluralism that are stipulated in the FDRE constitution.

Hence, all EPRDF coalition members should shift from revolutionary democracy to a more participatory democracy that currently some EPRDF coalition members, such as; the Oromo Democratic Organization and the Amhara Democratic Organization have started to practice it in their jurisdictions.

The federal government and the federated units should promote the culture of negotiation and genuine cooperation based on the principles of equality and trust. Research shows federal process can work to the desired level when democratic political culture and democratic government involves cooperation and compromise than use of force (see Lynn and Novikov 1997). In this regard, the regional state of Tigrai should submit itself to the guardians of federalism as stipulated in the FDRE constitution.

In Ethiopia, party and government functions are interfused, as repeatedly stated in this study; hence, there should be separation between party and state administration because this separation helps to reduce the effect of the friction within the party on public administration. Therefore, in both the federal government and the federated units, the party machinery should divorce from the state apparatus.

Non-titular and titular minorities should get fair representation in their respective regional councils that mean institutionalizing minority rights so that their constitutional rights not jeopardized; moreover, it serves for the healthy functioning of the federal system as democratic federations governed by defending minority rights. Accordingly, regional constitutions should be revised to allow fair representation both minorities (titular and non-titular).

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Economy Wide Impact of Currency Devaluation in Ethiopia: A Recursive Dynamic Computable General Equilibrium Analysis, Takele Abdisa and Derese Getachew, Ambo University

Abstract

This study analyzes the economy wide impact of currency devaluation on Ethiopian economy using Dynamic Computable General Equilibrium (DCGE) model. It utilized the updated 2009/10 Ethiopian Social Accounting Matrix (SAM) from 2005/06 developed by Ethiopian Development Research Institute (EDRI). In order to investigate the impact of currency devaluation on Ethiopian economy different simulations were made turn by turn. First, an increase in exchange rate by 15% was introduced to see the impacts of currency devaluation on Ethiopian economy. Consequently**,** all macroeconomic variables show reduction from base case scenario except the consumer price index which shows increment, explaining the inflationary pressure of currency devaluation. On the second simulation decrease in export price by 15% introduced to see the impact of currency devaluation on economy. As a result, decrease in export price failed to recovery the export from low performance because the structural problem from supply side is not sufficient to meet the increased demand for exports after devaluation. Similarly, increase in import price by 15% under the third scenario also deteriorated the overall economic performance since Ethiopian imports are strategic imports which are not amenable for reduction following the advised devaluation because, most input purchased from foreigners at expensive price which increases cost of domestic production. Lastly, there is welfare reduction resulted from poor economic performance and increase in price which result in deterioration of welfare of the society. Based on finding the best way to improve export performance would be to replace currency devaluation by the structural reform which is still the bottleneck for export performance.

Keywords: currency, devaluation, export, import, performance

Introduction

Background of the Study

Exchange rate is one of the most important policy variables, which determines the trade flows, foreign direct investment, inflation, international reserve and remittance of an economy. As well, the exchange rate is one of the major economic variables with important implications on international competitiveness since its change affects both export and import prices (Oskoee and Alse, 1994). The exchange rate (E) is the rate at which one currency exchanges for another. From a macroeconomic point of view, exchange rate changes can have strong effects on the economy, as they may affect the structure of output and investment, allocation of domestic absorption and external trade, influence labour market and prices, and alter external accounts. (Marc and Michel, 2011). Before 1992 the country was exercised a fixed exchange rate regime, when the rate is solely determined by the government. Since 1992 the country implemented an exchange rate policy which is more close to managed floating, where there is a government intervention

whenever necessary to stabilize the foreign exchange market (Nega, 2015). Maintaining exchange rate stability is considered as the principal policy objective of National Bank of Ethiopia so as to be competitive in the international trade and to use exchange rate intervention as policy tools for monetary policy to affect both foreign reserve position and domestic money supply (Lencho, 2013).

The devaluation of the Ethiopian Birr (ETB) per US dollar officially began during the EPRDF regime. Previously the country used to have a fixed exchange rate with a rate of 2.07 Birr per US dollar. During the military regime, Ethiopia's external sector enormously affected by current account deficit due to stagnant export earnings and rising imports (World Bank,1990). From the year 1988/89 up to 1990/91 export earnings were declined from Birr 902.8 million to Birr 616.4 million, while import expenditure rosé from Birr 2110.4 million to 2130.4 Birr million (NBE, 2003/04). As most findings pointed out that, one of the causes for this problem was the exchange rate policy, i.e. overvaluation of the domestic currency taken by the military government. Taking this into account the transitional government of Ethiopia decided to devaluate Birr by 58.6% i.e. from Birr 2.07 to 5.00 per US dollar in 1992. The devaluation of exchange rate was expected to increase output by encouraging the export sector as well as increase domestic production (Menasbo, 2012).

After the devaluation in 1992 the exchange rate is changed from fixed to flexible rate in order to control overvaluation through a gradual depreciation of domestic currency every year. However, during the fiscal year 2007/08 the rate of depreciation against other foreign currencies increased compared to the previous years. In the 2009/10 the Ethiopian Birr was depreciated by 23.7% against the US dollar. This huge devaluation was expected to "decrease overvaluation and increase competitiveness" (IMF, 2010; MOFED, 2009). Again, in October 2017, Ethiopian birr devaluated by 15% and exchange 1 birr with 27.59 US dollar.

Countries devaluate their domestic currency to achieve different objectives such as decreasing trade deficits through increasing export revenue and decreasing import expenditure, attract foreign direct investment and tourist, increase domestic product demand in foreign market through make export cheaper and shift the domestic consumer from consumption of foreign products to domestic products, this encourage import substitution strategies to minimize expenditure for import. As a result, domestic industry can be protected from open competition (Solomon, 2010). In the Mundell–Fleming model, devaluation shifts the *LM* curve to the right; it acts like an increase in the money supply under a floating exchange rate. Devaluation thus expands net exports and raises aggregate income (Mankiw, 2010).

However, exchange rate plays a prominent role in a given economy stabilization a little beat adjustment in exchange rate results in overall impact on microeconomic and macroeconomic variables such as: revenue level, gross domestic product, household income, household consumption, import, export, factor supply, factor income, investment, government expenditure, and the like micro and macroeconomic variable.

Statement of the Problem

The relative merits of currency devaluation in developing countries have been the subject of considerable debate in recent years. Analysts at international institutions, and particularly at the International Monetary Fund (IMF), have generally maintained that devaluation plays a positive and important role in balance-of-payments stabilization. However, many empirical finding give different conclusions about the effect of currency devaluation on the economy of countries. In some countries, devaluation is contractionary while it is expansionary in some other countries. In some cases, devaluation has mixed results (that is, both contrationary and expansionary) in the short and long run. In some other countries, the effect is neutral (Solomon, 2010). Acar (2000) has found different results on the effect of devaluation in less developed countries. Accordingly, devaluation is expansionary in the short run and neutral in the long run. Researchers like Bahmani-Oskooee (1998) found that devaluation has neutral (zero) effect in the long run. A study by Galbotswe and Andrias (2011), on the effect of devaluation shows that the currency devaluation contractionary effect in the long run while it is expansionary in the short run in trade balance of the country. Similarly, there are some researchers found different results about the effects of currency devaluation on GDP per capital, trade balance and output of Ethiopia economy. Lencho (2013) empirically shown, the adoption of devaluation of the domestic currency will increase the nation's trade deficit in the long run due to the price inelastic nature of imports and agricultural based production which is highly price inelastic demand. Yilkal (2014) assesses the short and long run effects of currency devaluation on output growth in Ethiopia. The result revealed that currency devaluations are contractionary in the long run and neutral in the short-run.

Even though there are studies on impact of currency devaluation, there is no common consensus and they come up with different results which are source of controversies on impact of currency devaluation on economy. In addition, most of them adopted partial equilibrium approaches that have failed to estimate the full impacts of currency devaluation on Ethiopian economy. Hence, there is the need for a more comprehensive approach that takes into consideration the various interrelationships between all actors in the economy, in order to more realistically estimate the economic effects of currency devaluation. In the absence of such type of comprehensive study giving general conclusion about the impact of currency devaluation on economy, in the country, could be problematic.

Thus, this study aimed to look macroeconomic impact of currency devaluation on Ethiopian economy by using the general equilibrium mode particularly, dynamic CGE model to fill the gap identified in the previous literature and to capture the economy wide impact of currency devaluation.

Objectives of the Study

The general objective of the study was to examine the economy wide impact of currency devaluation. Specifically, the study attempt:

- To examine the impact of currency devaluation on macroeconomic performance.
- To examine the impact of currency devaluation on factor utilization.
- To analyze the impact of currency devaluation on welfare of the society.

Research Methodology

Sources and Methods of Data Collection

For the completion of the study data were collected from Ethiopian Research Development Institute (EDRI), Central Statistical Authority (CSA), Ministry of Finance and Economic Cooperation (MOFEC), National Bank of Ethiopia (NBE), International Food Policy Research Institute (IFPRI), Ministry of Trade and Human Resources Office. The study used secondary data collected from national social accounting matrix developed for Ethiopian economy in 2005/6 and updated for 2009/2010 Ethiopian economy EDRI, GDP and other macroeconomic data from MOFEC. Also, production and productivity data from CSA, export and import data from ministry of trade, behavioral parameter from IFRI and employment data from human resource department.

Social Accounting Matrix

A social accounting matrix (SAM) is a comprehensive, economy wide data frame; typically representing the economy of a nation. More technically, a SAM is a square matrix in which each account is represented by a row and a column. Each cell shows the payment from the account of its column to the account of its row. Thus, the incomes of an account appear along its row and its expenditures along its column and underlying principle of double-entry accounting requires that, for each account in the SAM, total revenue (row total) equals total expenditure (column total) (Lofgren *et al*., 2002).

Mostly, the standard SAM has four key accounts. Firstly, activities account reviews production in the domestic economy. Secondly, commodities account, in its row, it represents demand for commodities and in the column side; it denotes supply of the commodities. Thirdly, factor account, the row side signifies the payment to factors from different sources (it could be from production sectors of the domestic economy and the rest of the world) whereas the column side signifies the distribution of factor incomes to various institutions. Fourthly, institutional account, all incomes and expenditures of institutions is shown in the institutions account. As a sub-account to this account the government, enterprises, household and the ROW account. When come to the ROW sub-account, the source of incomes could be the sale of imports and factors (this represents the outflow of foreign exchange).The inflow of foreign exchange could be expressed by the payment made for exports, factors, transfers (to households and government), and foreign savings.

The saving-investment (S-I) account, which summarizes the savings of different institutions (it could be from the government, households and foreign) in the row section, and expenditure for investment on capital goods in the column section. This study uses the 2009/10 Ethiopia SAM which was produced by Ethiopian Development Research Institute in 2005/6 and updated for Ethiopian economy of 2009/10 (EDRI ,2009/10). The updated SAM is produced in different level of aggregations. It is disaggregated into 113 activities (with 77 agricultural activities by agro ecological zones, AEZs), 64 commodities, 16 factors (by AEZs except capital), and 13 institutions including 12 households. The SAM also has17 different taxes, saving-investment, and rest of the world account show the interaction of different economic agents. It integrates regionally disaggregated agricultural production and income generation for the four main agro-ecological zones of Ethiopia (Humid, high land cereals, drought prone and pastoralist zones).

Furthermore, for the completion of this study further aggregation of SAM was done. Totally, seventeenth aggregated activities (cereal, non-cereal, livestock, mining, agricultural processing, chemical and pharmacy, machine and vehicle, manufacturing electric and water (utility), construction, trade, hotels, administration. Education, health and other service activity and seventeenth commodities (cereal, non-cereal, livestock, mining, agricultural processing, chemical and pharmacy, machine and vehicle, manufacturing electric and water (utility), construction, trade, hotels, administration. Education, healthy and other service commodity, four factors of production (labor, capital, livestock, and land), four type of household(rural poor ,rural non poor, urban poor, and urban non poor), enterprise, government, three tax category (direct tax, import tax and sales tax), saving-investment balance and rest of the world.

Method of Data Analysis

To analyze the impact of currency devaluation on the microeconomic and macroeconomic, for this study used a variable, dynamic computable general equilibrium model (DCGE). Mostly, dynamic CGE models are grouped into two categories: inter temporal and sequential (recursive). Inter temporal dynamic model is based on optimal growth theory where the behavior of economic agents is characterized by perfect foresight. In Lofgren and Robinson (2004) words, “everybody knows,” in inter temporal models, “everything about the future’’, and they use that information in making decisions. On the other hand, in the recursive model, agents make their decisions on the basis of past and current information with no role for forward looking expectations that means the agents have myopic behavior.

In this study, by taking Ethiopian economy into consideration, a recursive dynamic CGE model was used. The reason why the researcher used the dynamic CGE model is: ***Firstly***, the static CGE model has a problem of an analytical inconsistency between within-period decision and between-period decision, leads to contradictory optimization problem. ***Secondly,*** the static model does not generate different effects when lowering import tariff on capital goods and consumer goods and in calculation of optimal tariff, highest level of tariff is associated with capital-goods imports, lowering investment and no welfare effects since the capital stock was fixed. ***Lastly,*** the static

model also does not capture dynamic gain from policy intervention and reveals unrealistic results (Keshab and Emmanuel, 2005).

Overview of the Model

The computable general equilibrium (CGE) model has played an important role on policy impact analysis. CGE model is widely used model for policy analysis both in developing and developed countries specifically, on the impact of tax reform. The advantage of using the DCGE model is that it models the whole economy explicitly, capture the market mechanism, interlinking between sectors and transactions between economic agents despite being under restrictive assumptions (Burfisher, 2011).

A clear microeconomic structure with links between micro and macro aspects of the economy works on basis of circular flow diagram in the economy which makes it the soundest tool for quantitative policy analysis. Figure 2 shows how CGE links all macro and microeconomic variables. According to the circular flow diagram, each sector in the economy is linked to each other as they interact to each other. For instances, government, firms, households and foreigners interact together at factor, product and financial market. Government get tax and borrowing from all households, firms and foreigners. On other hand government have expenditure to each of the institution in terms of subsidy and infrastructure development.

Firms and households export and import from the rest of the world. Additionally, firms and households trade together at product and factor market since firms are owners of finished goods and households are owners of factors of production. At financial market, the four institutions also come together to withdraw or to save at the institution or to borrow or to repay. Generally, all actor in the economy are interdependent none the institution can perform better independently. So CGE uses this ideology and interconnection between the institutions for modeling the institutional behavior to represent the real economic activity. Additionally, CGE models allow simulating behavioral responses and adjustments on several markets, while enabling some flexibility in setting macroeconomic rules to assess the impact of different government revenue allocation policies. The model explains the flows of payment recorded in the SAM.

Production and consumption behaviors are captured by first order optimality condition; the system includes producers' profit and consumers' utility maximization subject to technology and income constraints respectively. A different market and macro aggregates constraints, which has to be satisfied by the system, are also included in the equations. A technology is specified in the model by a constant elasticity of substitution (CES) or a Leontief function of the quantities of value-added and intermediate input (Lofgren *et.al.* 2002).

Commodity Flow

It shows the flow of a single commodity from being supplied to the market to its final demand. The supply of a particular commodity from each producer is combined to derive aggregate commodity output and the aggregate commodity output is governed by a CES function which allows demanders to substitute between the different producers supplying a particular commodity, in order to maximize consumption subject to relative supply prices. The decision of producers is governed by a constant elasticity of transformation (CET) function, which distinguishes between exported and domestic goods, and by doing so, captures any time or quality differences between the two products. Domestically produced commodities that are not exported are supplied to the domestic market. Substitution possibilities exist between imported and domestic goods under a CES Armington specification and it takes place both in final and intermediates. The Armington elasticities vary across sectors, with lower elasticities reflecting greater differences between domestic and imported goods. The final ratio of imports to domestic goods is determined by the cost minimizing decision-making of domestic demanders based on the relative prices of imports and domestic goods.

Equation of the model

The model also includes equations for closures that adjust the economy to ensure equilibrium. The model follows the SAM disaggregation of factors, activities commodities, and institutions. The equations in the model are divided in to four blocks; these are prices, production and trade, institutions, and system constraints block.

A) The Static Equation (within period equation)

Price Block

The price block specifies equations for the endogenous model prices that are linked to other endogenous or exogenous prices and to non-price model variables. Some of the model prices are discussed below. The domestic import price of a commodity is the tariff and exchange rate adjusted world price of that commodity plus transaction costs to move the commodity from the border to the demander. The export price of a commodity received by domestic producers in the export market is similar to that of import price with difference in tax and cost of trading. Unlike the import price, tax and cost of trading reduces the price paid to the domestic exports.

Demand Price of Domestic Non-traded Goods: The model distinguishes the price paid by domestic demanders and received by suppliers due to the presence of transaction costs.

Absorption: The total domestic spending on a commodity at domestic demander prices are defined as absorption; it is the sum of spending on the domestic output and imports at the demand price without the commodity sales tax but includes the cost of trade inputs.

Marketed Output Value: For each domestically produced commodity, the marketed output value at producer prices is stated as the sum of the values of domestic sales and exports

Activity price: The gross revenue per activity unit, the activity price, is the return from selling the output or outputs of the activity, defined as yields per activity unit multiplied by activity-specific commodity prices, summed over all commodities.

Aggregate Intermediate Input Price: The activity-specific aggregate intermediate input price shows the cost of disaggregated intermediate inputs per unit of aggregate intermediate input. It depends on composite commodity prices and intermediate input coefficients, which show the quantity of input commodity *c* per unit of aggregate intermediate input (not per unit of output).

Activity Revenue and Costs: For each activity, total revenue net of taxes is fully exhausted by payments for value-added and intermediate inputs. CPI is fixed and function as numeraire is required since the model is homogeneous of degree zero in price the doubling of the value of numeraire would double the all price but leave all real quantity unchanged.

Production and Trade Block: Production in the economy carried out by activities which are assumed to maximize profit subjected to their technology taking prices as given and act in a perfectly competitive setting. The production technology chosen from two specifications permitted in the model, these are the constant elasticity of substitution and Leontief function at the top level of technology nest the activity level is either CES or a Leontief function of the quantity of value added and aggregate intermediate input use. In this study, the Leontief technology is at the top level of the technology nest. The production function for activity is a function of the quantities of aggregate value added and intermediate inputs that yield commodity outputs in the production process. The quantity of value-added is a CES function of disaggregated primary factors.

Demand for Aggregate Value Added and Intermediate Inputs: The aggregated marketed domestic outputs are allocated for domestic sales and export, expressed by a constant elasticity of substitution. The composite commodity supplied domestically is produced by domestic and imported commodities. The Armington function aggregates the composite commodities supplied domestically which are produced by domestic and imported commodities; and both imported and produced domestically. Domestic demand is made up of the sum of demands for household consumption, government consumption, investment, intermediate inputs, and transactions (trade and transportation) inputs.

Factor Demand: Equation activities demand factors at the point where the marginal cost of each factor is equal to the marginal revenue product (net of intermediate input costs) of the factor.

Disaggregated Intermediate Input: For each activity, the demand for disaggregated intermediate inputs is determined via a standard Leontief formulation as the level of aggregate intermediate input use times a fixed intermediate input coefficient.

Commodity Production and Allocation: On the right-hand side, production quantities, disaggregated by activity, are defined as yields time's activity levels. On the left-hand side, these quantities are allocated to market sales and home consumption.

Institutional Block: Institutional block contains the income and expenditure of the four major institutions (households, government, enterprises and ROW). Household and enterprises obtain their income from payment of factors made by each activity and transfers from other institutions. Households expend their income for consumption, saving, directs tax and transfer to other household and institution. With the exception of consumption and tax (enterprises do not consume13 and pay indirect tax), the expenditure pattern of the enterprises is similar to that of the households. Government revenue is collected from taxes, factors payment and transfer from the ROW. Its expenditure is confined to consumption, saving and transfers to domestic institution. The total income of each factor is defined as the sum of activity payments.

System Constraints Block: This block constitutes formulation of the system closures which equilibrate the model (keeping the equality of equations and endogenous variables) by fixing some variable for the model to have a solution. These are factor market and macroeconomic closure (commodity market, current account balance and government balance). The choice of closure affects all simulations other than the base simulation. The selected closures in this study are those applicable for the country under the study. The first closure in the standard CGE model is for factor markets. It equalizes the total quantity demanded and supplied for each factor in the factor market. An economy wide wage variable is free to vary to assure that the sum of demands of factors from all activities equals the quantity supplied. Each activity pays an activity-specific wage that is the product of the economy wide wage and an activity-specific wage distortion term which is fixed for this closure. Labor in the model is disaggregated in to agricultural and Nonagricultural and capital in the model is also classified to agricultural capital and non-agricultural capital. Current government balance imposes equality between current government revenue and the sum of current government expenditures and savings. For the government balance, flexible governments saving (GSAV) which balance the government accounts and fixed direct tax rates closure is used. Other two alternative closures for government balance are when the direct tax rates of domestic institutions are adjusted endogenously to generate a fixed level of government savings and fixed government savings and scaled direct tax rates for selected institutions.

B) Dynamic Model (Between the Period Models)

In the previous section we have described the within-period or static component of the model. However, the impact of policy-changes includes dynamic aspects, such as the inter-temporal effects of changes in investment and the rate of capital accumulation. In order to investigate in more detail the relationship between policy changes and factor accumulation the static model is extended to a dynamic recursive model. In the extended part of the model labor supply will be determined exogenously (updated by the population growth rate, i.e. as population grows, the total labor supply increases at the same rate) while capital accumulation is determined endogenously

(In a given time period the total available capital is determined by the previous period's capital stock and investment spending). Then new capital will be distributed among sectors based on each sector's initial share of aggregate capital income (Thurlow, 2004).

Results and Discussions

In this part present the impact of currency on the economy of Ethiopia. To look the impact state different scenarios that is used to assess the impacts of policy shocks on macroeconomic performance in Ethiopia and the experiment results. In the CGE modeling framework, it is essential to establish a baseline scenario that is counterfactual for comparing against the outcome of a policy shock. Hence, begin with the baseline simulation, the impact of each simulation on major macroeconomic variables, factors utilization, production level and the welfare of the consumer is assessed. Therefore, to obtain this objective, following simulations are considered:

1st The base case scenario is established to serve as a reference in the absence of any policy shock and services as a benchmark for policy evaluation. Thus, in this scenario, all macroeconomic variables show their value without any policy shock to the economy. Therefore, the base line simulation is used as the benchmark value so as to compare the values of different variables after the policy shocks.

2nd exchange rate shock by 15% is introduced to look the impact on overall economic performance including the export sector.

3rd reduction in world export price by 15% introduced following currency devaluation to look whether the designed policy really represent the intended objective.

4th increase in world import price by15% following introduction of currency devaluation is introduced to look their impact. Therefore, the last three simulations had been introduced to capture the impact of the policy shocks at national level and different stage of economic sector impact had revealed by using the SAM calibration and simulation. The result from all scenarios is presented below.

Macroeconomic Impact of Currency Devaluation on Major Macroeconomic Variables

This part looks at the impact of currency devaluation on all macroeconomic variables as whole for each simulation in turn. Accordingly, table 1 below shows the summary of the results, the three simulation focusing on absorption, private consumption, fixed investment, government consumption, export, and import, gross domestic product at market price, net indirect tax, and real GDP at factor cost (GDPFC). According to the table below, all macroeconomic variables showed reduction from the base case scenario which shows increase in exchange rate (currency devaluation) had no positive contribution. From the table, one can observe that absorption reduced by 0.12 percent compared to base case scenario when currency devalued by 15%. Following currency devaluation import price increase by 15%, the amount of absorption reduced by 1.19%. When look the private consumption it is decreased by 0.13% on 1st and 2nd scenarios and further

deteriorated on the 3rd scenarios when import price increase by 15%. This shows that currency devaluation initiate inflation directly and affects the purchasing capacity of citizen.

The third scenario increase import price make price of import expensive which affect the purchasing power parity of money then private consumption. When devaluation had been introduced, it is expected that domestic output would increase by further investment. But apart predetermined expectation investment reduced by 0.11% from base case scenario which is because of since most our investment depend on imported intermediate input increase import price reduce capacity of investment by 1.3% due to increase cost of production. Government consumption also showed 0.04 on the 1st and 2nd scenario and 0.26 on the 3rd scenario.

The main objective of currency devaluation were to enhance the export sector of Ethiopia through boosting domestic production and making cheap the product of Ethiopia over rest of the world that makes competitive but the intended objective was not achieved since export after devaluation again revealed reduction by 0.16% on first and second scenarios, and 1.35% on third scenarios. This is because the natures of products which are exported are price inelastic and the country no capacity to supply the increased demand due to supply side rigidity even though Ethiopia product became cheap to international market. When compare import with export, reduction in import is less than in export which implies even though import price is expensive the country is obliged to import at high price since not enough to substitute for foreign products. Positive impact of devaluation had been expected in improving domestic economy. But contrary to this output decreased in the three scenarios where the third scenarios were highly affecting one. This is because of increase in exchange rate affect domestic economy through inflation and Purchasing Power Parity (PPP) of intermediate input from rest of the world which result in domestic economic contraction.

Table 1: Macroeconomic Impact of Currency Devaluation in Ethiopia

Variables	**Initial**	**Base**	**Exchange rate increase**	**Decrease in World Export Price**	**Increase World Import Price**
Absorption	0.586624	7.229281	-0.1292	-0.1292	-1.19222
Private Consumption	0.402038	7.610983	-0.13868	-0.13868	-1.22012
Fixed Investment	0.140904	7.447072	-0.1141	-0.1141	-1.3403
Government Consumption	0.043682	1.082806	-0.04463	-0.04463	0.264068
Exports	0.085955	11.83134	-0.16997	-0.16997	-1.35781
Imports	-0.16249	8.302048	-0.1071	-0.1071	-1.04081
Consumer Price Index	0.612596	6.266473	1.342347	1.342347	1.27449
Output	0.66000	6.9700	-0.08000	-0.0800	-1.4700
GDP at market price	0.510089	7.872476	-0.14731	-0.14731	-1.28576

Source: Own computation From Simulation Result

The other important variable sensitive to policy change is consumer price index. As result, the policy shock consumer price index shows increment in the three scenarios, which confirm that currency devaluation press inflation which can be revealed by increase in price. Related to this, price of export show reduction on average by 2% but world import price show an increment by 3% or the net effect from change in price due to change policy is +1. Generally, over all GDP at market price from expenditure and income side as well as GDP at factor cost showed reduction in three scenarios, the third one highly deteriorated the overall economic performance of the economy (Table 1).

Impact of Currency Devaluation on Major Sectors

When we observe the sectoral impact of currency devaluation, all sectors showed a reduction in simulation 1 and 2 but showed huge reduction in simulation 3. GDP decreased by 0.14, in simulation 1 and 2 showed 1.17 reduction in simulation 3. The Agricultural sector decreased by 0.04 in simulation 1 and 2 and 2.01 in simulation 3. Industrial sector was the highly affected sector by this policy shock since it was reduced by 0.28 in simulation 1 and 2 and 0.65 in simulation 3. Similarly, service sector showed some reduction in simulation 1 and 2 and highly affected in simulation 3. When we compare the three sectors, industrial sector was highly affected by the policy followed by service and agricultural sector (Table 2).

Table 2: Sectoral Impact of Currency Devaluation Percentage Change from Baseline

Sectors	Base	Exchange rate increase	Decrease in World Export Price	Increase World Import Price
Growth rate of Agriculture	5.32349	-0.04961	-0.04961	-2.01406
Growth rate of Industry	12.36839	-0.28048	-0.28048	-0.65738
Growth rate of Service	5.475476	-0.07983	-0.07983	-1.31417

Source: Own Computation from Simulation Result

Impact of Currency Devaluation on Factor Supply

The factor supply result from simulation showed that no improvement in factor supply due to the impact of currency devaluation in three simulations compared to base case scenarios. This was because the devaluation resulted in inflation and inability to import more the domestic output reduced since most intermediate input comes from the rest of the world. When domestic output reduced demand for labor decrease the supply labor also decreased revealing that lower demand, lower labor supply and then lower factor utilization (Table 3).

Table 3: Summary of Factor Supply (percentage change from base line simulation)

Flab	**0.18**	**2.4**	**0**	**0**	**-2.4**
Flnd	0.06	3.1	0	0	-3.1
Fliv	0.06	18.11	0.29	0.32	-0.14
Fcap	0.86	15.66	0.31	0.27	-0.28

Source**:** Own computation From Simulation Result

Impact of Currency Devaluation on the Welfare of Households

The welfare of society can be indicated by using equivalent variation which is the most important indicators of the welfare effects of policy reform. Since policy shocks are usually followed by major price adjustments, the Equivalent of Variation (EV) measures the level of income (in money terms) that the consumer needs to pay before the shock to leave him as well off at the equivalent level of utility changes after the price changes. The main objective of the government is to increase the welfare of the society but contrary to this currency devaluation made in Ethiopia since 2017 negatively affected the welfare of the society.

The table below summarizes the impact of currency devaluation in three scenarios. The result in the table revealed that increase in exchange rate (currency devaluation) affect the welfare of the society negatively was the third scenario highly affected the welfare of the households. Among household category affect by the policy shock, urban poor households were highly affected on the first and second scenarios followed by rural poor and rural non poor households and urban non poor were less affected by the policy shock compared to other household. On the third scenario, rural non poor and rural poor were affected by the currency devaluation followed by the urban poor and urban non poor household (Table 4).

Table 4: Impact of Currency Devaluation on the Welfare of Households

Household	**Initial**	**Base case**	**Exchange rate increase**	**Decrease in World Export Price**	**Increase World Import Price**
Household rural poor	0.099839	8.814527	-0.28546	-0.28546	-3.6622
Household rural non-poor	0.180033	8.405226	-0.27036	-0.27036	-3.69169
Household urban poor	0.007679	9.163416	-0.30888	-0.30888	-3.5472
Household urban non-poor	0.114487	7.845777	-0.24277	-0.24277	-2.59727

Source: Own computation From Simulation Result

Policy Analysis

The Ethiopian economy in the last decades has been growing in different fashions depending on the economic policies undertaken by the ruling governments at their times. The economic performance is characterized by positive economic change from 2003 onwards and growing at above 7 percent on average, to reaching the middle-income country status by 2025. Which means that, if the country continues as base case scenario it will grow by above 7 % annually. In order to sustain this impressive economic growth, different macroeconomic policies such as Poverty Reduction Strategy Program, Agricultural lead industrialization, Public Safety Net Program, Growth and Transformation Plan I and II were implemented with different techniques and fashion to achieve macroeconomic goal. Even though this brought impressive economic performance for Ethiopian GDP, the issue of external sector (export-import) relation is under harsh condition and very challenging even up to the point where country even fall below the minimum requirement for import financing. As a result, GTP II had been developed by giving special focus for foreign sector to improve the trade balance which was one of the headaches in Ethiopian economic growth (GTP II, 2015). To improve the external balance, Ethiopian government devaluated the Ethiopian currency by 15% with objective of increasing export performance and reducing the import consumption as per advice given to Ethiopia from International Monetary Fund and World Bank to devaluate currency. But, far apart from this policy implementation, the export performance of Ethiopia is still below the level of plan which furthers the bottleneck and nightmare for Ethiopian economic performance. The empirical data from simulation of 2017 currency devaluation had no any surplus than resulting in inflation in the country evidenced by negative change from baseline scenarios except consumer price index which show positive increment implies inflation. The implication from this result is alerting that 2017 was not successful in meeting primary objective as the trade deficit was still 11 billion United States Dollars.

This implies that, the policy implemented, and the problem of export are not corresponding to each other as Ethiopian export-imports problems are strategic imports which are not amenable for reduction following the advised devaluation. Because of the breakdown, our imports show that about 70% of our imports are capital & intermediate goods, fuels and related imports which importing whether they are expensive or not and hence the wrong presumption of the government.

Apart from this above argument against the devaluation, the fact that Ethiopian exports will not dramatically increase or may not increase at all because of devaluation, as the government presumes the fundamental problem behind Ethiopian exports is not a need for a rise in price (note that devaluation here acts as a rise in price because exporters get more money in terms of birr for the same export) rather major hindrances is supply/production side constraints to increase export earnings and import substitution in terms of quantity, quality and variety. To sum up, the 2017 currency devaluation were at large successful in improving export problem because the problem was structural not financial; and hence need structural, not financial solution. In addition, when a country decided to devaluate its currency to benefit from devaluation, it should be based on the following assumptions: Firstly, the elasticity of demand for exports and imports should be elastic

or Marshall Lerner condition should be full filled. Secondly, the supply of exports is sufficient to meet the increased demand for exports after devaluation and the internal price level remains constant after devaluation. Thirdly, good trade reliability and perception of the inhabitants of importing nation towards the quality of the product to be exported. Fourthly, inflation rate should be very small and the like (Jhingan, 2003).

Conclusion

The purpose of this study was to examine economy-wide impact of currency devaluation on major microeconomic and macroeconomic variable using a recursive dynamic CGE model. The study used an updated version of the 2009/10 EDRI data. The study used different scenarios to evaluate economy wide impact such as devaluation of currency by 15%, decrease in world export price by 15% and increase in import price by 15%. The analysis revealed that in simulation all macroeconomic variables have shown negative changes except CPI which showed increment from base case scenario. Similarly, factor supply and factor income also showed negative change as a result of overall contraction economic performance which was witnessed by reduction in GDP at factor cost. In addition, the impact of devaluation on household welfare is considered. The result shows that, there was welfare reduction resulted from poor economic performance and increase in price. Urban poor households were highly affected from the welfare loose because of currency devaluation which resulted short term increase in price of products which decreases consumption of urban poor and then deteriorates welfare of the society. Generally, Ethiopia was not successful in currency devaluation since it resulted in worst economic performance and it calls for additional comprehensive macroeconomic policies to bring the desired objective.

Recommendations

Based on the findings, the researcher forwarded the following policy implications. Since currency is key element that can link microeconomic and macroeconomic aspect of the economy, a little beat modification on currency results in overall disturbance of the economy. So, deep and careful investigation should be intensively and extensively conducted on short-run and long run effect before conducting macroeconomic policy reform. In this analysis, currency devaluation highly deteriorated overall economic performance and decreased in export price failed to improve economic performance compared to increase in exchange rate and import price. Since the currency devaluation negatively affected real GDP and other macroeconomic variables appropriate measure should be taken by the government of Ethiopia to improve export performance. Therefore, the best way to improve export performance would be to replace currency devaluation by the structural reform and solving supply side constraints. Furthermore, when a country decided to devaluate it currency to benefit from the reform it should consider that the necessary conditions be fulfilled to benefit from the devaluation.

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Developmental State and Ethnic Federalism in Ethiopia: A Missed Link, Birhanu Bitew, Wolkite University

Abstract

Since the coming of EPRDF into power in 1991, Ethiopia as a state has oscillated with the experimentation of different economic models. Since 2001, the regime adopted the developmental state along with ethnic-based ways of restructuring the state through abandoning liberalism. Taking these facts into account, this paper assesses the compatibility between developmental state and ethnic federalism. The finding of the study revealed that there was no problem with the developmental state in terms of rhetorical points of view. It can improve development if the government strictly observe and implement the pillars that the developmental state needs to have. But, the marriage between developmental state and ethnic federalism incurs the possibility of the ill-implementation of the main pillars of the developmental state. The nature of the developmental state and the way Ethiopia's federal system structured is incompatible which I call such a relation the 'matrimony of the discordant'.

Keywords: developmental state, ethnic federalism, ethnocentrism, state capture

Introduction

Ethiopia, a centuries-old unitary state, has been run by an 'ethnocentric' insurgent group since 1991. Before 1991, the country was ruled by a dictatorial socialist regime, overthrowing the legendary monarchical regime through a military coup. Upon seizing power in 1974, the military regime known as *Dergue* (an Amharic word for the committee) ruled the country under a strict centrally planned economy with state-owned and controlled manufacturing activities. It is argued that the socialist policy resulted in market rigidity and economic distortions leading to inefficiencies in every sector of the economy (Tadesse & Dawit, 2017). The socialist policies along with long periods of civil war, political turmoil and general instability left the country in a total state of shambles. By the end of 1991, the country had a manufacturing industry dominated by inefficient state-owned enterprises, which were managed by loyalists instead of business-minded professionals (Tadesse & Dawit, 2017). The changing nature of the international system along with the internal political turmoil escalated the country's problem and many manufacturing industries became inefficient.

Under this economic background, the current government which took power in 1991 by removing the military regime through force changed the nationalization policy via implementing the Structural Adjustment Program (SAPs) under the auspices of International Financial Institutions, WB and IMF. The core policy prescription of SAPs intended to be implemented in Ethiopia was the privatization of state-owned enterprises. Privatization in this context implies the transfer of ownership from public to the private sector (Mugerwa, 2002). Accordingly, proclamation No. 146/1998 was decried to privatize state-owned enterprises in Ethiopia though the privatization process was started before. According to this proclamation, the main motive of privatization in

Ethiopia seems to be generating revenue from the sale of state enterprises. However, anecdotal evidence suggests that the transfer of state enterprises to the private sector has not made significant progress (Berhanu & Vogel, 2009). This happened because the dominant ethno-nationalist insurgent party known as the Tigray People's Liberation Front (TPLF) in the Ethiopian People's Revolutionary Democratic Party (EPRDF) controlled key economic, political, military and ideological powers. The exclusive control of such sources of power creates an opportunity for the TPLF to transfer the state-owned enterprises (SOEs) for the parbus (party business) and party-affiliated business groups.

Since the division of TPLF, however, the regime propagated the developmental state as a guiding economic model in the country. This model has been used as a means of legitimating the 'state capture' and undemocratic nature of the regime. In fact, the developmental state can be implemented within the context of a democratic political system (Edighegi, 2010) unless manipulated by the ruling party for political purpose. For the last two decades, this economic model has been there in the everyday lives of the Ethiopian people. Being accompanied by revolutionary democracy, the model served as an instrument of suppressing and intimidating political oppositions by labeling them as anti-development and anti-democratic forces. In addition, the developmental state is decried as the economic model of the country under a political system through which the state is restructured along ethnic lines. The internal division of the country along with rigid primordial ethnic identity endangered the national consensus among the population of the country. The agreement is lacking in the construction of development projects since ethnic federalism deepened the notion of 'we' and 'them' category. This strict and polarized ethnic categorization is in contrast to the main pillar of the developmental state, the national consensus among the general public.

Since the 2018 'partial' political reform, the new Prime Minister, the pioneer of the political reform, of the country has explicitly advocated the government's plan to transfer SOEs to the private sector. It is from this historic incident that the idea of the present paper originated. The main aim of this article was to examine the compatibility between developmental state and ethnic federalism in Ethiopia. Methodologically, the paper employed secondary data sources. Official reports, policies, and academic works were used to enrich the paper. The data was analyzed through the use of thematic analysis procedure.

The paper is organized as follows. First, the theoretical perspective on the developmental state is analyzed. Second, the historical anecdotes of developmental state experimentation and the nature of federalism in Ethiopia are assessed. Third, based on the theoretical frameworks discussed under section one and two, the marriage between developmental state and ethnic federalism is deeply discussed and analyzed. Lastly, the overall conclusion is made based on the findings of the paper.

The Developmental State: An Overview

Like most human institutions such as the family, the state, the village, the city, customs, laws and the nation, the developmental state was born long before anybody thought of naming it. It has

evolved over the ages and some have characterized the growth of the Netherlands in the sixteenth century, England in the sixteenth century to the nineteenth century and Germany in the mid-nineteenth century to the early twentieth century with it (Bagchi, 2003). However, the model of the developmental state and the term developmental state was originated with an American scholar, Chalmers Johnson, in his book "*MITI and the Japanese Miracle: The Growth of Industrial Policy, 1925-1973*" (Johnson, 1982). From this time onwards, the theory has captured and held the imagination of researchers working across East Asia (Boyd and Ngo, 2005). It has extended its scholarly empire far and wide to embrace the political economy of Latin America and Africa.

Historical evidence shows that in all countries that have transformed successfully from agrarian economies to modern advanced economies- the governments played a proactive role in assisting the national economy (ECA, 2011). The role of the state was central to the development of the nineteenth century industrialized countries such as Germany, Japan and Russia and more recently the success stories of East Asian countries have been largely the result of the proactive role of the state. Concomitantly, the successful economic transformation in Mauritius (Meisewhelder, 1997) and Botswana (Taylor, 1997) in the continent of Africa is attributed to effective implementation of the doctrine of the developmental state.

In most states of East Asia and Africa, the developmental state emerged as an idiosyncratic response to a world dominated by the Western neo-liberal economic model (Low, 2004; Woo-Cummings, 1999). The failure of SAPs devised by IMF and WB to alleviate the chronic economic problems of the 1980s in Africa, in particular, urged African governments to search for alternative economic models. This is best summed up by the late Prime Minister of Ethiopia, Meles Zenawi, in that "neo-liberal paradigm is dead-end, is incapable of bringing about the African renaissance, and that a fundamental shift in paradigm is required to bring about African Renaissance" (Meles, 2006). The paradigm shift opens up possibilities to overcome the dictates of the world system and the vagaries of the market.

The developmental state paradigm is a collection of theoretical propositions and empirical descriptions that relate economic performance to institutional arrangements of the state (Boyd & Ngo, 2005). It is a state that has both the ideological orientation and the capacity to realize its vision through a long term plans. The ideological element is related to the governments' firm stand on making economic development its prior mission and top agendum, whereas state structure is associated with the institutional and administrative capacities required to implement plans and policies. Hence, the developmental state is a crucial stimulant and organizer of socio-economic progress and a major agent of social transformation (White, 1988).

Most of the advocates of developmental state theory acknowledge their intellectual debt to Gerschenkron idea of late development. Gerschenkron (1969) argues that latecomers to the world economy need a centralized approach to industrialization and economic growth. As such, it is a 'plan-rational' state that engineer industrialization and economic growth (Boyd & Ngo, 2005) rather than a strictly socialist centralized state. Plan-rational state is a state that is led by technocrats

who enjoy a high degree of political autonomy, insulation from societal demand and yet who are simultaneously embedded in the society (Boyd & Ngo, 2005; Evans, 1995). Johnson (1982) famously argued that the role of the centralized mechanism was preferred by a 'plan-rational' state in the case of Japan.

A developmental state is not about a state dominated economic model. It is neither delinking nor closing to the imports and external capital. The developmental state rather has a developmental ideology and structure pertaining to the requisite institutions, norms, and standards that can support the development process (Gedion, 2015). It is also more about how it is able to govern development with a decisive ideological orientation and effective institutions and policies underpinned by bureaucratic and organizational capacity and political will (ECA, 2011). The motive and source of legitimacy of the developmental state is the single-minded pursuit of accelerated development. For development to be legitimate, inclusive and sustainable, it must be grounded in a democratic context. Democracy helps to create the foundation of legitimacy for development, in which citizens would participate and engage in the development process (Edighegi, 2010). The critical element of the developmental state is its ability to mobilize a public around economic development (Johnson, 1982) and this can be achieved through building a democratic developmental state.

In sum, the developmental state makes economic development a top priority of government policy, and design effective instruments including appropriate policies, functioning, and institutions. It harnesses the power of government at every level to ensure that each part of the country develops its potentials. The building up of standard of living of the people, including their health and education through intervention policies (Bagchi, 2003) is the ultimate goal of the developmental state. The success of the developmental state in improving the standard of living of the citizens depends to a large extent on its ability to work with other social actors. Different actors and interests should be brought together to define a common purpose and formulate developmental strategies (Edigheji, 2010). Sharing of ideas and resources between different stakeholders can have the power to enhance values, encourage hard work and self-improvement and increase employment.

Pillars of Developmental State

According to many scholars, some crucial and commonly held features define developmental state. The adoption of the developmental state as an alternative economic model, therefore, requires a good understanding of such characteristics of the developmental state. The underlying requirement of the developmental state is the creation of a nation-wide public. A nation-wide public need not be rooted in a unified sense of 'nation' based on cultural and linguistic unity, but may well take the form of civic identity. This helps the government to mobilize a nation around economic development. The secret behind the dynamism of the Asian developmental state, for instance, is "the moral ambition to develop and the will to develop" (Woo-Cummings, 1999), which is another way to invoke Johnsons' nationalist incitement of development. The most important thing here is

that the government should make its citizens feel like a unified nation than being isolated as an ethnic group. In China, for example, a strong nationalist ideology and sentiment acted as a powerful force behind the initiatives taken to industrialize the country and raise the productive potential of the public (Bagchi, 2003). Therefore, the developmental state must be able to create a strong sense of nationalism.

The other underlying feature of the developmental state is the presence of strong, competent and merit-based bureaucracy (ECA, 2011). Professionalism, discipline and technical skills are core issues in administrative competence and capability. The bureaucracy should be shielded from instrumental manipulation by powerful rent-seeking groups outside the state (Bagchi, 2003). Relative state autonomy in formulating and implementing state policy is essential. State autonomy means the presence of coherent state agencies that are able to formulate and implement coherent developmental goals (Edigheji, 2004). State bureaucratic autonomy is achieved through meritocratic recruitment rather than on political patronage, ethnic and religious consideration.

In fact, bureaucratic autonomy or coherence is not a sufficient condition for a successful economic transformation. Evans (1995) argues that autonomy must be complemented by embeddedness as a necessary condition for successful economic transformation. Accordingly, Evans elegantly summed up the characteristics of the developmental state in the concept of 'embedded autonomy'. Embedded autonomy according to Evans (1995) refers to a network of ties that bind the state to groups or actors that become allies in the pursuit of development goals. This principle is based on the premise that the success of a transformative project does not only rest on the internal structure of the state but also on the networks and institutions that link the state and other actors on the economy. The effectiveness of the developmental role of the state depends to a large extent with its ability to work with other social actors (ECA, 2011). As a result, Evans (1995) suggested that developmental state should be based on a "capable and meritocratic bureaucracy with a strong sense of corporate identity and a dense set of institutionalized link with the private sectors" (Pp. 42). When both state-business or state-society relations deviate from their optimum, or the developmental state it captures and loses its embedded autonomy and it is no longer in a developmental state, but perverse.

In line with the concept of embedded autonomy, the other necessary requirement of the developmental state is the presence of a production-oriented private sector. The market is a better mechanism for achieving development than the central planning practiced by socialist countries (Johnson, 1982). Hence, the commitment to free market economy must be unwavering even if the state is called upon the leading role both in terms of planning, investment, and directives (Messay, 2011). The main purpose of state intervention in East Asian developmental states was to promote the interests of the business sectors and create capital accumulation and productivity improvement. As Evans (1995) sufficiently expounded, the networks between the state and the private sector serve as a platform for information exchange, consensus building over policies and effective implementation and enhance the robustness of the state.

The participation of all stakeholders is remarkably in place if the developmental state is grounded with democracy. Developmental states are democratic in the sense that different actors and interests brought together to define a common purpose and sense of direction (Edighegi, 2010). Democracy helps to create the foundation of legitimacy for development, in which citizens would participate and engage in the development process. If this has strictly prevailed, development becomes sustainable and inclusive. This ensures the presence of political stability, peace, and order that further enhances development. It is from this ground that Kieh (2015) advised that for a state to be genuinely developmental "all activities of that state should be shaped by major democratic principles such as consultation, debate, pluralism, and accountability" (pp. 21).

The presence of development-oriented leaders, relatively uncorrupted, non-predatory or with limited personal ambition that will not impede investment is also the other crucial feature of developmental state (Gedion, 2015). What makes the bureaucratic autonomy possible is the control of the state power by patriotic and development-oriented elites (Boyd & Ngo, 2005; Messay, 2011). Such kinds of leaders mainly are motivated by the desire to increase the national wealth rather than using state apparatus for personal enrichment or short-term political gains. Development-oriented leaders invest continuously and extensively on education (Edigheji, 2010), which is another ingredient of the developmental state. Education is geared toward nation-building project. It promotes national consciousness and unity. The promotion of nationalism is necessary to justify the prerogative of a strong state and inculcate discipline, just as it is necessary to galvanize people around the national goal of development.

The Reemergence of Developmental State in Ethiopia

The first attempt to adopt a developmental state model in Ethiopia dates back to the Haile Selassie I regime in the 1920s. A group of Ethiopian intellectuals, who were labeled as 'Japanizers', such as *Negadras* G/Hiwot Bayikedagn, *Blattengeta* Hiruy W/Selassie, Dr. Martin Workineh and *Ato* Kebede Michael was passionate about the Japanese developmental model. Such groups of intellectuals compare Ethiopia with Japan and attempt to imitate and model Meiji's economic transformation in Ethiopia.

In his book entitled, *Japan Endemin Seletenech* (How Japan Modernizes), Kebede Michael reflected on how he had been much inspired by Japanese civilization and how that country had to develop in a short period of time. He was more passionate about the way the Japanese led their economic and educational development as compared to the political and social aspects of development. Kebede seemed to be trapped between the lagging and antidevelopment aristocracy he was serving and the rapidly transforming intellectual group that confronted the aristocracy with more growing venom. He advised the imperial regime to give emphasize on education, the domination of investment by domestic enterprises and the participation of every section of the society on development.

In 1925, Teferi, the latter Ethiopian Emperor under the crown name, Haile Selassie I, told a Japanese commercial envoy that he wished to lead Ethiopia along the same path as the Japanese emperor had made (Kassa & Tamirat, 1998). In October 1931, the imperial government of Ethiopia sent a group of government officials to Japan to study different aspects of that country's development for use as a development model (Bahiru, 2002). *Blattengeta* Hiruy W/Selassie, the then Foreign Minister of Ethiopia, had this to say when he met the then Japanese Emperor Hirohito:

> *On behalf of Emperor Haile Selassie, that the two countries in the world, that is, Ethiopia and Japan, have 'unbroken lines' of imperial rule, and that Haile Selassie had been determined to follow the model of Japan's charter to develop his country (Messay, 1999).*

According to Gedion (2015) several factors influenced the Ethiopian regime to choose the Japanese experience for the country's development model. The two countries had similar social, economic and political similarities. They had uninterrupted imperial regimes and a history of independence and isolation. The two countries had a warrior and patriotism culture. However, Ethiopia's attempt to adapt to the Japan model was unsuccessful. This is because Ethiopian intellectuals and the 'Japanizers' did not conduct an in-depth study of the Japanese model. The Emperor did not have the required commitment to implement the model and failed to keep his promise (Kassa &Tamirat, 1998). Moreover, while there were a few similarities between the two countries, the social and technological gap was so wide that the Japanese model remained a subjective urge, which was not supported by objective reality. In its extreme sense, Levine (1997) claims that it is hard to imagine two societies more dissimilar than Japan and Ethiopia. In implementing developmental state care must be given to avoid the 'one size fits all' syndrome, in which the experience of one country or one region can't be transplanted and replicated in another (Edigheji, 2010).

The next attempt to build a developmental state model in Ethiopia is by the incumbent regime. Though some scholars believe that developmental state is established in the aftermath of the 2005 election, several documents prepared by the government and the party shows that the paradigm the state should follow was one of the reasons for the split of TPLF in 2001. For Messay (2011) what remains true is that the 2005 election crisis and its consequences turned the model from a personal preference of late Prime Minister, Meles Zenawi, into an indispensable ideology of the ruling elites in general.

There are a number of policy documents that have a direct implication on the developmental paradigm, earlier than it was declared publicly. The documents issued by the government have extensively covered the desired economic growth of the nation as well as the necessity of different forms of state activism and selective intervention including setting priorities, infrastructural development, and cooperation with non-state actors. The documents which explicitly indicates the developmental state nature of the regime includes Agricultural Development Led Industrialization (ADLI) (2001), Plan for Accelerated and Sustainable Development to End Poverty (PASDEP)

(2006-2010), Growth and Transformation Plan (GTP I) (2011-2015) and Growth and Transformation Plan (GTP II) (2016-present).

The resuscitation of the developmental state is the result of many interrelated factors. The first factor is the 1998-2000 Ethio-Eritrea war. The war opened the eyes of the government to the fact that different Nations, Nationalities and Peoples had a common sense of identity, which was not consisdered by the government so. The second reason was the 2001 crisis within the TPLF and the resultant split. For some scholars, the split of TPLF was the result of disagreement over economic models. But, for Clapham (2013) and Gedion (2015) the victorious group within the TPLF under the leadership of the late Prime Minister, Meles Zenawi, came up with the revisionist idea, declaring its commitment to build a developmental state in the country. The third factor was that lessons drawn from the 2005 election necessitated the regime to change its economic outlook to win the heart of the people. According to Messay (2011), the main purpose of developmental state was to create the conditions for a long term rule of Meles and his party by siphoning off popular support from the opposition to the point of making them irrelevant.

The failing ideology of neo-liberalism, which had been promoted by western countries and their institutions, was the other factor for the resuscitation of the developmental state. Neo-liberalism was considered as dead-end in such a way that it was incapable of bringing development in Africa in general and in Ethiopia in particular (Meles, 2006). Meles advised African governments to shift their economic model from a non-interventionist night-watchman state to a capable state. The Ethiopian model is drawn from South Korea, Taiwan and China (De Waal, 2012). The developmental state should, Meles argued, be obsessed with value creation, making accelerated and broad-based growth as a matter of national survival. The path of this accelerated growth is possible through strong developmental states that creates policy space, encourages and direct investments and promotes work culture and ethics among Ethiopians.

The Nature of Ethiopian Federalism

After the demise of the military regime in 1991, the EPRDF government established a federal system on the basis of ethnic identity. This federal arrangement was elaborated first in the Transitional charter and then institutionalized in the federal constitution that was adopted in 1995. Ethnic federalism was mainly introduced to decentralize power and resolve the 'nationalities question' by accommodating diversity (Assefa, 2006). The intended purpose of this federal system was to achieve ethnic and regional autonomy while maintaining the unity of Ethiopia as a whole (Alem, 2005). However, ethnic federalism became the most controversial issue in the public discourse everywhere.

Supporters of the Ethiopian federal system claim that ethnic federalism maintains the unity of the Ethiopian people and the territorial integrity of the state at large. They argue that it has brought recognition of the principle of pluralism and ethnic equality (Alemseged, 2004; Temesgen, 2015; Young, 1998). It also produces a sense of pride and equality especially among those Ethiopians

who felt marginalized by the dominant culture of the center (Assefa, 2012). The supporters illustrate that ethnic federalism in Ethiopia ensures the recognition of the cultural and linguistic rights of ethnic groups with the aim of improving inter-ethnic relations.

In contrast, the critics stipulated that the federal arrangement entitled cultural and linguistic rights without providing genuine political freedom (Alem, 2004). Despite its goal of maintaining inter-ethnic harmony, ethnic-based federal system escalates the inter-ethnic conflict in the country. Moreover, many critics argued that the use of ethnicity as the main organizing device of federalism unnecessarily essentializes identity, encourage secessionism and fragment political space along ethnic lines (Alemante, 2003; Abbink, 2006; Daniel, 2003).

For many scholars, ethnic-based federalism is engineered for the sake of 'divide and rule' aiming at securing Tigreans' political supremacy (Abbink, 2006; Bekalu, 2016; Merera, 2003). In addition to this, TPLF devised this policy to divide the other people of Ethiopia along ethnic lines so that it could maintain its political position at the expense of other political groups (Aalen, 2006). To accomplish their goal of political supremacy, the leaders of TPLF who learned the principle of divide and rule from European colonists have propagated the gospel of ethnic division. The TPLF's system is to disintegrate Ethiopia into pieces, abolishing the long existing unity of the people and retarding the development and growth of Ethiopia (Aalen, 2002). In its extreme case, Tuso (1997) contends that the EPRDF/TPLF regime deliberately fosters ethnic hatred and division for its own political goals particularly at the expense of the Amhara ethnic groups.

In the current political atmosphere of Ethiopia, parties and other political groups even are organized on the basis of ethnic identity (Abbink, 1998; Huntington, 1993). It is because Ethiopian ethnic federalism encourages political parties to organize along ethnic lines (Alem, 2003; Bekalu, 2016). This has a disastrous effect on the national unity and political stability of the country. Rather than improving inter-ethnic relations in Ethiopia, ethnic federalism invites ethnic conflict and risks state disintegration (Alem, 2004,). Many scholars fear that Ethiopia might face the fate of the USSR and Yugoslavia (Aalen, 2002; Kymilcka, 2006). This is because ethnic federalism in Ethiopia reinforced and generated local ethnic conflict by destroying the country's collective identity.

Developmental State and Ethnic Federalism: The Matrimony of the Discordant

The coming of EPRDF into power overturned the centuries-old experience of unitary state structure into federalism, mainly based on the parameters of primordial nature of ethnic identity. This radical structural change is accompanied by the developmental state as, according to government officials, a '*sin qua non* to bring national development and improve the welfare of the people'. However, there is much controversy among Ethiopian scholars and politicians on the commitment of the government in implementing the basic requirements of the developmental state as well as the suitability of the marriage between ethnic federalism and developmental state. The

debate is between government officials and opposition political party members, ruling party-affiliated and independent scholars and among the general public.

Since the scope of this study is to interrogate the compatibility between developmental state and ethnic federalism, the paper is not going to discuss the commitment of government in implementing the basic requirements of the developmental state. It exclusively focuses on the divergence and convergence between ethnic federalism and the basic pillars of the developmental state. In fact, little is studied about the suitability of the marriage between developmental state and ethnic federalism among Ethiopian scholars with the exception of political debates, public speeches and routine rumors among the ordinary citizen. Rumors within the general public and political debates show that the developmental state is initiated in Ethiopia to legitimize the 'state capture' behaviors of the ruling party.

To begin with, the main arguments on federalism and developmental state, the very essence of federalism is not comfortable for implementing developmental state. Proponents of this view assert that almost all countries known for building an effective developmental state, such as Japan, South Korea, Thailand, Singapore, and China, are unitary in their state structure. The centralized nature of developmental state and its long-term national plan defect the need for sub-national decision making autonomy in a federation. Sub-national financial autonomy, the necessary requirement in a federation, is hardly possible in developmental state through which centralized revenue collection and arrangement is a must. However, such a problem is resolved through the creation of democratic federalism. If the existing federalism is based on the notion of democracy along with visionary, nationalistic and committed leaders, a developmental state is possible in a state having federal state structure. Development-oriented leaders under a federal state could allocate the national cake in a just and proper way.

The relative homogeneity of the state is better to be effective in bringing national development via the principle of the developmental state is the other contentious issue. The developmental state requires explicit consensus among the public on the major national projects. But, the conviction that in a diversified society there is disagreement on different national projects among the public is a fatal mistake. It depends on the way how the government accommodates diversity and the nature of the regime itself. The problem arises when the government favors certain segments of society for political purposes. Ethnic patronage creates grievance among the population of a certain state that further retards cordial inter-ethnic relations, which inevitably led to disagreement on major national projects initiated by the developmental state. Disagreements on national projects create a feeling of 'non-ownership' among citizens. Visionary, nationalist and development-oriented leaders can enhance positive ethnic relations and develop consensus among the public on major national projects.

The nature of Ethiopian federalism is unique. It is established via stretching ethnic identity rather than promoting common citizenship. The divergence between developmental state and ethnic federalism in Ethiopia lies at its basic organizing principle of federalism, more of ethnic-based,

rather than the nature of federalism. What is most prevalent in the Ethiopian political atmosphere since 1991 is 'ethnocentric federalism without meaningful devolution' (Birhanu, 2011), which amplifies the contradiction between the basic requirement of the developmental state and Ethiopia's federalism. There are some in the public at large, particularly between Amhara and other ethnic groups, who contend that a developmental strategy involving ethnic federalism is fatally flawed (Keller, 2002). Hereunder, the main divergence between the main requirements of the developmental state and the nature of federalism in Ethiopia is discussed.

State Nationalism versus Ethnocentrism

The primary impetus of any developmental state is the availability of a nationalist theme that can mobilize the public around national goals. The creation of a nationwide public is necessary to create nationalistic feeling and national consensus that makes the people to be involved in any national project. The leaders should have a nationalistic orientation and ambition to develop the country (Woo-Cummings, 1999). It is from this ground that the EPRDF regime attempts to develop a nationalistic outlook since the inception of developmental state in contrast to their long periods of ethnic identity differences narration. The rhetoric of 'war on poverty' and the 'Grand Renaissance Dam' on Abay (Blue Nile) river have been serving as a governments' instrument to mobilize the people around development (Messay, 2011). The latter project, in particular, is more nationalistic in the sense that it revives the longstanding grudge against Egypt over the control of the Nile so that all Ethiopians contributed a lot for the successful completion of the project regardless of their ethnic background.

The attempts of the regime to create nationalistic orientation, however, are less successful. This is because the 'practice of divisive counter-narratives on the history of the Ethiopian state by ethnically inspired governing and non-governing political elites has minimized the collective identity of Ethiopians' (Aaron, 2017, Pp. 4). The differences between the various ethnic groups are high lightened, while values, experiences, principles, and goals that they share in common are discouraged (Daniel, 2003). Ethiopianist symbols and heroes were denigrated and new ones have been celebrated frequently. The historic flag of Ethiopia, for instance, was labeled by the late Prime Minister, Meles Zenawi, derogatively as a 'mere piece of cloth'. While primordial identities got legal and constitutional status, *Ethiopiawinet* was relegated as an identity of secondary importance. Such a continuous rhetoric resulted in the notion of 'we' and 'them' category. As a result, the consensus is low on national development projects since the project established in one constituency is perceived as nothing useful for the rest ethnic groups.

The worst belief among the Ethiopian ethnic groups is that the EPRDF regime is controlled and ordered by the TPLF. The TPLF has major allegiance to the northern parts of the country in particular to the Tigrigna speaking groups. The control of the central government by the TPLF inevitably resulted in the allocation of the national resources into Tigray Region (Daniel, 2003; Ermias, 2016; Paulos, 2003) since TPLF is an extremely narrow ethno-nationalist group. In fact, TPLF has not officially given preferential treatments in Tigray Region in terms of the formal

expenditure assignment, revenue assignment or yearly subsidiary transfer (Paulos, 2003). The TPLF is aware that favoring Tigray openly would potentially lead to ethnic conflict or be exploited by opposition political elites to mobilize their constituencies against the regime.

The excess lopsided distribution of resources into one region brings dissatisfaction, revolts and ethnic strife. The recurrent protests in Amhara and Oromia Regions since 2015 were the sign of such grievances and dissatisfaction. In the protest, immense property destructions were prevailed by attacking different Companies, Buses, Hotels and other service providers to the TPLF and its affiliated business groups. Selam Bus, the main transport service provider in different parts of Ethiopia, was targeted because of the fact that the shareholders of the Company are members of TPLF. The burning of Companies, being owned by TPLF, government-affiliated business groups and foreigners, have been set baking development efforts of the country. It also influences the good image of the country in the eyes of the international community which deter foreign direct investment.

In addition to the above facts, ethnic federalism has encouraged an upsurge in ethnic nationalism and promoted ethnic parochial divisiveness along ethnic lines (Daniel, 2003). The sermonizing of ethnic division discouraged nationalistic outlooks. Extreme ethnic categorization has emerged which is accompanied by the exclusive ownership of certain districts by a single group. As a matter of fact, different national projects have been aborted. The protest of Oromo people against the Addis Ababa Master Plan which has now aborted is a sign of this terrible fact. The burgeon of Amhara nationalism as a result of land claim over Wolqiet and Raya district is the other saddest fact in Ethiopia. Ethnic federalism, in general, has led to tensions among ethnic groups leading to competing claims of town and land ownership (Aaron, 2003). These tragic incidents have been experienced because of the fact that boundaries are created not for administrative purpose rather they are established in such a way that ethnic groups feel a sense of exclusive ownership.

It is platitude that without the development of the values of loyalty, national consensus, unity, and cordial ethnic relations, the developmental state cannot achieve the mobilizing power it leads the country in the road of rapid development (Messay, 2011). The consensus is lacking among the different ethnic groups on the nature of Ethiopian state formation as a result of the ruling party's intentional distortion of history. Ethnic federalism has further exacerbated the rise of narrow ethnic nationalist sentiment rather than uniting the people. It generated more inter-ethnic conflicts in Ethiopia which have a negative impact on the creation of civic country wide citizenship for the successful creation of a developmental state in Ethiopia (Clapham, 2009). The emergences of 'ethnic boundary' (to use Barth's terminology) results in a sense of non-ownership in the national projects constructed in other ethnic groups' territory. Moreover, the prevalence of frequent inter-ethnic conflicts distorts the development efforts of the country. It has been frequently argued that the success of the East Asian miracle is directed by nationalism (Haley, 2005). To achieve development, all Ethiopian should come out from the track of ethnocentrism to see themselves as Ethiopian rather than being Amhara, Oromo or Tigray.

Meritocracy versus Ethnocracy

The success of the developmental state is determined through the presence of merit-based recruitment and the promotion of bureaucrats. Johnson (1982) pointed out that the success of Japan was the result of merit-based recruitment through which civil service was built with the most talented graduates of top universities. Professionals, merit-based and disciplined bureaucratic elites give priority for the interest of the country and its citizens above its own personal enrichment. Such determined bureaucratic and political elites are either relatively uncorrupted or limited personal gains to non-predatory states which did not impede investment and the expansion of national productivity (Messay, 2011). Above all, bureaucratic autonomy is in place if and only if the merit-based recruitment system is established.

The lesson that Ethiopia should learn from South Korea, Singapore, Botswana, and Mauritius is the necessity of a committed, visionary and patriotic leadership that gives priority for national development rather than personal development (Turok, 2010). Such kinds of leaders are established through the application of the principle of meritocracy. Nevertheless, what is more, prevalent in Ethiopian history is that the civil servants have been recruited on the basis of political affiliation, personal patronage, and ethnocracy. Observing this complex problem, Ethiopian classic scholar, Geberehiwot Baykedagn (1917), advised the imperial governments of Ethiopia that they need to adopt a policy of development facilitated by visionary and accountable leadership, an educated population and skilled labor force. However, the consecutive Ethiopian governments have been reluctant to accept this noble advice and this makes Ethiopia the least developed country and on the way of state disintegration.

The EPRDF regime, in particular, has failed to take a lesson from the failure of the past regimes. Far from allowing bureaucratic autonomy through a meritocratic principle, the regime undermines impartiality and professionalism and distributing favorable treatments on the basis of political patronage and ethnic affiliation. Under the system of EPRDF, all apparatuses of states are used to marginalize and exclude rival political elites, be they ethnic, religious and class based. The intellectual community of Addis Ababa, with its large Amhara contingents and Ethiopianist orientation, was excluded from positions of responsibility and influence in the new government (Young, 1998). The practice of exclusion instead of integration denotes the lack of development-oriented political elites and the preponderance of rent-seeking predatory elites. In the predatory state, the office bearers use their position to pursue individual interests via excluding political rivals through the use of state apparatuses (Edigheji, 2004). After the May 2018 ‘partial’ political reforms in the EPRDF regime, the investigations by the Federal Supreme Judge of Ethiopia indicates that the rent-seeking behavior within the regime was rampant. The state was considered the sole property of a small group of political elites.

Coming to the main issues of discussion, state restructuring under ethnic federalism since 1991 is based on the narrow sense of ethnic identity, often on its primordialist sense. The restructuring of the state in such a way produced a weak bureaucratic structure which is a key to the developmental

state. Ethnocracy rather than meritocracy has been highly employed to recruit professionals which adversely affect the establishment of a highly competent bureaucratic staff. Ethnocracy in this context refers to the allocation or division of political power and bureaucratic positions primarily on the basis of ethnic identity (Mazrui, 1975). A typical feature of ethnocracy includes an 'essentializing, general and all-encompassing 'ethnicization' of society, seeing it as a hierarchy of ethnic groups …' (Anderson, 2016, Pp. 6). To make it clear, ethnocracy exists when the way how the bureaucracies operate is influenced and shaped by ethnic affiliation.

The Ethiopian experience shows that the recruitment and appointment, as well as the promotion of the bureaucrats, has been solely depend on ethnic belongingness. Ethnic federalism urged for the proportional representation of the ethnic groups in both levels of bureaucracies without considering the required knowledge and experience. In such a system, elites are more committed to improving the well-being of their own fellows rather than any other groups or national development. The problem is not about working for the betterment of once fellow ethnic groups but has to do with the commitment of elites to work for their ethnic groups at the expense of other groups. A developmental state favors the commitment of elites for national development rather than being emotionally attached to their fellows. Many projects have been suspended and delayed because of the lack of the required skills and commitments needed to mobilize the resources of the nation for the intended purpose.

The worst part of ethnocracy is the emergence of the notion of 'indignity' and 'non-indignity' among Ethiopians. In developing regions, even though there is a possibility to recruit professionals from other groups, key positions are given for indigenous ethnic groups without having the required knowledge. Let alone other institutions, in Universities through which high academic and professional competencies are required, key administrative positions from top to bottom levels are filled by indigenous members. The working environment for 'non-indigenous' groups has not suitable. The indigenous officials harassed them by attaching different names like 'you are an outsider' and job performance is evaluated through ethnic affiliation rather than work effectiveness. As a result, the outsiders are not that much committed to working diligently for the effective accomplishments of the organizational goals. The so-called 'outsiders' are usually seeking to transfer in a place where their fellows are lived particularly after they accumulate work experiences. This has an adverse effect on the development efforts of least developed regions since bureaucracies are filled by new graduates with low professional experiences.

In addition, ethnic federalism urged for the establishment of local administrative units based on ethnic identity. State power and budget are accessed if and only if ethnic groups are organized on the basis of ethnic identity. This inevitably led to the quest for identity recognition and self-determination right. The government gives response to this quest to each ethnic group without considering the social context of the country (Abbink, 1997; Asnake, 2009; Bekalu, 2017; Daniel, 2003). Most ethnic groups in Ethiopia could not inhabit in territorially defined geographical areas (Bekalu, 2017). This is because the diverse peoples of Ethiopia have created a single geographic and cultural unit as a result of migration, interaction, conquest, trade, and intermarriage. However,

the new ideology of self-determination created ethnic dispute and the upsurge of ethnic nationalism that deteriorate pan-Ethiopianist view and setback development. Let alone national development, this ideology makes the country on the way of national disintegration.

Embedded Autonomy versus Party-state Business Domination

It is platitude that the success of the developmental state requires the governments' commitment to support and work in cooperation with private sectors. Private businesses should be strengthened to make it as an engine of economic growth and productivity enhancement. The role of the state in the developmental state should be to facilitate and not inhibit private initiatives (Aaron, 2017). What distinguished Ethiopian developmental state from South East Asian states experience is the presence of what Evans said 'embedded autonomy' in the latter's economic experience. In fact, the rise of embedded autonomy in such states is the result of ethnic homogeneity, the favorable climate in the world market and the development of an astute political leadership (Edigheji, 2004). In contrast, most observers acknowledge that committed political leaders are hardly created in Ethiopia that can accommodate diversity and work for the creation of a favorable environment for private investors.

Ethnic heterogeneity is not a problem to effectively implement a developmental state. The accommodation of diversity through the building up of genuine democracy and the allocation of proper political and financial autonomy create favorable conditions for the application of developmental state in the ethnically heterogeneous state. If the government fails to do so, ethnic strife inevitably might have erupted that deteriorate national development. The TPLF led EPRDF regime is known for its discriminatory policy and state capture behavior. Upon taking power in 1991, the ruling TPLF liquidated non-military assets held by the struggle to found a serious of companies whose profit would be used as venture capital to rehabilitate the so-called 'war-torn' Tigray region's economy (Ermias, 2016). A huge business empire known as Endowment Fund for the Rehabilitation of Tigray (EFFORT) has established to accomplish such a purpose. This makes the TPLF have a dominant economic power owning and managing parastatals in agriculture, trade, cement production, textiles and garments, livestock and leather, mining and exploration, transportation, engineering, construction and the finance sector (Vaughan & Tronvoll, 2003). The control of central financial resources by the TPLF makes the existence of clientelistic relations between TPLF and other subordinate ethnic parties through subsidies.

The claim of TPLF on the purpose of the EFFORT, the organization is formed to by investing capital contributed from the Tigray during the struggle to rehabilitate the region's economy, is not problematic by itself and has no any contradiction with the guiding ideals of the developmental state. The problem arises when the government provides special support for the company. Some critics suggested that EFFORT companies would not survive without government subsidy and protection. Preferential access to government credit facilities, preferential treatments in obtaining license and custom clearances, manipulation of privatization and other state property sales, tailoring public sector infrastructure investment to the needs of the parbus are the most frequent

economic incidence in Ethiopia (Taddesse & Dawit, 2007). The government allowed free flow of commodities in the name of EFFORT without paying the necessary custom and tax. As a result, the party parastatals are involved in every sector of the economy.

The provision of preferential treatment for party owned businesses deteriorate the expansion of private sectors. The central government is controlled by the TPLF top leaders and is criticized for their creation of ruthless economic opportunity for private conglomerates such as Mohammed International Development Research Organization Companies (MIDROC) that have close economic ties with it (Messay, 2011). Urban land, extensive rural land, and other economic opportunities have been provided for EFFORT and other affiliated business groups. This influences hazardously the effective functioning of private sectors in Ethiopia. Business groups with no political and economic affiliation with TPLF has remained small and marginalized, operating areas left out by the two major economic powers (EFFORT and MIDROC). This is succinctly elaborated by World Bank (2007) report in that the competition between party parastatals and private firms with no affiliation with TPLF resulted in the closure and exit of the private firm. The WB report acknowledges the Ethiopian system as being highly opaque in which patronage is a common practice.

The phenomenon of party owned business much like military controlled business is an integral part of the drive for a total capture by an insurgent party (Birhanu, 2011). The capture of the economy by the ethno-nationalist insurgent party has led to the promotion of industrialization in one region and advancing the standard of living of a specific ethnic group. TPLF has been criticized for favoring Tigray region and Tigrigna speaking groups. As the former senior politician from the ruling party, Ermias Legesse, succinctly put that the parastatals are an instrument to implement the most routine rumor among the Ethiopian public, 'until Tigray is developed, let the other be debilitated'. The public rumor should not be given less attention since most recently public grievance against the Tigrigna speaking group is developed. The attack on Tigryans in different parts of Ethiopia by labeling them as agent and supporter of TPLF dictatorial regime is one of its manifestations.

The fact that the control of the state economy by an ethnocentric party via excluding private investors is a total deviation from the main pillar of the developmental state which in particular is branded as embedded autonomy. The developmental state requires the coordination between the state and private sectors to encourage innovations, to create employment opportunities and enhance national development. As a matter of fact, such a noble prerequisite of the developmental state is hardly implemented in Ethiopians' political economy. Being controlled the key economic resources by EFFORT, the manufacturing premises are located in Tigray region, and they generate gainful employment and improve the lives of some of the members of the ethnic group (Paulos, 2007). This has a disastrous effect on national development and even on states integrity.

Conclusion

In conclusion, the paper attempted to explore the compatibility between the two, developmental state and ethnic federalism, dominant economic and political ideologies of the EPRDF regime. The premise of the study starts from the argument that from rhetorical points of view there is no problem associated with the developmental state. The problem arises when the ruling party or the incumbent government uses it as a means of 'state capture' and an instrument of exploitation. Furthermore, the way state structuring system organized is a detrimental factor for the success of the developmental state. As a matter of fact, successive rulers in Ethiopia attempt to imitate the economic and political models from abroad without considering the domestic scenes of the country. The notion of 'one size fits all' negatively influences the development as well as nation-building projects of the country. To ameliorate economic development, the EPRDF regime pursued the developmental state in line with the ethnocentric way of restructuring the state. The developmental state has been there in everyday lives of the Ethiopian public for the last two decades. Being accompanied by the controversial ideology of the government, revolutionary democracy, the developmental state has used as a means of legitimating state capture and as a lever for sate exploitation. The situation worsened as a result of the marriage between developmental state and ethnic federalism which I call such a relation the 'matrimony of the discordant'. The nature of the developmental state and the way Ethiopian federalism organized is incompatible. Civic nationalism, the primary prerequisite for the success of the developmental state, is substituted by ethnic nationalism. It is because ethnic federalism focuses more on the primordial nature of ethnic identity rather than preaching common citizenship. The fostering of bureaucratic autonomy through a meritocratic recruitment and promotion system is discouraged by an ethnocratic and political patronage system. Furthermore, embedded autonomy has been non-existent in Ethiopia since the government is involved in controlling important economic areas. The adoption of an economic model requires appropriate state structure, mostly nationalistic in its orientation, and the commitment of the incumbent government to effectively implement the basic pillars of the adopted model in accordance with the domestic scene of the country.

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Instructors' Concern Survey: In the Case of Faculty of Business, Tesfaye Tilahun and Yalew Gorfu, St. Mary's University

Abstract

The paper examined various issues regarding the concern of the Business Faculty instructors. Instructors conduct 15hrs per week. They are expected to conduct research and participate in community services. In addition, they involve in annual plan activities that would be executed by their respective departments. These demand the instructors' effort. Thus, this paper focuses on concerns related with factors affecting instructors' performance in the teaching and learning, gather information regarding the concerns of instructors with respect to pedagogical concern, apprehension on the programming, time tabling, and the utilization of action research to overcome problems. In related to pedagogical concern, their consideration of learning style and assessing properly in a manner of providing feedback. In addition, students' class size was assessed. The researchers used non-probability and convenient sampling technique. They applied their tools in quantitative method to collect data. They analyze in a descriptive way and came to their findings. Thus, it was found that student's class size, instructors' work load, and availability of instruction materials, were in a moderate manner. Regarding students, their motivation to learn was high. Therefore, the conclusions and recommendations emphasized the need to focus on some academic concerns to stride in a better way. The paper would be a direction to further study.

Keywords: instructors' concern, instructors effort, pedagogical concern

Overview of the Faculty of Business

The Faculty of Business was established as Business Faculty in August 2005 in response to the increased number of departments and with the view to provide efficient and quality service to the mounting number of students joining the business stream of the University and meet the skilled work force requirement of the economy.

The faculty has three departments under it; viz. Management, Marketing Management, and Tourism and Hospitality Management (THM). The number of students joining the Business Faculty has been steadily growing over time except few fluctuations in some departments. The increment rate at Management and Marketing Management Department is remarkable due to the high employment opportunity in the labor market.

The Faculty Dean's Office has two employees: the Faculty Dean and a secretary to carry out its day to day activities. Currently, in the Faculty, there are 36 permanent instructors: 12 in Marketing Management Department, 22 in Management Department, 3 in Tourism and Hospitality Management Department.

Issues pertaining to teaching and learning, students' cases, research, and community services are discussed and endorsed by the Faculty Academic Commission which is held fortnightly The

commission is chaired by the Faculty Dean and three department heads. One students' representative is member of it, though his/her participation is limited. The secretary of the commission is elected from the members.

The Faculty makes the necessary follow-up on the accomplishment of activities in the annual action plan of each department. The Faculty made action plan performance a discussion agenda in all Faculty Academic Council meetings and its progress was reflected almost in all meetings, so that the department heads would have an opportunity to identify activities done and activities not yet done.

Purpose: Gather data on the current concerns of instructors regarding their instructional activities.

Target: Permanent, Contract, and Part-time instructors in the Faculty of Business of SMU

Being concerned means you think about it frequently and would like to see some change (by concerned body or yourself).

Degrees of Concern and Operational Definitions

***Not concerned* –** not an issue at all to influence the accomplishment of neither preparatory (off-class) nor teaching (class) duties of the instructor currently and in the near future (1–5 years)

***Little concerned*–** an issue currently not significant but potential to influence the accomplishment of either preparatory or teaching duties of the instructor in the near future (1–5 years)

***Moderately concerned* –** an issue currently influencing the accomplishment of preparatory and/ or teaching duties but managed by the instructor with no change in approach

***Highly concerned* –** an issue currently influencing the accomplishment of preparatory and/ or teaching duties that forced the instructor to change the approach pursued.

***Extremely concerned* –** an issue currently influencing the accomplishment of preparatory and/ or teaching duties of the instructor to the extent of enforcing a shift in schedule or failure in completion/ coverage of the course content planned.

Directions: Indicate your response to the following inquiries by putting '√' mark in the box and/ or by writing in the respective space provided.

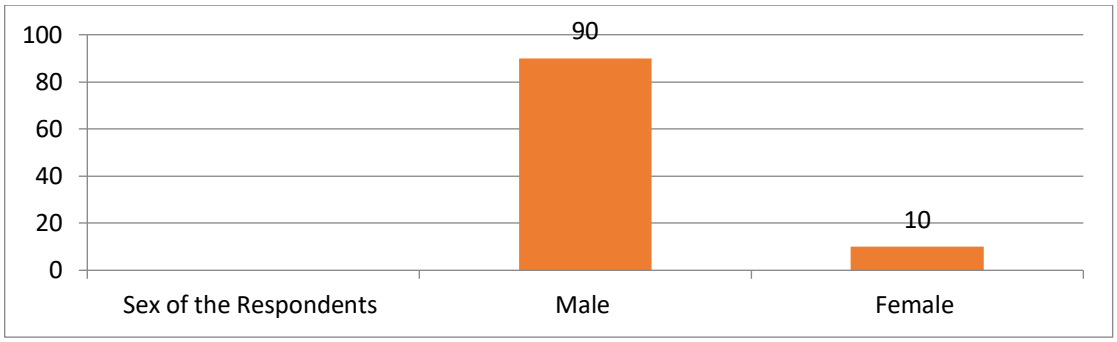
The inquiry is concerned with both **regular and extension** modes of education but the time refers only to the **current (2010 EC)** academic year.

Please, keep in mind the above definitions of '**Degrees of Concern**' while responding to every question below and there is **no need of writing your name** on the paper.

Results

General Information about the Respondents

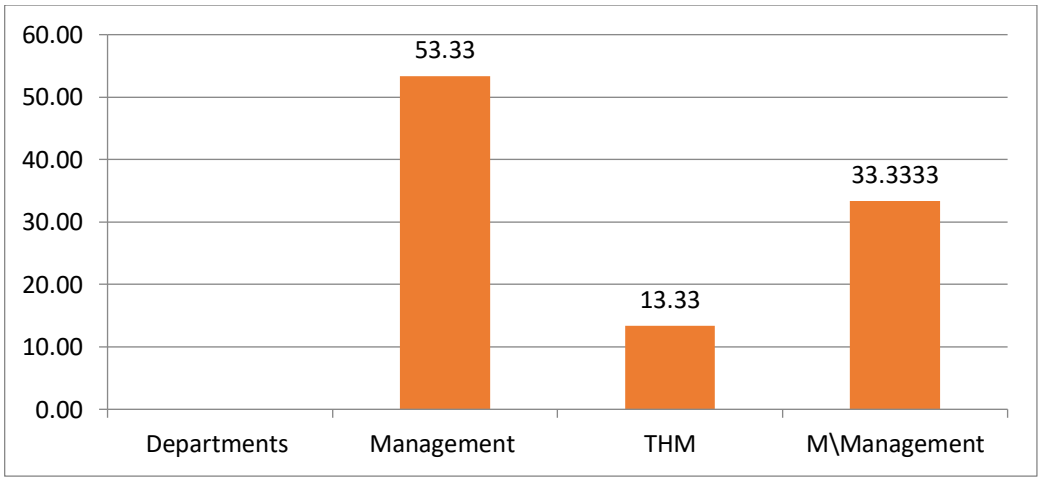
Chart 1: Sex of the Respondents in Percent



Source: Instructors Concern Survey Questionnaires, 2010 E.C

The chart above (Chart 1) dictates that, majority of the respondents were male, which was 90% of the total participants and the rest 10% were females. This shows that there was a big variation in the number of participants in relation to sex differences.

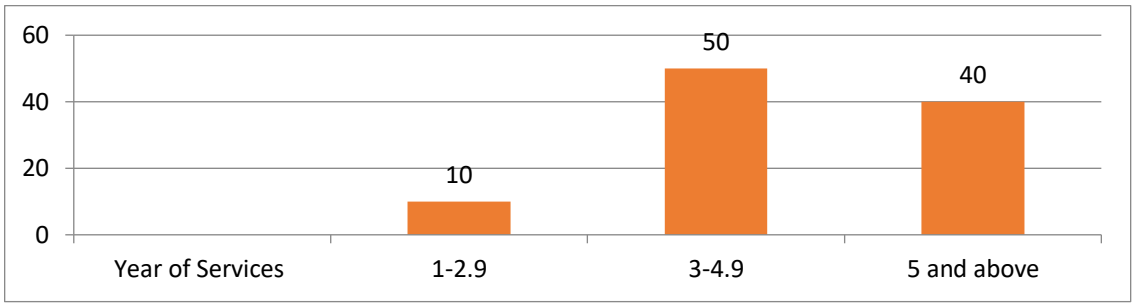
Chart 2: Departments of the Respondents in percent



Source: Instructors Concern Survey Questionnaires, 2010 E.C

The chart above shows that majority of the respondents(53.33%) were from Management Department and the rest 33.33% and 13.33% were from Marketing Management and Tourism and Hospitality Management Departments respectively.

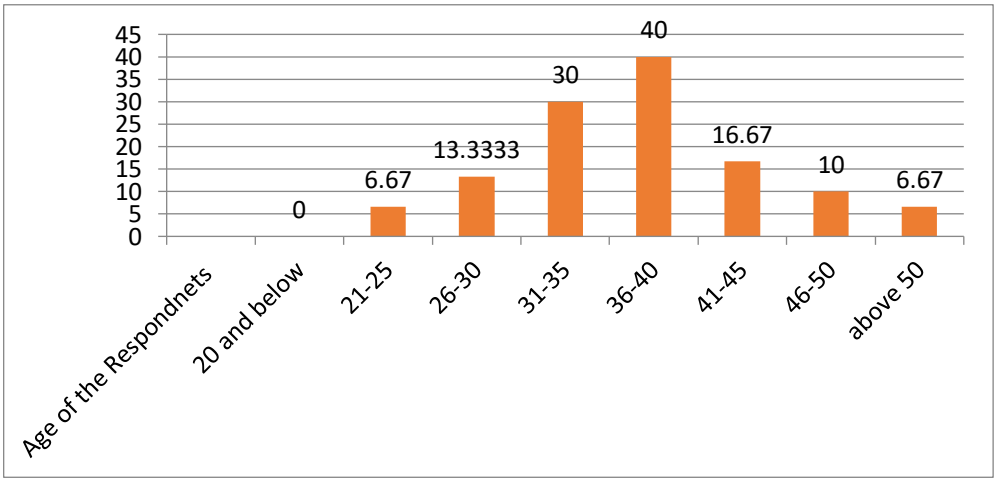
Chart 3: Respondents Year of Services in Percent



Source: Instructors Concern Survey Questionnaires, 2010 E.C

Chart 3 above shows that in relation to service year of the respondents, majority (50%) said they worked in the institution between 3-4.9 years. In addition, 40% and 10% of the respondents served for >5 and 1-2.9 years respectively. This implies that majority of the participants of the study which were 90 indicated that they worked in the institution for more than 3 years which in turn showed that they can provide sufficient information about the institution.

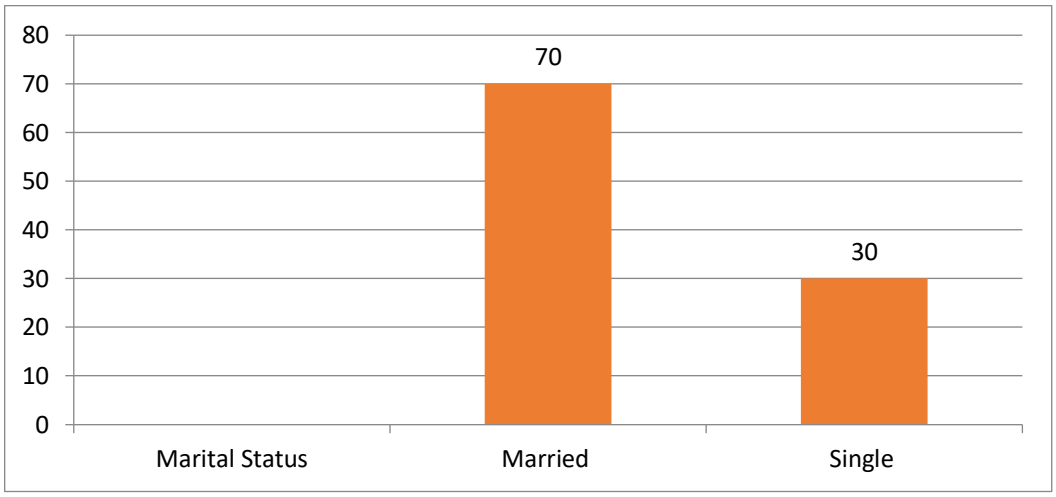
Chart 4: Age of the Respondents



Source: Instructors Concern Survey Questionnaires, 2010 E.C

The chart above (Chart 4) shows that majority of the respondents (40%) were at the age range of 36-40 years. This shows that they can easily communicate with their students and they can approach their learners in relation to their needs and aspirations. The rest 30%, 16.67%, 13.33%, 10%, 6.67% and 6.67% of the respondents were at the age of 31 to 35, 41 to 45, 26 to 30, 46 to 50, and 21 to 25 and above 50 respectively.

Chart 5: Marital Status of the Respondents in percent

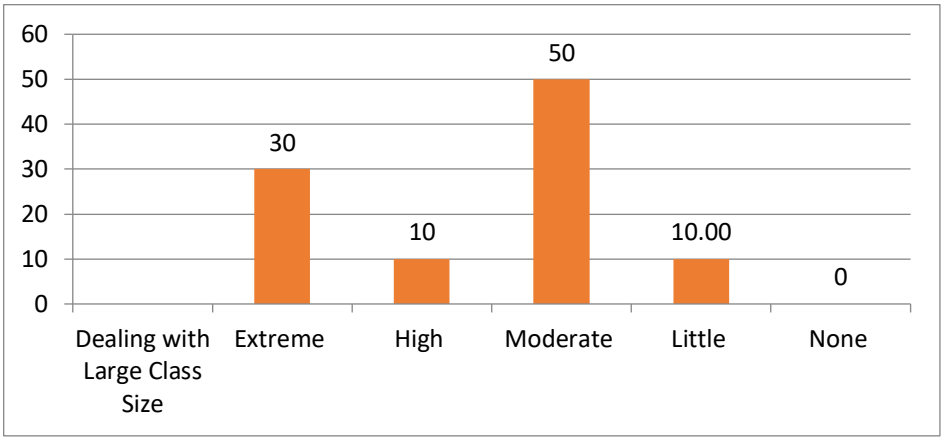


Source: Instructors Concern Survey Questionnaires, 2010 E.C

Chart 5 above shows that 70% of the respondents were married and 30% of the respondents were single. This shows that majority of the respondents had sufficient experience in taking responsibility and managing different tasks in time.

Academic Concerns

Chart 6: Dealing with Large Class Size in Percent

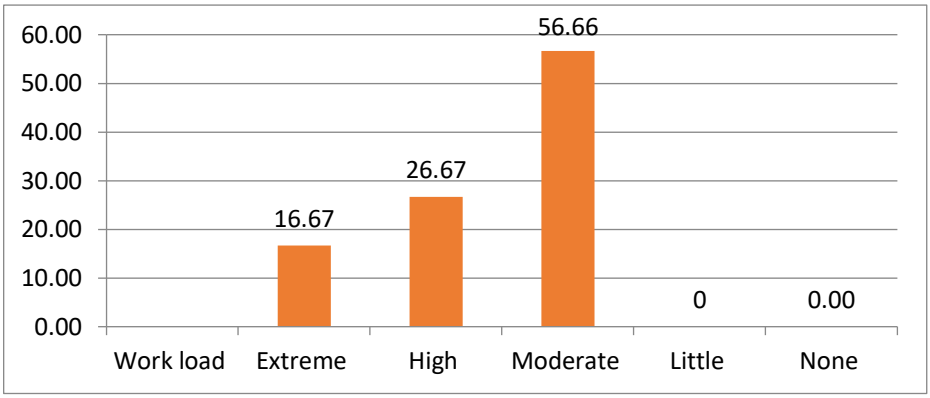


Source: Instructors Concern Survey Questionnaires, 2010 E.C

According to the above chart, which indicates the level of concert they have in dealing with large class size, half of the respondents (50%) pointed out that it is moderate in affecting their teaching and learning process. Moreover, 30% and 10% of them pointed out that it has extreme and high effect and the remaining 10 of them said there is little effect.

Based on the data indicated above, one can deduce that close to half of the respondents (40%) reported that large class size has either extreme or high effect on the accomplishment of teaching duties of the instructor to the extent of enforcing a shift in schedule or failure in completion/ coverage of the course content planned.

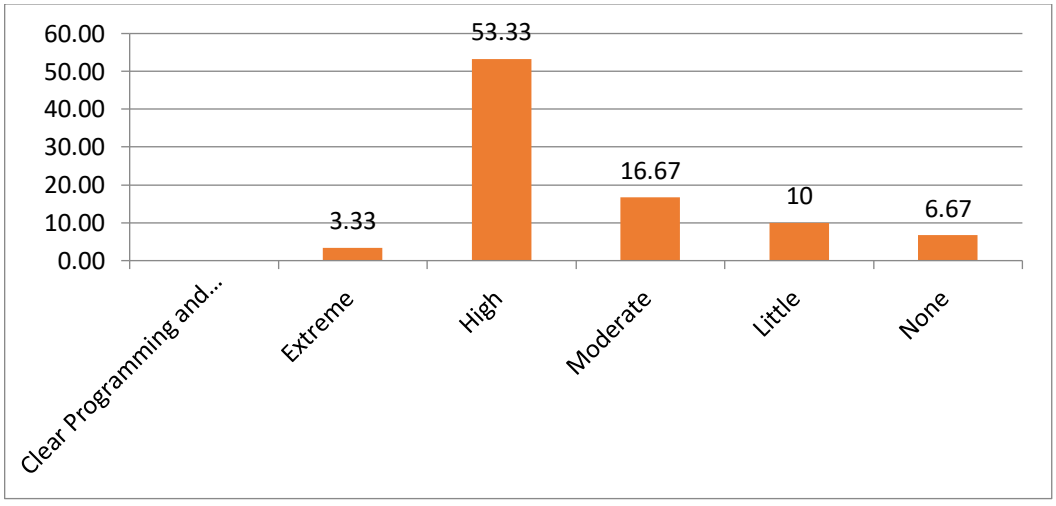
Chart 7: Workload of Credit Hours Per Week in Percent



Source: Instructors Concern Survey Questionnaires, 2010 E.C

The above chart indicates workload of credit hours per week and 16.67% said it has extreme effect while 26.67% of them said it has high effect and the remaining 56.66% of the respondents said it has moderate effect. Based on the data above, one can deduce that there was significant effect of work load on the teaching learning process in the institution.

Chart 8: Clear Programming and Time Table in Percent

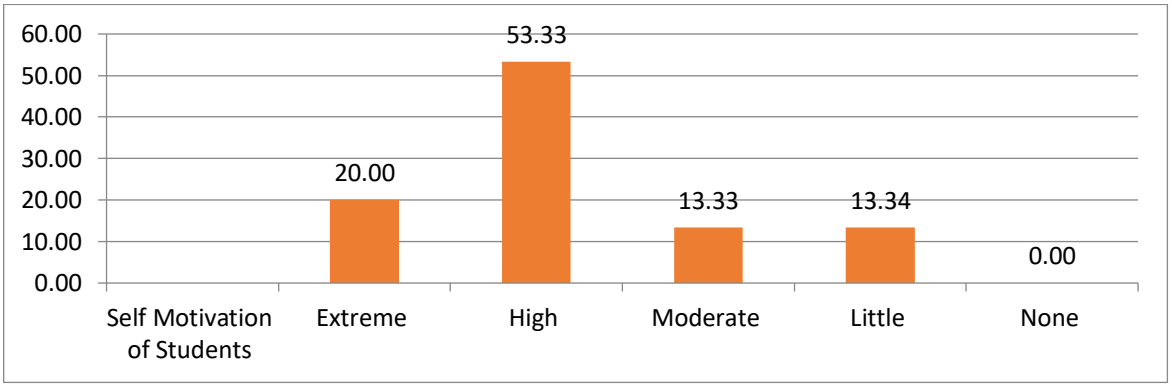


Source: Instructors Concern Survey Questionnaires, 2010 E.C

Chart eight above shows whether clear programming and time-tabling of major academic events (time and places of registration, class, practicum, and exam) have an effect on teaching and learning and to this end, more than half of the respondents (53.33%) said high and 16.67% of them

said moderate and the remaining 3.33%, 10%, and 6.67% of them said extreme little and no concern for the issue above mentioned respectively. Based on the data indicated above, one can conclude that more than half of the respondents (56.66%) said it is either extreme or high and this in turn indicates an issue currently influencing the accomplishment of teaching duties that forced the instructor to change the approach pursued.

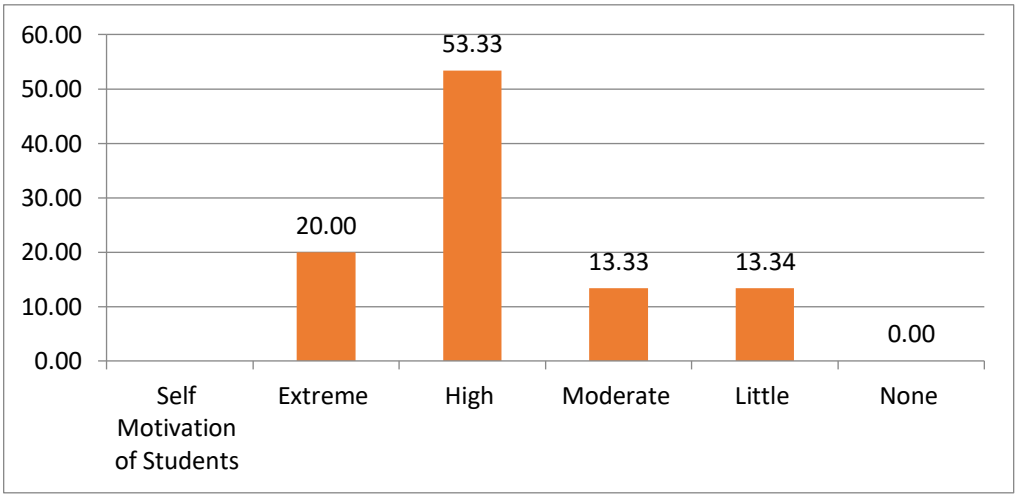
Chart 9: Competency of Students in Percent



Source: Instructors Concern Survey Questionnaires, 2010 E.C

Chart 9 above indicates capacity of students on the courses they register for, to which 20% of the students reported here is high concern, while in 53.333% of them said there is high concern and the remaining 13.33% 13.34% reported there is moderate and little concern in the capacity of students on the courses they register. Based on the data, one can deduce that there was either extreme or high concern in the capacity of students on the courses they register for.

Chart 10: Students Self-Motivation in Percent

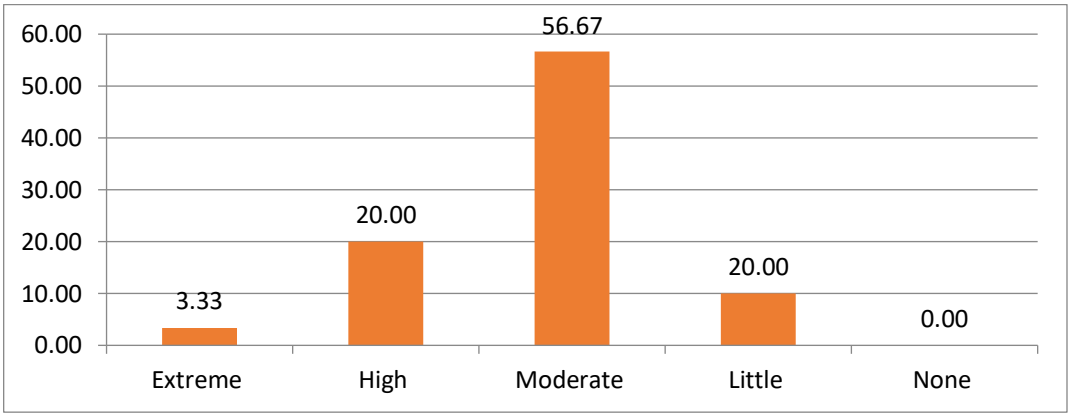


Source: Instructors Concern Survey Questionnaires, 2010 E.C

According to chart 10, which indicates self-motivation of students, there is extreme concern on the motivation of students (20%), of them there is high concern (53.33%) and there is either moderate

or little concern in self-motivation of students as reported by the remaining 13.33% and 13.34% the respondents.

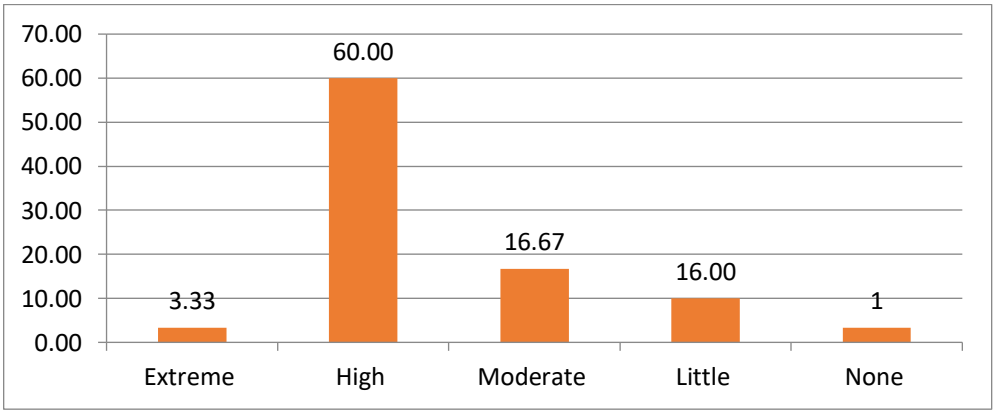
Chart 11: Addressing Students Needs in Percent



Source: Instructors Concern Survey Questionnaires, 2010 E.C

Chart 11 above, which shows, addressing the needs/problems of different kinds of students, 3.33%, 20%, and 56.67% of the instructors said they have extreme, high, and moderate concern respectively, while the remaining 20% them said they have little concern. Based on the data, one can generalize that majority of the respondents (80%) reported that they have more than moderate concern in addressing the needs/problems of different kinds of students.

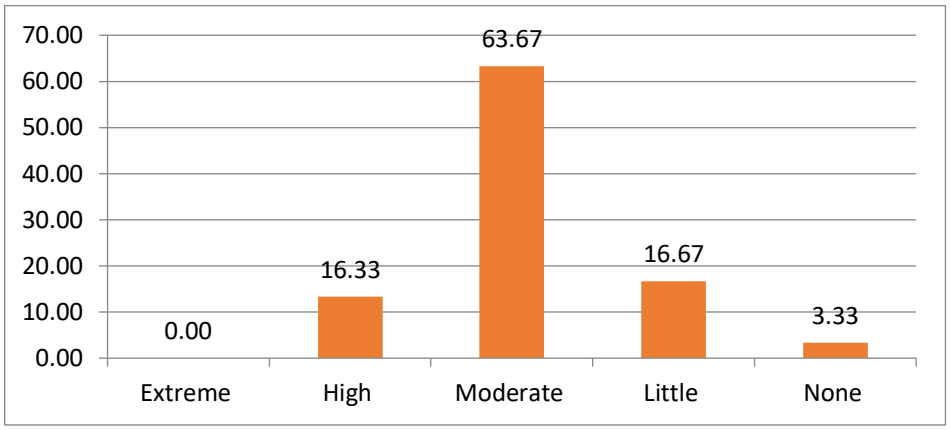
Chart 12: Employing Variety of Active Learning in Percent



Source: Instructors Concern Survey Questionnaires, 2010 E.C

Pertaining to chart 12 which indicates employing variety of active learning, 3.33% of them said there is extreme concern, 60% of the respondents said there is high concern on the issue and the remaining 16.67%, 16%, and 1% said there is moderate little or no concern in employing different active learning, respectively. From this, one can infer that majority of the respondents (63.33%)reported that there is either extreme or high concern in applying variety of active learning methods.

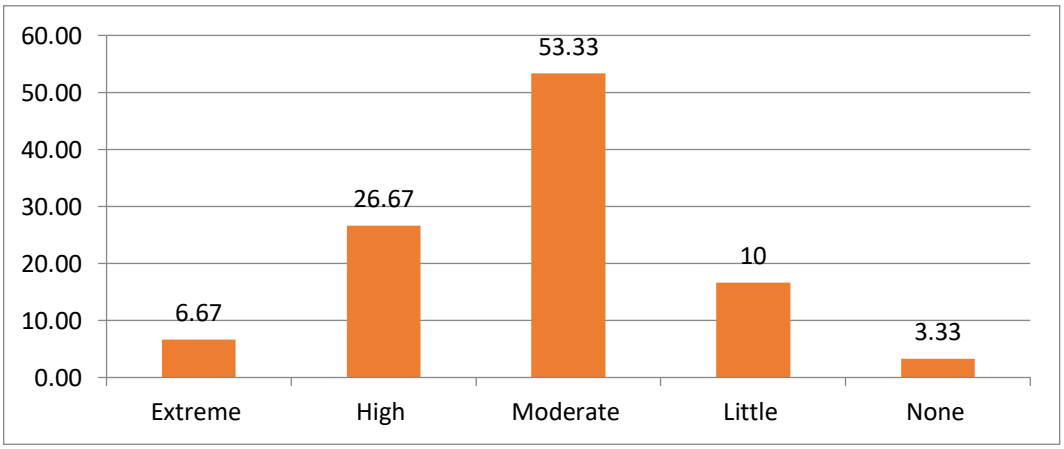
Chart 13: Managing Class Room Misbehaviors in Percent



Source: Instructors Concern Survey Questionnaires, 2010 E.C

Chart 13 above, which shows managing class room misbehavior, 16.33% and 63.67% of them said there is either high or moderate class room misbehavior and the remaining 16.67% and 3.33% of them said there is either little or no concern in managing class room misbehaviors. Based on the data indicated above, one can comprehend that majority of the respondents (80%) said that there is more than moderate concern in managing class room misbehavior.

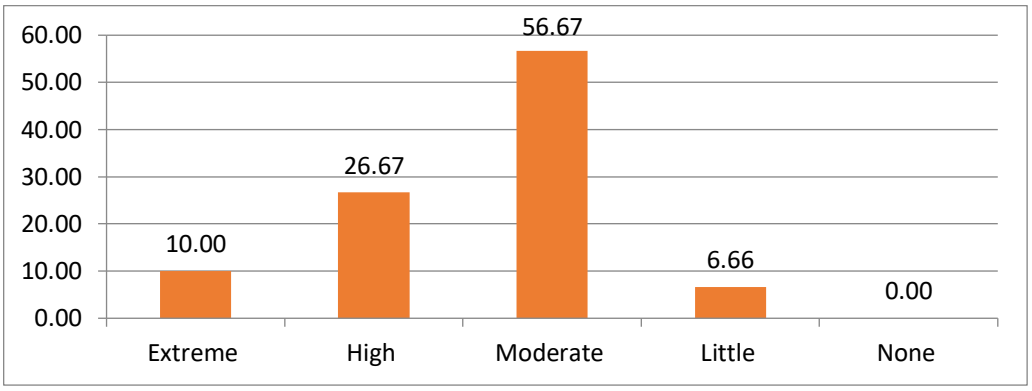
Chart 14: Conducting Valid Assessment of Students in Percent



Source: Instructors Concern Survey Questionnaires, 2010 E.C

With respect to chart 14, which indicates conducting valid assessment of students, 6.67%, 26.67%, 53.33%, 10%, and 3.33% of the instructors said there is extreme, high, moderate, little, and no concern in conducting valid assessment of students, respectively. Based on the data indicated above, one can understand that majority of the respondents (86.67%) reported that there is more than moderate concern in conducting valid assessment of students.

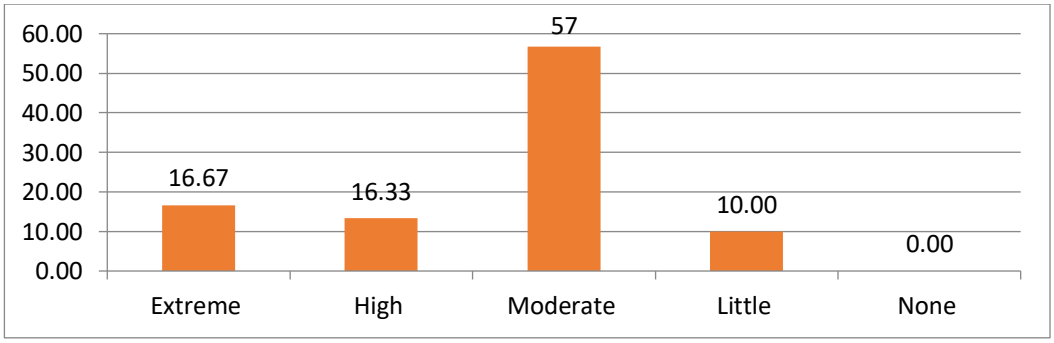
Chart 15: Availability of Instructional Materials in Percent



Source: Instructors Concern Survey Questionnaires, 2010 E.C

Chart 15 above on availability of instructional materials, indicated that 10% of the respondents said they are extremely concerned, 26.67% of them said they are highly concerned, 56.67% of them said they are moderately concerned and the remaining 6.66% of them said they are little concerned in the availability of instructional material. Based on the data, one can deduce that majority of the respondents (93.34%) reported that there is above moderate concern in the availability of instructional material.

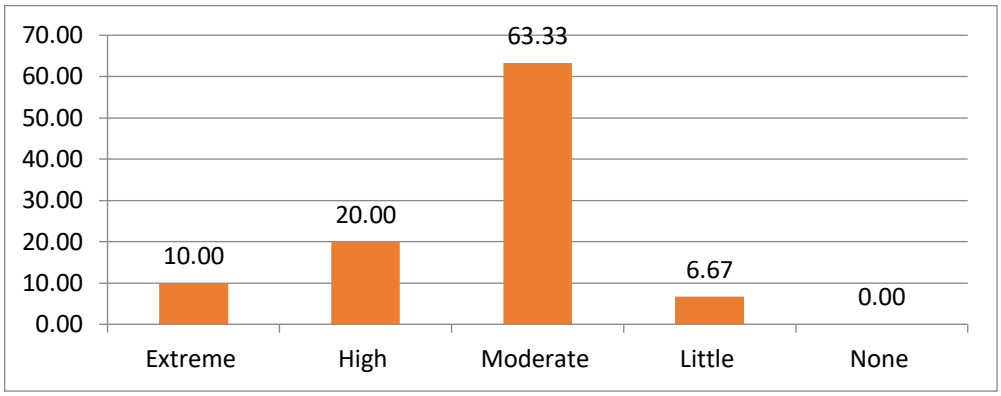
Chart 16: Solving Problems through Action Research in Percent



Source: Instructors Concern Survey Questionnaires, 2010 E.C

With respect to chart 16, which indicates solving problems through action research, 16.67% of them said there is extreme concern, while 16.33% of them said there is high concern, and the remaining 57% and 10% of them said there is moderate and no concern, respectively. Based on the data indicated above, one can deduce that majority of the respondents (90%) them said there is more than moderate concern in solving problems through action research.

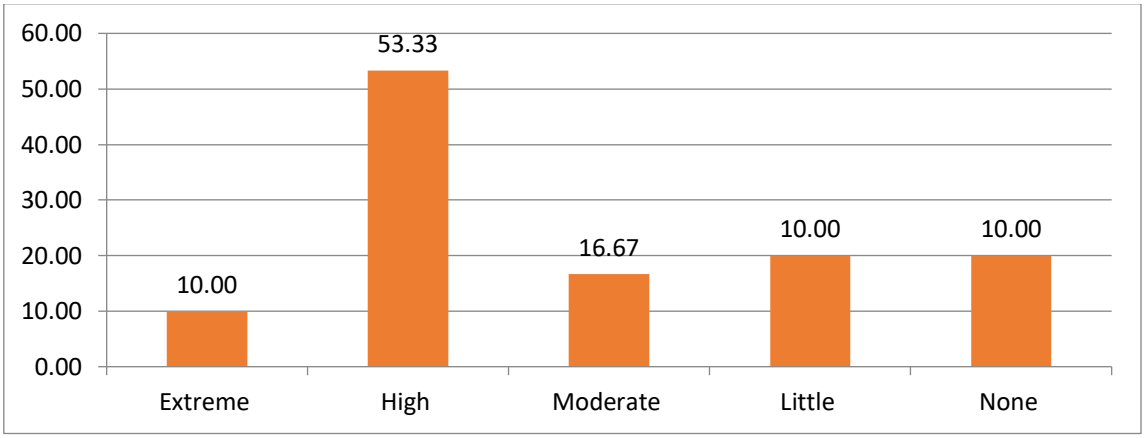
Chart 17: Collaboration among Instructor's in Percent



Source: Instructors Concern Survey Questionnaires, 2010 E.C

Chart 17 above on collaboration among instructors, shows that 10% of them said there is extreme concern and the remaining 20%. 63.33%, and 6.67% of the respondents said there is high moderate and little concern related to the issue, respectively. From this, one can deduce that almost all the respondents (93.33%) said there is more than moderate concern in collaboration among instructors in the institution.

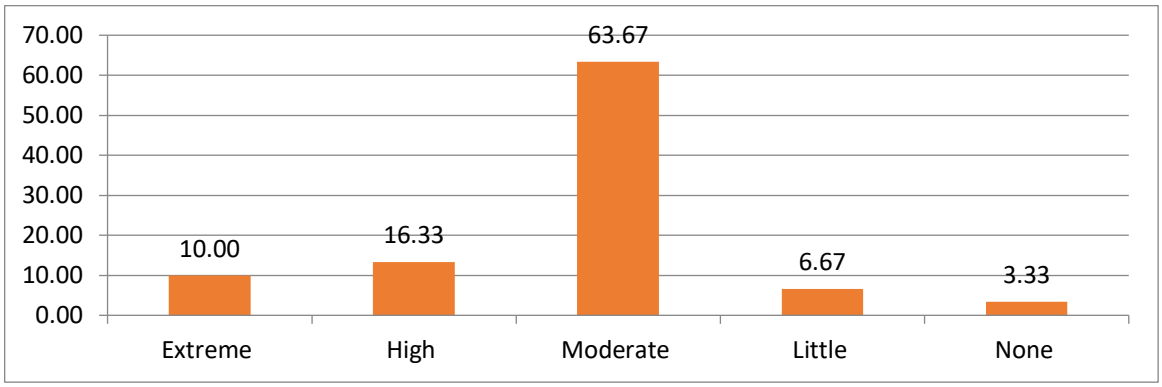
Chart 18: Decision Making Power of Instructors in Percent



Source: Instructors Concern Survey Questionnaires, 2010 E.C.

With regard to chart 18 above, which indicates decision making power of instructors, 10% of the respondents said there is extreme concern, 53.33% of them said there is high concern regarding the issue, 16.67% of them said there is moderate concern and the remaining 10% and 10% of them said there is either little or no concern in decision making power of instructors, respectively. Based on the data, one can conclude that more than half of the respondents (63.33%) said there is either high or extreme concern in decision-making power of the instructors.

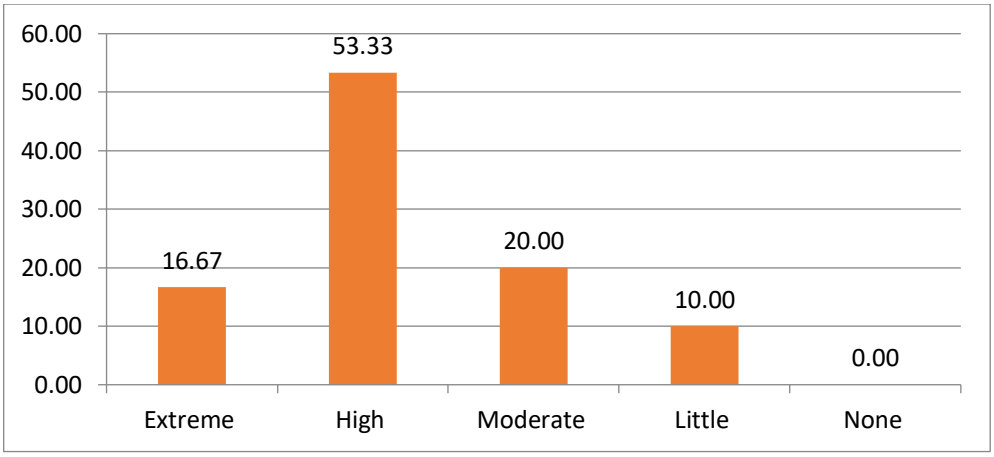
Chart 19: Uniformity of Rules Applied to all Departments in Percent



Source: Instructors Concern Survey Questionnaires, 2010 E.C

Chart 19 above on uniformity of rules applies to all departments, shows that 10%, 16.33%, and 63.67% of them said there is extreme, high, and moderate concern related to the issue and the remaining 6.67% and 3.33% of them said there is either little or no concern in the uniformity of rules applies to all departments. Based on the data indicated above, one can deduce that majority of the respondents which are 90% of the respondents said there is more than moderate concern in the uniformity of rules applies to all departments.

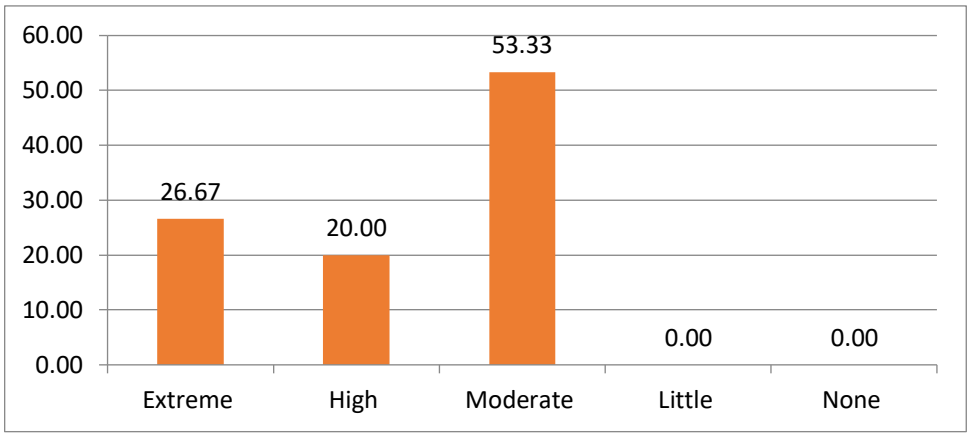
Chart 20: Ease of Communication with Departments and Faculty in Percent



Source: Instructors Concern Survey Questionnaires, 2010 E.C.

According to chart 20 above, which indicates ease of communication with Departments and Faculty, 16.67%, 53.33%, 20%, and 10% of the respondents replied extreme, high, moderate, and little concern related to the issue, respectively. From this, one can generalize that majority of the respondents said there is either extreme or high concern related to ease of communication with departments and faculty.

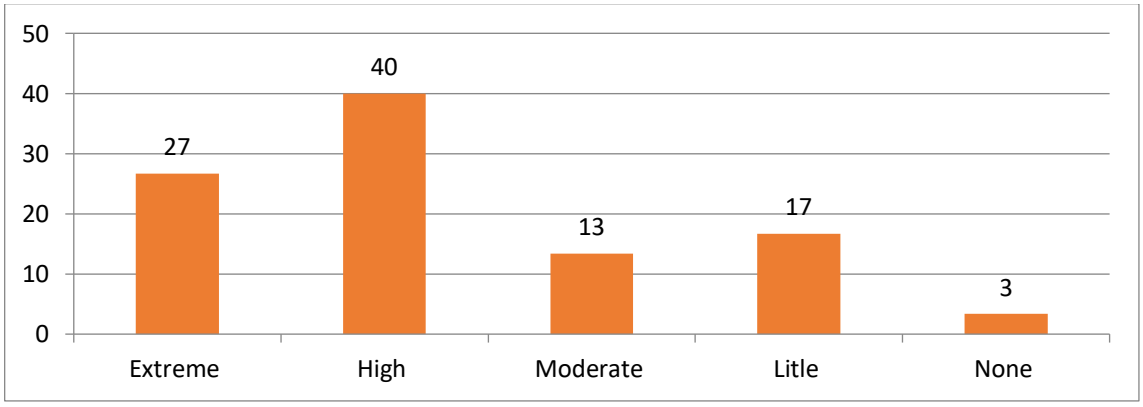
Chart 21: Efficiency of the Departments/Faculty in Responding Timely and Properly to Enquiries in Percentage



Source: Instructors Concern Survey Questionnaires, 2010 E.C

Chart 21 above indicates instructors response to efficiency of the departments/faculty in responding timely and properly to enquiries and 26.67% and 20% of the respondents said there is extreme and high concern related to the issue while the remaining respondents 53.33% of the respondents said there is moderate concern in efficiency of the departments/faculty in responding timely and properly to enquiries. Based on the data, one can deduce that all of the respondents pointed out that there is moderate above concern related to efficiency of the departments/faculty in responding timely and properly to enquiries.

Chart 22: Academic Freedom for Instructors in Percentage

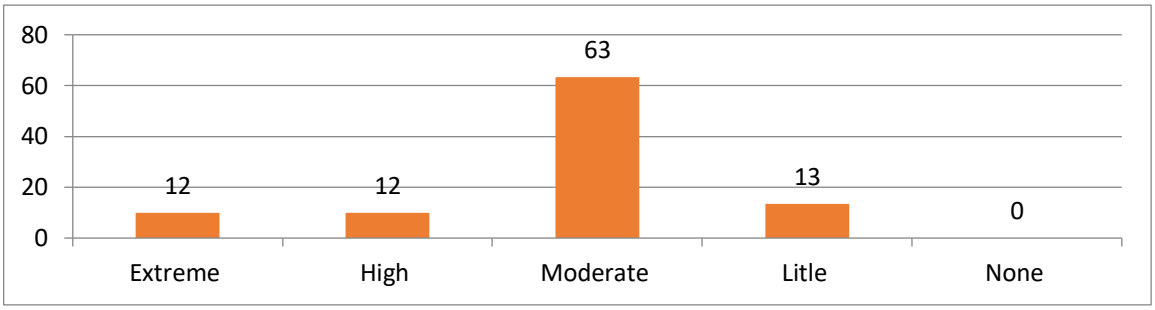


Source: Instructors Concern Survey Questionnaires, 2010 E.C.

Chart 22 above indicates academic freedom for instructors and 27% of the respondents reported that there is extreme concern while the remaining 40%, 13%, 17%, and 3% of the respondents said there is high, moderate, little, and no concern with respect to the issue, respectively. Based on the data indicated above, one can infer that majority of the respondents (67%) said there is either high or extreme concern in the academic freedom for instructors.

Administrative Concerns

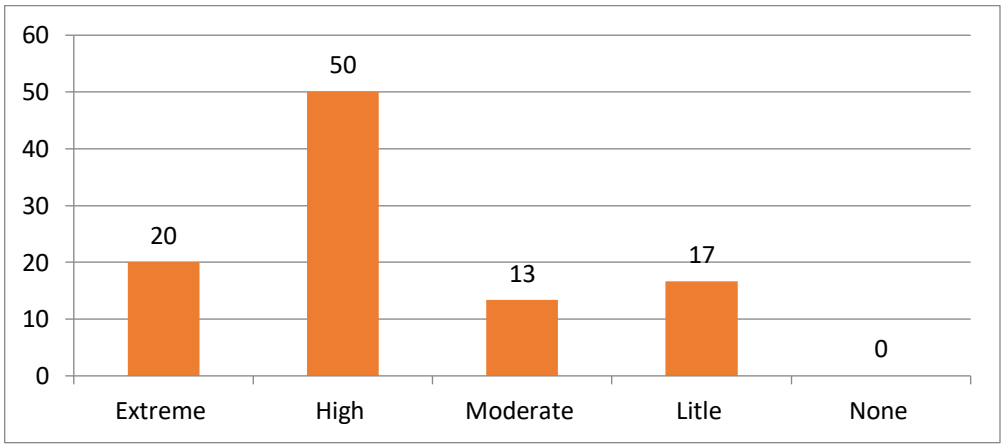
Chart 23: Induction for New Recruited Staffs in Percentage



Source: Instructors Concern Survey Questionnaires, 2010 E.C

According to chart 23, which indicate instructors' response to inductions (orientation/introduction to the system and staff) for newly recruited staff, 12%, 12%, and 63% of the respondents said there is extreme, high, and moderate concern in the aforesaid issue and the remaining 13% of the respondents said there is little concern. Based on the data, one can infer that majority of the respondents (87%)said there is concern in currently influencing the accomplishment of teaching duties.

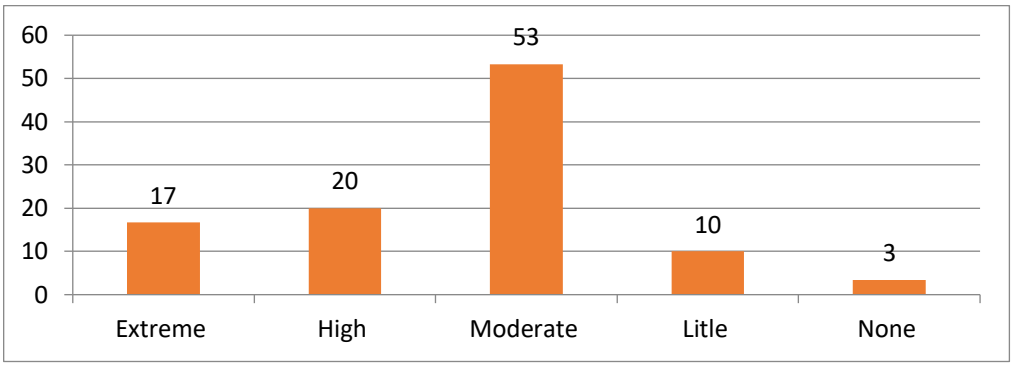
Chart 24: Availabilities of Basic Office Facilities in Percentage



Source: Instructors Concern Survey Questionnaires, 2010 E.C.

Chart 24 above, which indicates availabilities of basic office facilities, shows that 20% and 50% of the respondents said there is extreme and high concern in the availability of basic office facilities respectively and the remaining 13% and 17% said there is moderate and little concern with respect to the issue respectively. Based on the data, can deduce that majority of the respondents said there is either extreme or high concern in the availabilities of basic office facilities in percentage.

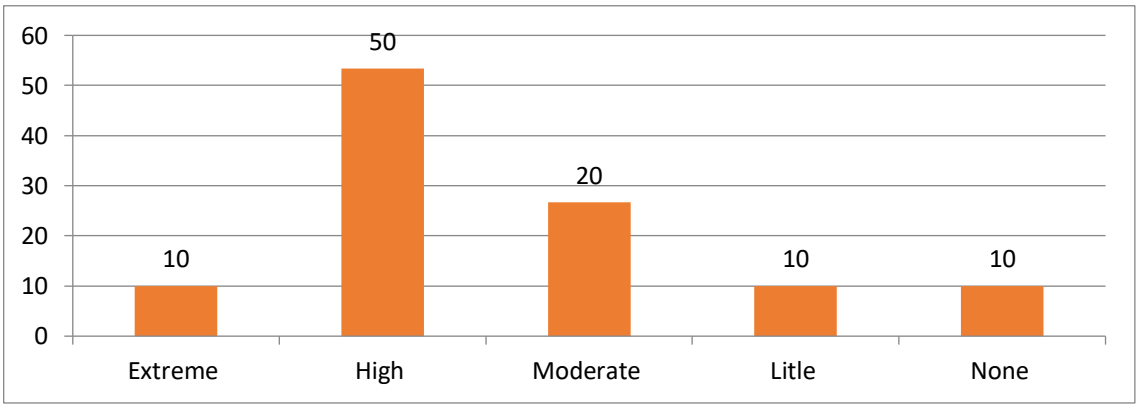
Chart 25: Access to Secretarial Services in Percentage



Source: Instructors Concern Survey Questionnaires, 2010 E.C

According to chart 25 above, which shows access to secretarial services, 17%, 20%, 53%, 10%, and 3% of the respondents said there is extreme, high, moderate, little, and no concern with respect to access to access to secretarial services. From the data, one can deduce that majority of the respondents (90%) said there is moderate and above concern related to access to secretarial services.

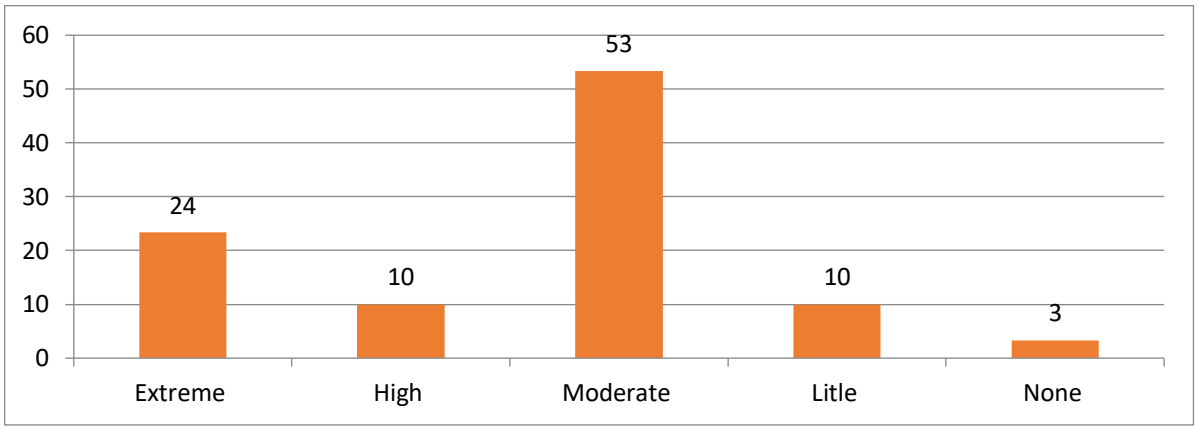
Chart 26: Availability of Appropriate Library Services in Percentage



Source: Instructors Concern Survey Questionnaires, 2010 E.C

In keeping with chart 26, which indicates availability of appropriate library services, 10% and 50% of them said there is either extreme and high concern with respect to the issue respectively and the remaining 20%, 10%, and 10% of the respondents said there is moderate , little, and no concern with respect to the issue, respectively. Based on the data, one can conclude that majority of the respondents (80%) said there is moderate and above concern related to availability of appropriate library services.

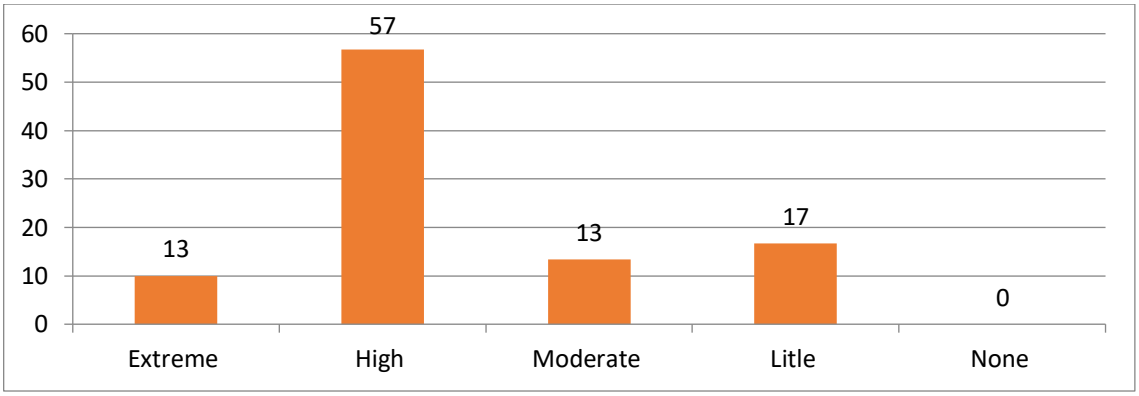
Chart 27: Availability of Sufficient Cafeteria Services in Percentage



Source: Instructors Concern Survey Questionnaires, 2010 E.C

Chart 27 above, which indicates the availability of sufficient cafeteria services, shows that 24% of the respondents reported that there is extreme concern while 10% of them said there is high concern and the remaining 53%, 10%, 3% of them said there is moderate, little, and no concern with respect to the issue respectively. Based on the data, one can understand that majority of the respondents (87%) said there is moderate and above concern related to availability of sufficient cafeteria services.

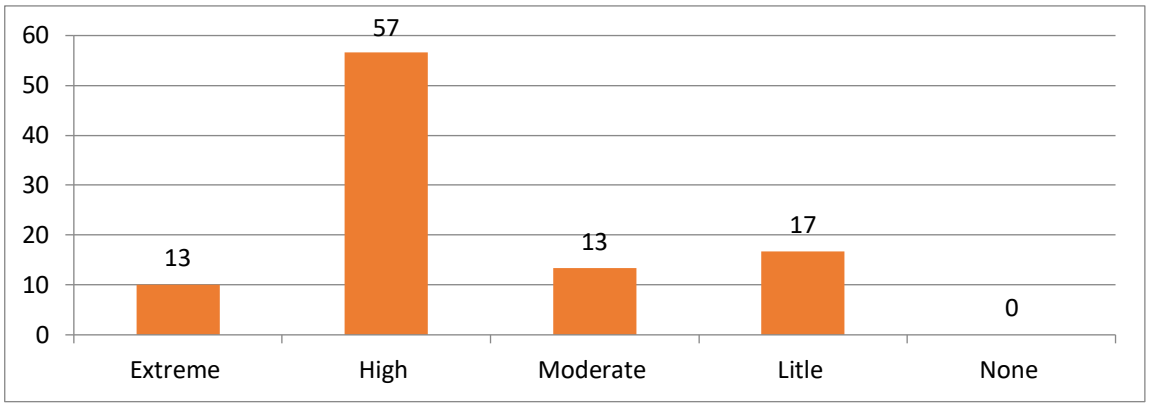
Chart 28: Access to Internet Service in Percentage



Source: Instructors Concern Survey Questionnaires, 2010 E.C

According to chart 28, which indicates access to internet service, 13% and 57% of them said there is extreme and high concern in the issue, respectively while the remaining 13% and 17% of the respondents replied that there is moderate and little concern in access to internet service respectively. From this, one can conclude that majority of the respondents (70%) responded that there is either extreme or high concern in the access to internet service.

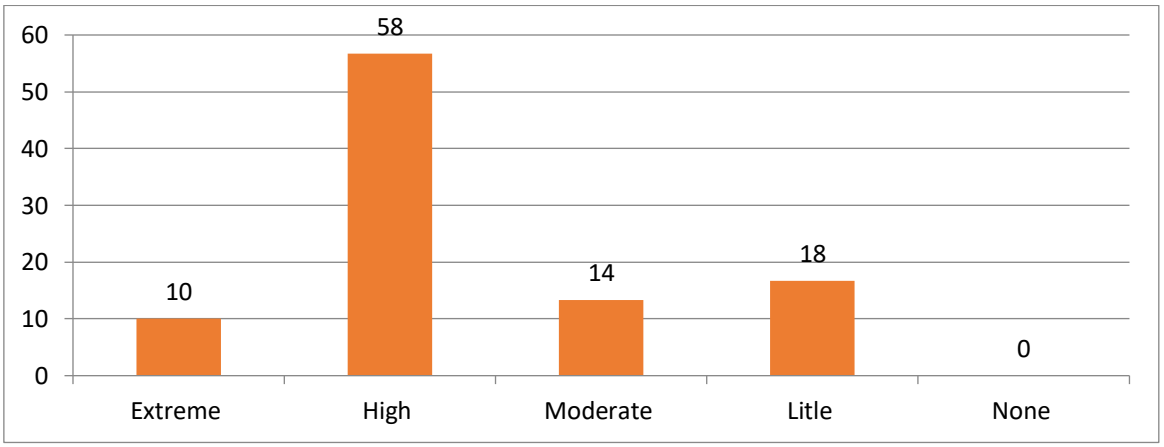
Chart 29: Scale of Salary, Benefit and Provisions Compared to Other Institutions in Percentage



Source: Instructors Concern Survey Questionnaires, 2010 E.C.

With respect to chart 29 above, which indicates scale of salary, benefit and provisions compared to other institutions, 13%, 57%, 13%, and 17% of the respondents indicated that there is extreme, high, moderate, and little concern in the scale of salary, benefit and provisions compared to other institutions respectively. From this, one can infer that majority of the respondents which are 70% said there is either extreme or high concern scale of salary, benefit and provisions compared to other institutions.

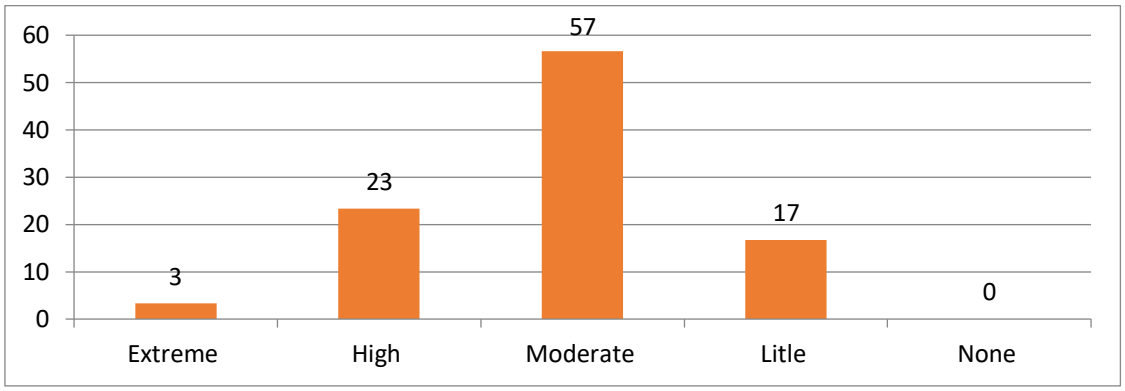
Chart 30: Ease of Communication with Administrative Units in Percentage



Source: Instructors Concern Survey Questionnaires, 2010 E.C

With regard to chart 30 above, which indicates ease of communication with administrative units, 10%, 58%, 14%, and 18% of the respondents replied extreme, high, moderate, and little concern related to the issue respectively. Based on the data indicated above, one can deduce that majority of the respondents (68%) said there is either extreme or high concern related to ease of communication with administrative units.

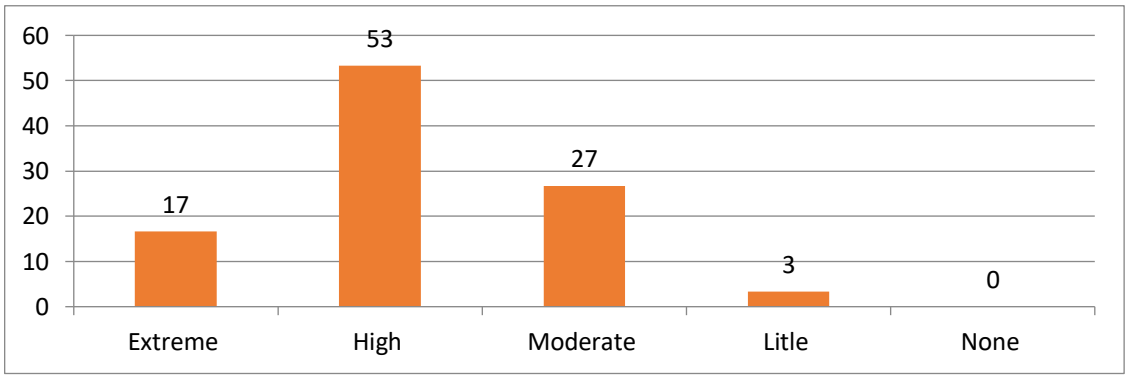
Chart 31: Ease of Communication with Top Management Bodies in Percentage



Source: Instructors Concern Survey Questionnaires, 2010 E.C

Chart 31 above, which presents ease of communication with top management bodies, shows that 3%, 23%, 57%, and 17% of the respondents replied extreme, high, moderate, and little concern related to the issue respectively. Based on the data, one can assume that majority of the respondents (83%) said there is either extreme, high and medium concern related to ease of communication with top management bodies.

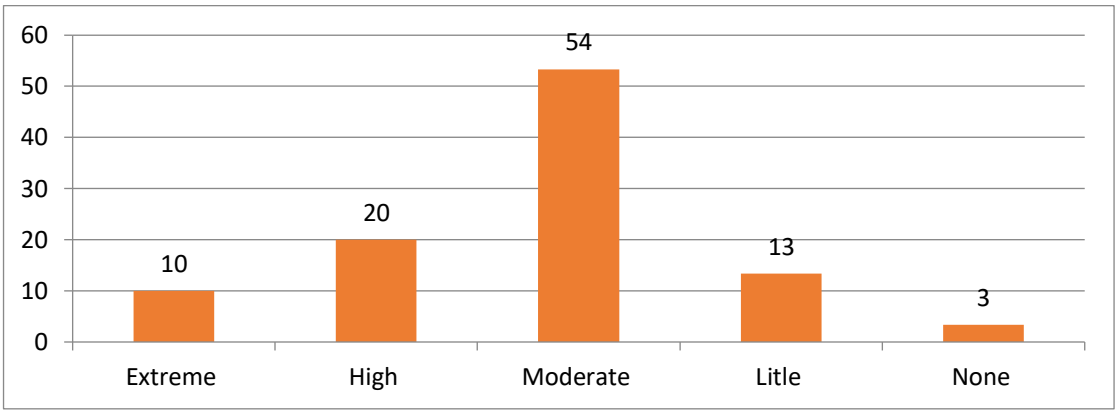
Chart 32: Efficiency of Administrative Units in Percentage



Source: Instructors Concern Survey Questionnaires, 2010 E.C

In connection with chart 32 above, which indicates efficiency of administrative units at SMU (punctuality in routine works like salary and overtime payments, respond timely and properly to unusual inquiries), 17% and 53% of the respondents said there is either extreme or high concern with respect to the agenda and the remaining 27% and 3% of the respondents pin pointed moderate and little concern in the efficiency of administrative units. From this, one can deduce that majority of the respondents (70%) reported that there is more than high concern in the efficiency of administrative units in other words in punctuality in routine works like salary and overtime payments, respond timely and properly to unusual inquiries.

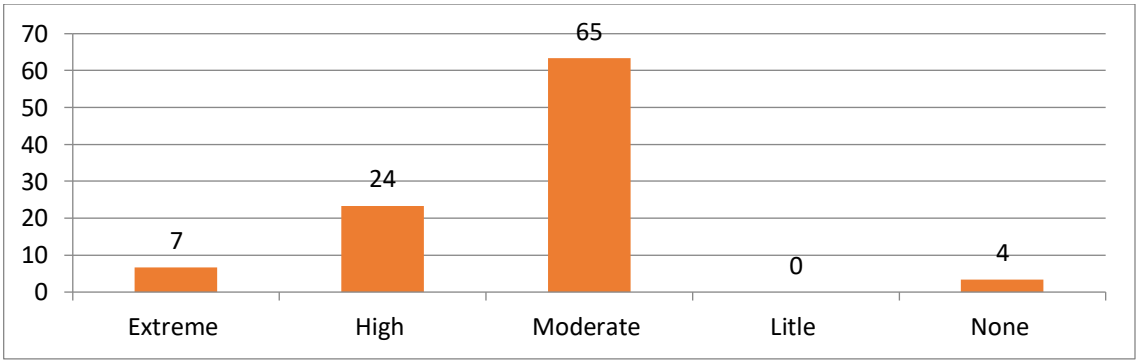
Chart 33: Clarity of Financial and Personnel Rules in Percentage



Source: Instructors Concern Survey Questionnaires, 2010 E.C

Chart 33 on clarity of financial and personnel rules/regulations (like deduction of income tax) at SMU, shows that 10%, 20%, 54%, 13%, and 3% pointed out extreme, high, moderate, little, and none concern in the clarity of financial and personnel rules. Based on the data indicated above one can deduce that majority of the respondents which are 84% said there is above moderate concern in the clarity of financial and personnel rules (like deduction of income tax).

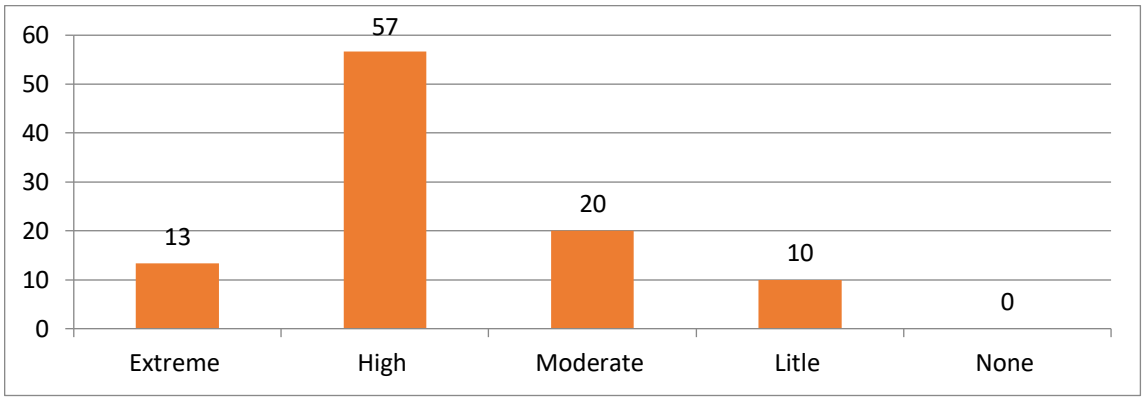
Chart 34: Modest Evaluation of Teaching and Scholarly Performance of Instructors in Percentage



Source: Instructors Concern Survey Questionnaires, 2010 E.C.

According to chart 34 above, which indicates proper and modest evaluation of teaching and scholarly performance of instructors at SMU, 7%, 24%, 65%, and 4% of the respondents pointed out extreme, high, moderate, and no concern related to the issue. Based on the data, it can be deduced that majority of the respondents (96%) reported that there is above moderate concern in the proper and modest evaluation of teaching and scholarly performance of instructors.

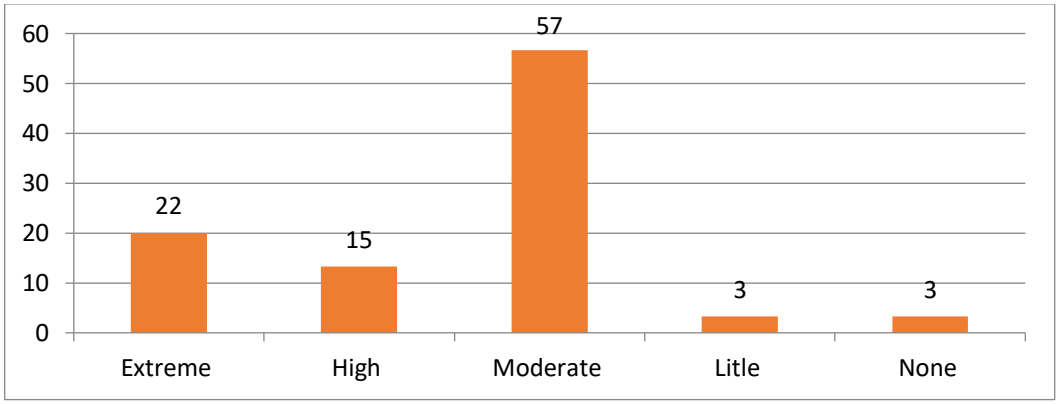
Chart 34: Availability of Training and Further Education Opportunities in Percentage



Source: Instructors Concern Survey Questionnaires, 2010 E.C

Chart 34 above, which presents availability of training and further education opportunities at SMU, shows that 13%, 57%, 20%, and 10% of the respondents pointed out that they have extreme, high, moderate, and little concern related to the issue. Therefore, it can be presumed that majority of the respondents (90%) said there is above moderate concern in the availability of training and further education opportunities.

Chart 35: Sustainability of the University in Percentage



Source: Instructors Concern Survey Questionnaires, 2010 E.C.

Consistent with chart 35 above, which indicates sustainability of the University, 22% and 15% of the respondents said there is extreme and high concern related to the issued respectively and the remaining 57%, 3%, and 3% of them said there is moderate, little, and no concern related to the issue, respectively. Based on the data indicated above, one can presume that majority of the respondents (94%) replied that there is above moderate concern in the sustainability of the University.

Summary and Conclusion

This instructor's concern survey ocused on three aspects. namely: General Information about the respondents, Academic Concerns and Administrative Concerns. On the basis of the questionnaires of instructor's survey, majority of the respondents were males (90%) and the rest 10% were female. In relation to respondents' department, majority of the respondents (53.33%) were from Management Department and the rest 33.33% and 13.33% of the respondents were from Marketing Management and Tourism and Hospitality Management Departments, respectively. With regard to their experience, majority of the respondents (50%) said they served in the institution between 3-4.9 years, while 40% and 10% of the respondents reported they served for >5 and 1-2.9 years respectively.

Pertinent to the level of concentration that they have in dealing with large class size, half of the respondents (50%) pointed out that it is moderate in affecting their teaching and learning process. In addition to this, 56.6% of the respondents in relation to workload of credit hours per week replied that it is moderate. On the other hand, 53.33% of the respondents replied that clear programming and timetable is high and the same percentage of the participants replied that competency and motivation of Students in the university is high. In addressing students need, 56.67% of the participants replied that it is moderate. 60% of the respondents replied that they highly applied variety of active learning and 63.67% of the respondents managing class room misbehaviors moderately. The result of the survey showed that 53.33% of the respondents conducted valid assessment of students. On the other hand, 56.67% of the respondents replied that availability of instructional materials is moderate.

Conducting action research is among the basic objectives of the university. In relation to this, 57% of the respondents replied that they tried to solve problems through action research. But it is moderately conducted. In relation to team work, 63.33% of the respondents replied that collaboration among instructors is moderate. On the other hand, 53.33% of the respondent's decision-making power of instructors is high. 63.67% of the respondents replied that there is moderate uniformity of rules applied to all departments. In relation to communication, 53.33% of the respondents replied that ease of communication with departments and faculty is high. This indicates that, the existence of high communication among such individuals can facilitate the teaching learning process. 40% of the respondents replied that instructors in the university have academic freedom.

In order to support the teaching learning process of the university, availability of different instruments is very important. In relation to this, 50% of the respondents replied that the availabilities of basic office facilities is high. When comes to the access of internet, 57% of the respondents replied that there is moderate access to internet service. In relation to salary and benefits, 57% of the respondents replied that, scale of salary, benefit and provisions compared to other institutions is high. 58% of the respondents replied ease of communication with

administrative units is high. 57% of the respondents replied that availability of training and further education opportunities is high.

Recommendations

Based on the analysis, which is concluded from instructor's response, the following possible recommendations were forwarded:

- As of information generated from instructors, our students lacked self-motivation. So, to enhance the motivation level of our learners, we all need to focus on quality, attractive, and active teaching methods;
- The financial and personnel rules and regulations are not well known among the instructors and this leads to misbehaving in the institution. Therefore, the human resource office, in collaboration with top management bodies, should provide orientation and relevant documents should be publicized;
- Most of the instructors replied that applying active learning methods to the students was difficult due to shortage of teaching materials like projector, computer and printing machines in addition to lack of students' motivation. Therefore, concerned bodies should solve the problem by providing such materials and follow up the effective implementation of active learning in the class room;
- Most of the staffs replied that, there were no adequate training and further education opportunities in the institution. Therefore, it is better if the institution gives more attention to satisfy the demand of the instructors in relation to providing training and educational opportunities.

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Law and Practice to Support Students with Disabilities: What Can be Learnt from Debre Markos University, Ethiopia?

Dessalegn Mekuriaw and Dessalegn Yeshambel, Debre Markos University

Abstract

This study was conducted to identify and evaluate types of care and support provided by Debre Markos University to students with disabilities against its by-laws (if any) and the proclamation for higher learning institutions. Data were collected from 80 participants of which 58(72.5%) were students with disabilities while 22 (27.5%) were different academic and administrative staffs with disabilities and/or connected with service provision to those students. The study primarily employed qualitative methods (focus group discussions, in-depth interviews and observation) as well as survey in order to triangulate qualitative data. It also employed census, purposive and convenience sampling techniques to recruit participants. While qualitative data were analyzed using content and thematic analysis, quantitative data were done by descriptive statistics. Though all students with disabilities who participated in this study never questioned about their placement in their choice of department, their view of the depth, breadth and quality of services provided to them is low in its own right as well as in comparison with other Universities. This was ascertained by absence of any written by-law to support students with disabilities which in turn led them face various problems while using libraries; dormitories; departments and classrooms. Colleges/institutes and schools allocate class with no consideration of disability cases; nor is the support system uniform across departments and among instructors. As a result, students with disabilities may or may not receive the needed support (if they receive, it is out of providers' keen interest and enthusiasm than being guided by some kind of rule).In addition, the provision of separate reading room in the main library was offset by total absence of any reading materials and librarian to give service, and prohibition of students to take reading materials from other sections to their own. What is more perturbing is the university's failure to implement exam time and deadline extensions; alternative testing strategies; tutorial classes and construct disability sensitive buildings at least in line to Ethiopia's higher education proclamation of 2009. Therefore, the university needs to develop and implement comprehensive and detailed by-law for students with disabilities and mainstream disability issues as per higher education proclamation and other laws of the country to enhance their academic achievement and achieve its vision of becoming one of the ten top East African Universities by 2025. Ethiopian government, and ministry of science and higher education in particular, also needs to identify and appropriately support students with disabilities in this and other Universities not only by explicitly setting the minimum standards for assistance for such students but also by checking their observance against these standards. Furthermore, it should identify and upgrade the identified universities to appropriately provide the needed support for students with disabilities.

Keywords: disability, support, Protection, academic success, Debre Markos University

Introduction

Ten percent of world populations are persons with physical disabilities (ENDAN 2011). Similarly, out of 73.7 million people, 805,492 (1.09%) people with physical disabilities are found in Ethiopia (CSA 2007) though this data has been criticized by scholars in the disability area for being skewed by under-reporting, due to framing of census questions, lack of disability-related knowledge among those involved in census data gathering and analysis and the application of a narrow definition of disability. As a result, students with disabilities are said to be the most recent marginalized group to move toward equal opportunity in education following low-income persons, racial and ethnic minorities, and women (The Institute for Higher Education Policy, 2004). To solve their challenges, the principle of inclusive education was first internationally recognized and endorsed in 1994 at the World Conference on Special Needs Education in Salamanca, Spain; the UN Convention on the Rights of Persons with Disabilities (CRPD) established inclusive education in 2006 as a mechanism to deliver the right to education for people with disabilities (Stubbs 2008).

Similarly, Ethiopia has constitutionally approved, signed and ratified many international agreements and conventions pertaining to all people with different disabilities. Ethiopian constitution under proclamation number 1/1995 article 41 (5); federal civil service proclamation number 262/2010 article 13 (4); employer and employee proclamation number 377/2011 under article 29 (3); and proclamation on employment rights of peoples with disabilities under proclamation number 568/2008 articles 2 (5), 4 (1 & 3), 6 (1 & 2) & 7 (1, 2, & 12) declared that within the permissible possibility of national economy of the country, the government will take rehabilitative and supportive measures to take care of people with physical and mental disabilities (ENDAN 2011). More specifically, Ethiopian higher education proclamation number 40 (1-4) of 2009 clearly indicated the support systems and services to be provided to persons with disabilities in all higher educational institutions (HEIs) operating in the country on the following four issues:(1) Institutions shall make, to the extent possible, their facilities and programs amenable to use with relative ease by physically challenged students. (2) Institutions shall, to the extent that situations and resources permit, relocate classes, develop alternative testing procedures, and provide different educational auxiliary aids in the interest of students with physical challenges. (3) Building designs, campus physical landscape, computers and other infrastructures of institutions shall take into account the interests of physically challenged students. (4) Institutions shall ensure that students with physical challenges get to the extent necessary and feasible academic assistance, including tutorial sessions, exam time extensions and deadline extensions.

In lieu of this proclamation, however, it is difficult to know whether the above-mentioned standards are met for students with disability in Debre Markos University (DMU). Therefore, the main intention of this research was to fill this gap.

Statement of the Problem

Today, education is increasingly being recognized as "a fundamental human right" all individuals are entitled to enjoy irrespective of their living experiences (UNESCO 2012). As is the case in many countries of the world, Ethiopia has constitutionally approved, and signed and ratified many international agreements and conventions pertaining to people with disabilities. Viewed from educational sector, attempts are underway in terms of ensuring inclusive education at all levels of the educational system. For example, the Ministry of Education has asserted that Ethiopia 'cannot attain MDG ignoring the marginalized and those with learning difficulties and impairments' (Lewis, 2009: 23). Moreover, the connection between poverty and disability is widely acknowledged (Singal, 2009), with disability being both a cause and a result of poverty (Handicap International, 2013). Furthermore, article 40 (1-4) of Ethiopia's higher education proclamation of 2009 explicitly indicates the obligations of HEIs to relocate classes and develop alternative testing procedures; provide different educational auxiliary aids and academic assistance (including tutorial sessions, exam time extensions and deadline extensions); and construct disability sensitive building designs, campus physical landscape, computers and other infrastructures taking into account the interests of physically challenged students within the permissible capacity of their resources.

In spite of such provisions and Ethiopia's commitment to international proclamations pertaining to persons with disabilities, academic challenges of Students with Disabilities (SDs) surface across all levels of the country's educational structure, in which DMU is not an exception. Out of an estimated 691,765 disabled children in Ethiopia, for example, only about 2,300 are enrolled in schools (Lewis, 2009), with a high risk of dropping out (MoE and UNICEF, 2012). Tirussew (1989) also indicated that major educational challenges faced by students with disabilities (SwDs) are lack of adequate educational background, shortage of instructional materials, text and reference books (written in Braille or recorded cassettes) (cited in Tirussew, T. *et.al.* 2014). Though they have studied 11 universities namely, Adama Science and Technology, Addis Ababa, Aksum, Bahir Dar, Dilla, Jigjiga, Haromaya, Hawassa, Mekelle, Gondar and Samara Universities, DMU is not part of their research area. In addition, their study predominantly relied on a single method, survey, which cannot adequately capture perceived feelings of participants which the current study primarily delves on.

Relatedly, the study conducted by Endalkachew and Dessalegn (2017) found that AAU remains far from satisfying visually challenged female students for academic success as it has not yet established a structure to assist them and for failing to develop mechanism of checking their academic achievement. Moreover, the study conducted by Abebe Y., Raija P. and Timo S. (2015) have not only focused on Ethiopian technical, vocational education and training schools (TVET) but also employed only higher level officials and experts having no disability cases with respect to policy practice gaps; however, the current study primarily used students with disabilities as sources of information.

Objectives of the Study

Generally, this study aims to explore the level of support and protection systems to students with disabilities for their educational success in DMU by assessing support systems accruing to them vis-à-vis the breadth and depth of support systems and services, student's levels of satisfaction and the level of congruence of support with statements of higher education proclamation (2009) and other laws and conventions. More specifically, ittries to:

- Explore the types of supports provided by DMU to students with disabilities
- Evaluate the types and nature of support systems provided to students with disabilities in DMU in line to national laws and proclamations for students with disabilities.

Methods and Materials

Study Area

This study was conducted in DMU, Main and Burie campuses located in Debre Markos town, the capital of East Gojjam Administrative Zone, 300 kilometers North West of Addis Ababa, and Burie town, located 87 kilometers North West of Debre Markos town along the road to Bahir Dar from Debre Markos respectively.

Sources of Data

Data for this research was collected from primary sources i.e. in-depth interview, focus group discussions and survey of students with disabilities and observation of services utilized by them. In addition, different concerned bodies in the university such as senior officer of disability; students service head; people who have been assisting for visually challenged students; workers in three libraries; officer of HIV/ AIDS and women affairs and; academic staffs with and without disabilities were participated for in-depth interviews and focus group discussions.

Research Design and Approach

This study employed cross-sectional and approximating longitudinal designs and a mixed approach (QUAL backed by QUAN). Qualitative approach was chosen to get in-depth understanding of the lived experiences & challenges for academic success of students with disabilities in DMU to allow them broadly and freely express their views while quantitative one was used to complement and triangulate these. However, the study largely relied on qualitative methods and qualitative data because of the demands of the objectives set.

Methods of data collection

This study employed qualitative and quantitative methods of data collection so as to enhance the quality of data through triangulation. Data were collected using in-depth interviews, focus group discussions, observation and survey. In-depth interviews and focus group discussions were conducted to elicit information on the overall support, its systems and mechanisms made by the university; students' levels of satisfaction on the supports and services they obtain, and challenges

and opportunities of such support systems and mechanisms from emic perspective and triangulate the data obtained from one another. In addition, observation of their reading rooms in the library, Braille materials, computer services, building designs and other facilities meant for students with disabilities in general was made. Survey was also used to examine determinants for academic success of students with disabilities. They were discussed in more depth along with their respective sample size and sampling techniques as follows.

Focus Group Discussion (FGD)

Focus group discussions (FGDs), each consisting of 8-12 discussants whose number was determined by data saturation, was planned and held in this study among students with different disabilities in separate sessions as per their types of disability. Accordingly, three FGDs were held among students with disabilities each consisting of eight to twelve discussants totaling 30 and recruited based on purposive and convenience sampling. Purposive sampling was employed to enable researchers include students with different disabilities and sexes. This was however backed by convenience sampling to collect data from those who are available and willing during data collection periods. In addition, one FGD was held with 10 main library employees of the university making the total participants of FGD for this study to be 40. To this effect, FGD guide pertinent to the objectives of the study was developed and utilized for data collection.

In-depth Interview

To triangulate and enrich data obtained from focus group discussions; data was also collected using in-depth interviews from purposively recruited students with disabilities of various types whose number was planned to be determined by data saturation. However, finally it was found that a total of 22 participants were recruited for in-depth interviews from students with disabilities (male=5, female=5, total= 10), senior officer of disabilities (1), workers of three libraries at three branches of DMU main campus (3); Library Documentation and Service Coordination team leader(1); academic staffs with disabilities (2); DMU head of students affairs (1); HIV/AIDS, and disabilities officer of Burie campus (1), senior academic staff at Burie campus (1); and DMU administrative staffs who served as invigilators for students with visual challenges (2) to explore the general picture of responding to, and challenges of students with disabilities in DMU. To this end, interview guide was developed in English and translated into Amharic language for data collection.

Observation

This method was employed to understand the real support mechanisms of DMU to students with disabilities such as whether bylaws exist or not; how many disability sensitive buildings were constructed; whether study rooms for students with disabilities exist and filled with adequate resource with quality services. It was also used to assess possession of basic educational needs by students with disabilities such as braille materials, stick, IC recorder, library, dining rooms and overall infrastructure of the university as per higher education proclamation. Of the various types

of observation, non-participant observation was employed since the aforementioned issues in this study can be adequately obtained using it.

Survey

To triangulate data collected using qualitative methods, quantitative data were also collected using questionnaire from a total of 18 students with different physical disabilities who found to avail during data collection period.It is found that the total number of students with disabilities in DMU (in both campuses) in 2010 are 62 of which 14 have visual problems, 45 have leg and/or hand problems; 2 have hearing problems; one has mental problem and the remaining one has multiple disability. Since the total size is manageable, census has been used to select research participants who were not participated using qualitative methods. Accordingly, 18 of them have participated to fill survey questions. Survey data was collected once in hall five to avoid diffusion of information where participants have been called to meet for the purpose with the help of their campus coordinators.

Data Collection Procedure

Data for this study were collected after having prior information on students with disabilities. To this effect, along making preliminary interviews, the researchers obtained list of students with disabilities from the officer of disability in Debre Markos University's main campus. This has enabled to know the specific colleges and departments in which students with disabilities were placed along with their names, results and batch. This has led to exhaustibly discuss the case with their representatives as to how, where and when to approach them to collect data. During the discussion, it was found that since almost all students with disabilities share dormitories with other students without disabilities as well as students have been urging for their final exam for the last semester of 2018, collecting data in their natural settings was found to be inconvenient. As a result, representatives of students with disabilities assisted to gather them in hall 5 of the university for survey data collection for one day and staff lounge of the university in the next 4th day for focus group discussion and interview purposes from 5:30 to 1:30 PM in the evening during non-class hours. Data collected using qualitative methods were audio recorded, transcribed and translated first and then organized, themed and synthesized to enable for data analysis.

Methods of Data Analysis

This study employed concurrent mixed methods to analyze data obtained from both quantitative and qualitative methods. Since, all objectives primarily demand qualitative data and hence analyzed thematically and content wise. However, they were also complemented with quantitative data obtained from survey. Moreover, the last objective was also analyzed using spearman's rank order correlation. These quantitative data were analyzed using descriptive statistics.

Ethical Consideration

Due to the insensitive nature of the subject, informants were asked to provide verbal consent after showing them letter of support taken from Debre Markos University; briefing them about the objectives of the study and the intimate nature of questions. They were further informed confidentiality of information they provide, and assured to refuse to answer any question if they feel uncomfortable in any stage of data collection to termination of providing it. In addition, all of the participants were communicated in convenient places and time selected by them and their representatives. Furthermore, all the names indicated in data analysis were pseudonyms.

Results

Background Information of Respondents

As background data, information on age, sex, religious affiliation, year of enrollment and department of respondents have been collected. With respect to sex category of the respondents, 72.22% of males and 27.78% of females were participated. Similarly, while 94.44% of the respondents are orthodox Christians, the remaining 5.56% are Protestants. Data collected on respondents' educational background reveals that while those who were enrolled in the year 2007 E.C. and 2008 E. C. constitute 22.22% each, those who were enrolled in 2009 and 2010 E.C. constitute 38.89% and 16.67% respectively. These data are shown in the pie charts as follows.

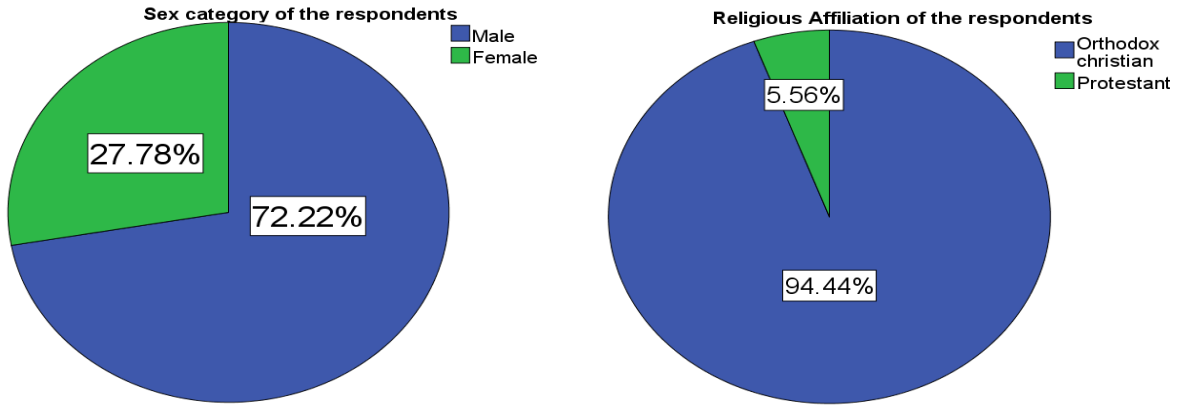

Figure 1: Sex Categories and Religious Affiliations of Respondents

As shown in the Bar chart below, 83.33% of the respondents have stayed two years and more while 16.67% of them were stayed for only a year in the University. In addition to this, as shown in the pie chart below, respondents from the department of civics and ethical studies, information technology, health informatics, statistics, special needs education, medical laboratory, pharmacy and nutrition each constitute 5.56%, the remaining respondents from the department of software engineering, mechanical engineering, electrical engineering, construction management (CoTM) and agricultural economics each constitute 11.11%.

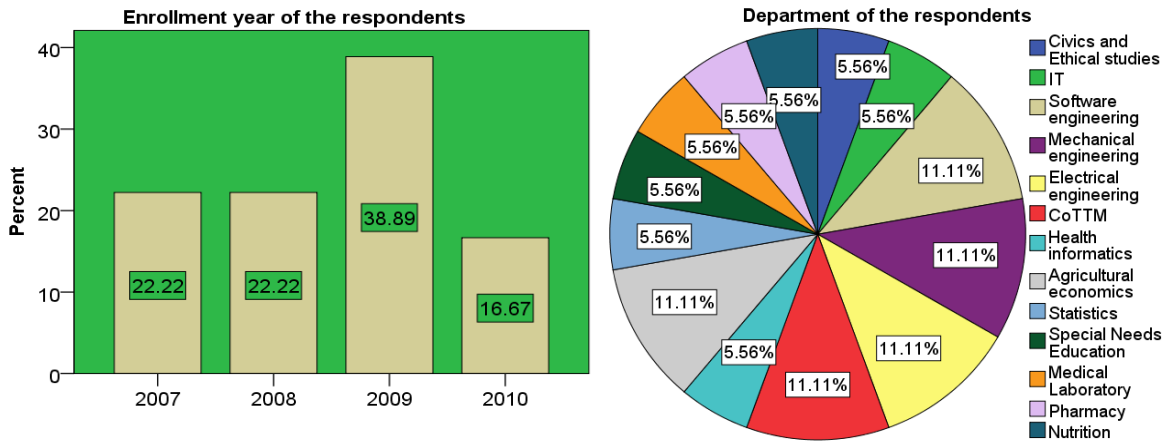

Figure 2: Enrollment Year and Department of the Respondents

Relatedly, descriptive statistics such as range, minimum, maximum, mean and standard deviation of respondents' age and CGPA was also run using SPSS version 20. The results revealed that while there is age difference of six years between maximum and minimum age of the respondents, with respect to CGPA, variation among students with disabilities is significant with minimum and maximum CGPAof 2.03 and 3.84. The details of these are shown using descriptive statistics table below as follows.

Table 1: Descriptive Statistics of Age and CGPA of Respondents

	Range	Minimum	Maximum	Mean	Deviation
Age of the respondents	6.00	20.00	26.00	21.8333	1.58114
PA of the respondents	1.81	2.03	3.84	2.9158	.49202

The Types of Support Systems and Services for Students with Disabilities

Data were collected to identify and examine the types of support systems students have been receiving from DMU. According to disability office report of DMU (2018), monthly payment of 300 birr per student for students with visual impairment and 200 birr per student for students with other disabilities have been made; IC recorder for visually challenged students and training on employment proclamation for graduates has been provided; payment has also made for those who assist for invigilating visually challenged students. It is also discovered that the university has reserved block 36 for students with different disabilities. Students with disabilities have also confirmed these in various ways during interview and FGD sessions. While some have mentioned the provision of trainings, all students with disabilities have also openly expressed absence of problem when they are placed to departments as the university places in their first choice. Data collected from survey also indicated that all students with disabilities have been placed to departments of their own first priority. Let's see various issues raised by different interviewees and discussants as testimonials:

> *During my stay, the university has been providing me 400 Ethiopian birr per month through Gender, HIV and Disability office. The university has also been trying to prepare some bathrooms around our buildings and support us in café (P1-Participant one). In my department, I have got different supports like pen, white papers and handouts. In addition to these, I have received 400 birr per two months through gender, HIV and Disability office even though it is little enough to cover the weekly and monthly expenses (p2). I am happy in the support system especially in my department as it treats me in different aspects like giving handouts, pen and working papers as I want. Moreover, Gender, HIV and Disability office regularly supports me financially (p3).*

Data obtained from survey also indicated that out of 9 alternatives given to select, the only support systems students with disabilities have indicated was financial support. Accordingly, while 94.4% of the students with disabilities (70.59% males and 29.41% females) have reported to have had received financial support, the remaining 5.6% (only males) have reported to have received no support at all.

These are also shared by some of the participants of the study despite the differential amount of services they have been reported of receiving in their respective departments. Students with visual disabilities have also mentioned payment for their readers during exam time. Furthermore, the university has reserved block 36 for students with different disabilities because of its proximity for café and library in particular. Moreover, the university has attempted to construct shower rooms as well as toilets in its nearby. Students with disabilities have also acknowledged the University for separating dining rooms for students with disabilities.

Focus group discussant employees of the main library also agreed that even though there are no sufficient books for all students with disabilities, there are some brail materials that are written in English language. They also stated that for reading and studying purposes, there is a special room reserved for students with disabilities in the main library. In addition, students with disabilities are served first when they come with students without disabilities. That is, they are not forced to wait in the queues with other students to enter to the library. Researchers' observation also showed that there are 12 seats in the main library that are reserved for these students.

Evaluation of the Types of Support Systems

Evaluation of the support systems for students with disabilities shows various blemishes. In the first place, as is the case with some other universities of the world indicated by UNESCO (1997), DMU is among one of the Universities having no written policy regarding students with disabilities. Indeed, since its support mechanism for students with disabilities recognizes the specific needs of students with disabilities and emphasizes the importance of addressing them 'without restricting or prejudicing the rights of other students' or 'where it is practicable and affordable'. This is captured under the "adjusting approach" than "equal opportunities approach".

Secondly, there were no legal provisions pertaining to the rights of students with disabilities in Ethiopia's higher educational institutions' proclamation number 351/2003. However, according to higher education proclamation 2009 of article 40, the then Ethiopian government has ratified four rights for Physically Challenged Students. Against the proclamation, no student with disability cases who participated in this study quantitatively and qualitatively replied to have received exam time extensions; project and assignment time extensions in Debre Markos University. Despite those directives of national proclamation, in many of the standards, the services provided and support systems instituted for students with disabilities are not only limited in depth and breadth but also below the abovementioned qualitative standards. The following statements from the findings show detailed issues.

Though students with different disabilities have confirmed the existence of services such as provision of financial support, they stated the occurrence of different gaps. One of these is irregularity in the provision of financial services in addition to it being too low. Time wise, while some described that they get every month; many suggested that they receive once in two months. From this, it was understood that there is a gap either in awaking the students or in the service provision which differentiated their views. With regards to the amount of payment, while some replied to be 200 birr others replied 400 birr and this was found to be due to the month they took. However, this support has been highly criticized for its being lowest as compared to the same service for students with disabilities in other higher learning institutions such as Bahir Dar, Jimma, and Gondar Universities. As a result, research participants have aggressively inquired the need for uniformity of financial support systems across universities.

In addition, a female student with disability who came from other university through transfer has disclosed herself of never receiving any type of financial support for a semester because no one informed her; nor does she knew the existence of any kind of support for students with disabilities. In her words, she stated, *"I have no information about the support system and I didn't get any support from my department and from the office of Gender, HIV and Disability office too"*. This informs absence of a system where such kind of students can be informed to benefit from university service. Furthermore, students cannot get back payments in the next month if they missed for various reasons in the preceding month.

It was also found that students with disabilities in DMU did not receive services such as exam time and deadline extensions and tutorial services which are explicitly indicated in 2009 higher education proclamation of Ethiopia. This finding is concurrent with the national finding by Yibeltal (2013) which stressed that in spite of the policy advances Ethiopian government has for students with disabilities, formal commitment has not yet sufficiently manifested in action. Indeed, while gender and disabilities officer of Burie campus stated the least focus paid on disabilities issues for there were no students in the campus, one of the academic staffs with disabilities in the same campus expressed the existence of three students with disabilities she knows well in her department alone and added the ignorance of disability issues to be openly discussed and debated in the campus. She also mentioned the existence of serious problem in

identifying students with disabilities. In the main campus too, senior officer of disabilities stated low concern of Gender, HIV/AIDS and Disabilities Directorate for students with disabilities as compared to attempts made to support female students. These statements from current findings are concurrent with the findings of UNESCO (1997) which indicated that although quite a number of disabled students' enroll in African Universities accompanied by a growing improvement in the provision of special education for them, there seems to be a lack of appropriate action in providing equal opportunities and that tertiary level institutions are, generally, not well prepared to accommodate them, although there are exceptions.

In regard to library service, interviewees and discussant students with disabilities suggested absence of any formal support mechanisms for students with disabilities. More specifically, they explained absence of separate reading rooms for students with disabilities adding the small size of the room readied in separate section of the library without any books except law Braille books while significant number of students have non-visual physical disabilities. Moreover, the placement of the books is one storey above the ground than reading room for students with disabilities. As a result, it is not easily accessible; nor is there any librarian who is assigned to serve these students. Except the circulation desk, there is no any building constructed by considering issue of disability into account. Focus group discussant librarians have also agreed of no experience of the library workers to discuss ways of handling students with disabilities in any of the meetings they have had participated; they serve them only in ways in which they feel correct.

Researchers' observation also revealed that while the only library having disability sensitive recently re-constructed design of the entrance is library number two where college of business and economics and school of law books are available, the main library has extremely multiple layers that can weaken even people without disabilities precluding students with disabilities. Observation of students' main library revealed that there is only one disability sensitive gate for students with disabilities which are opposite to their classrooms. As a result, students with disabilities need to round the library to get into it without being tired. Similarly, in library number one, there is a nine step story for students with disabilities to go down and up to get into and get out of the library respectively. This was shown in the following figure.

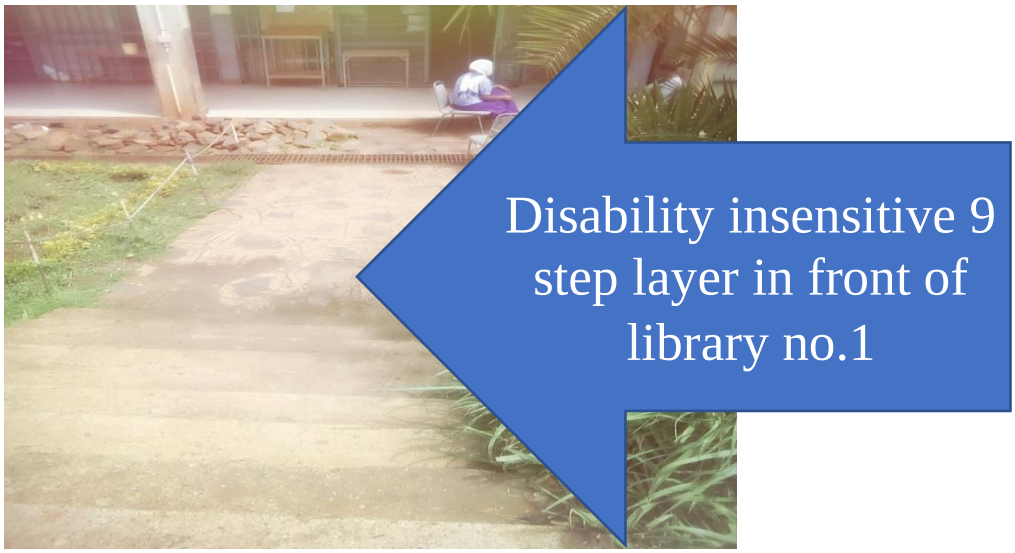

Figure 3: Disability Insensitive Road Construction at the Gate of Library Number 1

All participants of the study also expressed that in the construction of the buildings, there was no recreational center (sports field, gymnasium and so on) for students with disabilities. Students' Service head also shared the problematic nature of the University's topography as well as disability insensitive buildings for academic success of students with disabilities in his statement: "*When we observe the topography, it is challenging for them. Because the dining rooms, the clinic and the learning classes are found far apart from each other. Therefore, students with disabilities are suffering more. Indirectly this challenge might put them in achieving low academic grades".*

Students' disability affairs officer also stated that, "the buildings are not constructed by considering disability issues. Even in the buildings, toilets and shower rooms are not easily available except building number 36. In building 36, there are 8 classes in which three of them are giving services for office purposes but five of them are available for disability students. "Taking this to be true, out of 65 students with disabilities, only 30 students (below 50%) are supposed to live in building which the university claimed to have readied for them but only 6 are found living. Any cautious person can ask as to why more students with disabilities do not prefer to live in this block which students' disability affairs officer and students' service head of DMU reported to have made the block to be disability sensitive. In the first place, this building was considered to be disability sensitive primarily not because of the existence of good building designs but because of its relative nearness to cafeteria and café as a result of which communal toilet rooms have been constructed. This leads to deduce that physical accessibility alone cannot bring satisfaction to live there. However, according to students' service head, gender and disability directorate and disability office have never had established synergy with other concerned offices and departments in a systematic manner. They used to call them just for meetings of the same nature with the same individuals seemingly for reporting purpose. Female

dormitories under my supervision have never had participated in any of the trainings and discussion forums the two offices conducted while having close contact with many of the female students. Results of survey data also confirmed this; it is found that 88.89% of the respondents rated with disagreement or strong disagreement to the question of existence of disability sensitive buildings in the campus. Students with disabilities have also indicated the existence of only 4 computers for more than 65 students with disabilities in their separate library where no librarian is available since books are not allowed to be placed. This was also ascertained by researchers' observation. Discussants and interviewed university librarians have pitifully expressed these issues with sympathy and desire for a working system to better support them.

Along with the four computers, the library had boxed tables which can only accommodate ten students. Because of the above reasons, librarians reported absence of students with disabilities who want to read in reserved separate sections. More specifically, below is one of the direct quotes that one of the students explained the library to extend services of special interest to students with disabilities:

> *I cannot wear my shoes because of my leg problem. When I go to library during day hours to read books, my classmates without leg problem go faster to the library and take ahead of my arrival to it. As a result, I hardly get books in the library. Nor can I read it during night time because of additional problem of extreme coldness of cement for my leg. Understanding this personal problem, I have been facing, the library could have borrowed the book to me and others like me even for one day. So why not we score less academically dismissed than non-disable students and?*

Students with disabilities also explained that building number 36 of the university was assumed to be reserved by the University for students with disabilities for its being at the center. In addition, incumbents have also stated that the building's shower rooms as well as constructed toilets in its nearby were been functional. However, students with disabilities criticized this in many ways. In the first place, the building is not at the center for all students' class and department while it is close for only the dining hall. Secondly, building 36 has so many problems such as absence of any special building design to accommodate all students with disabilities; dysfunctional shower rooms and congested toilet and above all cost sharing office which regularly disturbs for two weeks each month. Thirdly, students with disabilities need the support of students without disabilities whom they know well during their pre-university education. In search of these students, they lived in dormitories of their interest and block 36 accommodated only 8-12 students with disabilities. Inter alia, these reasons did not attract students with disabilities to prefer block 36 of the building which the university claims to have done well for students with disabilities. Furthermore, they stated,

> "*There are many holes and ditches that are not covered appropriately especially around building 36. We both visually and physically challenged students are highly challenged in the stairs of the class as well as in the café as these were not constructed with due consideration of desires and the nature of students with*

> *multiple disabilities. Furthermore, most of the roads are full of holes always waiting the university or any concerned body to fill either by a mud/soil or a pebble.*

It is also worth mentioning to further see one of female academic staffs with disabilities in Burie campus stated:

> *In Burie campus, there are many students with disabilities whose disabilities are not recognized and hence do not receive adequate and appropriate support. I know one of the students having leg disability who just graduated last year and two other students with sight problems in my department. I do not know, or heard of, any support systems to such students. Let alone students, academic staffs with disabilities including me are not beneficiary of special support systems which deemed the simples and easily understandable. My female colleague who has visible thinning of one of the legs was asked to bring letter of being disable from concerned bodies when she asked special support from the university. Let's come to myself. As you see me, I am one legged; but forced to teach using chalk and marker by prohibiting LCD to use. My request to use projector has been raised as futile to my disability by a higher official at campus level meeting. Even if I managed to get the projector with fierce struggle, no one will arrange classes and fix light problem. Not only this, the campus assigns class and exam halls and class without any consideration of their distance and floor's. When we are assigned for invigilation, there is no way that we are assigned to nearby classes or lower floors. There has not been open discussion about disability issue in the campus; when it is arranged by the main campus, the discussion seems a type of evaluation than open academic discussion. Under all these circumstances, it is difficult to identify students with disabilities and provide appropriate support to them.*

This quote can be compared against what Gender and Disabilities Officer of the campus had highlighted stating, "*There are no students with disabilities in Burie campus since they are allowed to be in the main campus".*

Furthermore, students with disabilities have raised their challenge in dining hall which they stated is "neither clean nor enough to be served; its floor is filled with water most of the time and difficult to walk. As a result, we should be equally treated at least in terms of dining room being served. Furthermore, most of the students with disabilities need a servant but most of the servants are not willing to serve disability students". Students with disabilities have also raised their disadvantaged position in the university in comparison to female students and others having different merits. The following quote summarizes this:

> *In most cases, we face multiple challenge..., in this university, female higher scorer graduates have been employed as graduate assistants through quota system; presidents of students are also always given Master's scholarships disregard of students with disabilities despite we are disadvantageous and leading our disability association.*

Furthermore, female academic staffs with disability in Burie campus also explained her knowledge of and satisfaction from disability support mechanisms as follows:

> *I did not hear the existence of support systems for students with disabilities in this campus. Let alone students, as an instructor, I didn't get any support from the office in the name of disabilities. So, how can I talk about the level of satisfaction in the absence of service? How can you imagine when higher officials take my request for projector for teaching as unrelated to my disability while I am one legged? A friend of mine had also requested to bring evidence of disability if she is going to be supported while one of her legs is extremely thin. I just want to say that the campus should recognize disability in right way and work more on support systems of students with multiple disabilities.*

All in all, the academic success of students with disabilities in DMU has been challenged by the interaction of multiple set of factors affecting their capacities in a continuum. The interaction of unwelcoming library system, indiscriminate class placement, unwelcoming teachers for recording audios of their lectures, inconsistent and indiscriminate material support systems by departments and other concerned bodies are found to exert profound negative pressure on students' academic success. More importantly, failure of the university to address the issue at least as stipulated in 2009's higher education proclamation of Ethiopia seems to have given more power and strength to negatively influence their support with institutionalized and inconsistent system.

Recommendations

The findings showed multiple blemishes on the side of the University and HIV/AIDS and disabilities directorate in general, and disabilities office in particular which are primarily entrusted with disability issues in DMU. Accordingly, the following recommendations were suggested for further intervention.

The university should be abide by disability proclamation for higher education of 2009 to institute appropriate measures, at least as stipulated in HEI's proclamation of 2009; buy and provide basic educational aids for students with disabilities within the permissibility of disability laws; design information sharing system with students with disabilities; capacitate the university's office of disability to create active links with all concerned bodies and offices (such as the library, clinics, colleges and departments, students service head, students café's, representatives of students with disabilities and Debre Markos branch of Ethiopian association of the blind) within and outside of the university. The university should also implement disability mainstreaming in order that disability issues are planned and addressed at each level of administration. As part of disability mainstreaming, the university should have a guiding policy and law which enables to check against accountability of individuals and structures to this guiding law at every level of the University's structure pertinent to students with disabilities. Disability office, too, should work with synergy and coordination involving joint planning and

executing of the tasks with other departments having direct or indirect relation with disability issues. Senior officer of disability needs to share practical experiences from other Universities to scan and implement best practices in Debre Markos University and at least in the standards of other Universities. Not least, further study need to be made to better help in dealing with the subject both in Debre Markos University and other Universities of Ethiopia.

Ethiopian government should not only set the minimum financial assistance to students with disabilities in HEIs, but also needs to check its observance. Furthermore, it should identify and upgrade the identified universities to appropriately provide the needed support for students with disabilities.

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A Panel VAR Model Analysis of Human Capital Development and Economic Growth Nexus in Sub-Saharan Africa Countries, Wondesen Teshome, Dire Dawa University

Abstract

Human capital development is the progression of its core social indicators like long and healthy life, knowledge and a decent standard of living. It is a channel used to tackle the core macroeconomic problems such as poverty, unemployment, and inequality as one main input of economic growth and sustainable development in the world. This study examined the interdependence of human capital development and economic growth in Sub- Saharan Africa (SSA) countries through Panel Vector Auto-Regression (PVAR) model analyses including 38 SSA countries in the period from 2000 to 2017, annually. The PVAR model was estimated by Generalized Methods of Moment (GMM) method of estimation, and its estimate was also used to assess the association, causality, cointegration and impulse response of the variables. The unit root tests imply that both variables became stationary after first differences transformation. An order one PVAR model was fitted based on the moment and moment selection criteria. The results of the study found that human capital development and economic growth had a positive correlation between them while the auto-regression of the economic growth was with a weak degree of inertia and the human capital development with a high degree of persistence. The Cross Dependence parametric test of Pesaran shows that the SSA countries had cross-sectional dependence. The Bootstrap estimation of Westerlund's panel cointegration tests that the cointegration or long-run relationship occurred between the two variables. The PVAR Granger causality Wald tests show that there was a short run uni-direction causality link between the two variables, which goes from human capital development to economic growth. The impulse response result of the panel forecast error variance decomposition estimate implied that 35 percent of the variation in human capital development in SSA countries could be explained by their economic growth while human capital development could explain only about 20 percent of economic growth variation. The results also suggested that economic growth in SSA countries would have a more significant impact on realizing human capital development in the long run, as human capital development had an impact on economic growth.

Keywords: causality, cointegration, economic growth, human capital development, PVAR Model, SSA

Introduction

Human capital is the aggregate of immaterial assets interconnected to knowledge and skills established by education, health care, and experience to increase efficiency for economic growth (Becker, 1962). It enhances technology adoption from elsewhere via the absorption of ideas (Teixeira and Fortuna, 2011). It also shakes economic development positively and inclines to progress the crime rates, social cohesion, health levels, environmental conditions, and civic participation (Sianesi and Reenen, 2003). In the endogenous growth theories, Romer (1986) and

Lucas (1988) suggest that human capital led the economic growth. They claimed against the neoclassical theory hypothesizes that capital, including human capital, has a long-run propensity to practice diminishing returns to economic scale. And they claimed that long-run capital including human capital may have constant returns to scale but not diminishing returns to scale.

According to Barro (2001), through the deficiency of exogenous technological development to the long run per capita growth, the existence of human capital in the massive concept of capital may reduce the limitation of diminishing returns. So, the development of human capital may be an alternative to technology development, particularly in the case of asymptotically constant returns to capital, as a tool to make long-run growth. Moreover, Lucas (1988) incorporated human capital as a factor of production in his growth model corresponding to physical capital and human capital causes economic growth by the externalities generated by knowledge production through private and public sectors' investments and human capital savings. He also noted that investments in human capital are the opportunity cost of the time spent on education. That means education or value of learning helps to develop the human capital.

An economic growth model theoretical explains that education is the best tool for human capital development. According to Schumpeter (1934), education is pointed as led to the innovation process to increase economic growth. Denison (1967) Among the neoclassical growth theory it is underscored on education investments' understanding and its contribution to economic growth. Endogenous growth model suggests that education is input in the production of human capital. So, human capital has a positive impact on economic growth.

Mankiw et al. (1992) also developed human capital as one of an economic growth determinant followed the Solow's growth theory that merely accounts physical capital and raw labor as core factors of economic growth (Solow, 1956). The inclusion of human capital into the former empirical estimate of Solow's growth model of Mankiw et al. (1992) tackled the specification bias resulted due to its omission. The variables' in the most empirical literature used to proxy human capital is imprecise to measure human capital development.

A well-progressed Human Capital Development (HCD) is one of the authoritative to accomplish inclusive and sustainable growth as a channel tackling the core macroeconomic problems such as poverty, unemployment, and inequality. Human Development Index (HDI) is a recommended proxy variable of human capital development. It is, by designation, a merely composite index of accomplishments in three essential dimensions a long and healthy life, knowledge and a decent standard of living. It also ensures that a country gains a long and healthy life, knowledge and a decent standard of living (United Nations Development Programme, 2016). These gains' attract foreign direct investments, increases innovation, technological advances and entrepreneurship intensity of the people and improves transparency and corporate governance practices (Dakhli and Clercq, 2004).

However, the contribution of human capital in Sub-Saharan Africa (SSA) countries economy is comparatively low. Despite the relative vast human capital revolution began before decades, the

SSA countries have been building a huge amount of educated labor force in the economy. Even if there is an argument regarding how much the quality of education in the countries does is contributing to the real economy. Unquestionably, the countries are doing well to distribute access to the education sector (Girma et al., 2013).

The reasons behind SSA countries as a concern of this paper are remarkable. Firstly, according to UNDP (2016) human development report, the condition of human development in the region is undeniably low as compared with other parts of the world. Among the SSA countries, for instance, Ethiopia has been registering double-digit economic growth for more than a decade, and it is among the five fast-growing countries in the world excluding oil exporters (World Bank, 2017). However, the human development index of Ethiopia ranked as 174 out of 188 countries UNDP (2016). When these happened, some questions must be addressed; was there a significant contribution of human development to the economic growth of SSA or vice versa?
Secondly, the SSA countries economy is suffering several contests in terms of foreign currency shortages, terrorism, and extremism. These challenges are affecting the countries sustainability in social, economic, and political affairs. The social and political phenomena in SSA are curiously shaking the economy in every direction (Girma et al., 2013).

Economic growth, through a human development process, is meant to human development but it is not the end. Human capital development has an irreplaceable contribution for sustainable economic growth through its factors of production such as in the form of technology and income effects that are the direct result of well-developed human development (Ang and Madsen, 2010; Benos and Zotou, 2014).

The interdependence between human capital and economic growth have been investigated through several economic empirical pieces of literature. For instance, based on data types used: Romer (1986) and Nelson and Phelps (1966) used cross-country data, Katircioglu (2009) used time-series data and Cohen and Soto (2007) and Agiomirgianakis et al. (2002) applied to panel data; based on proxy used for their human capital variable: Huang F et al. (2009) and Agiomirgianakis et al. (2002) used education (school enrolment rates) and Katircioglu (2009) used investments in education; based on the metrics for economic growth literature utilized different proxies such as GDP, GDP per capita or GNI.

However, this paper utilized the best data-type considering panel data, the best proxies of the variables' of interest through the human development index for the human capital development and the real gross domestic product per capita for the economic growth, and the best econometric model by the PVAR models analyses. The panel Vector Auto-Regressive (VAR) model was fitted to tackle the endogeneity and heterogeneity of the variables problem (Cohen and Soto (2007); Abrigo and Love, 2016).

This empirical paper has undeniable impacts to the existing knowledge in SSA countries by econometrically quantifying the causal, co-integration and impulse response functions interdependence of human capital development process and economic growth through the

application of Panel Vector Auto-Regression (PVAR) model analyses in which the estimation accuracy can be improved given that the variables have interrelationship. The PVAR model can capture the endogeneity and heterogeneity of the variables by its multivariate nature considering the time and cross-sectional variation. Therefore, the PVAR was employed to analyze the link between human capital development and economic growth for selected SSA countries and agreed to depart from the existing empirical literature in numerous ways and contribute more. It employed to examine the interdependence between the variables of interest while the variables are allowed to identify any uni- or bi-directional causality, simultaneously. In addition, it reveals the direct and indirect impacts and impulse responses which human capital development may or may not have on economic growth, and vice versa.

Data and Methodology

This part of the paper describes the empirical methodology adopted to assess the dynamic link between human capital development and economic growth and to explain the data and data sources. The variable human development index was computed in three main dimensions proxy for human capital development. And the variable real gross domestic product per capita was taken as a proxy for economic growth since most literature suggests. Next, a PVAR model estimation helped to examine general association result before the causal, co-integration and impulse response interdependence of economic growth and human capital development.

Variables and Data Sources

The data were extracted from the database of the World Bank, World Development Indicator, Human Development Index (HDI). The human development process was measured as the value of HDI and data was extracted from the Human Development Report (World Bank, 2017).

This paper used secondary data of 38 Sub-Saharan African countries and covered a period of 18 years (2000–2017). It made use of the following variables; Human capital development (HCD) is measured by the Human Development Index (HDI). Economic growth is measured by Real GDP per capita calculated by dividing the GDP by the consumer price index. The selected Sub-Saharan Africa countries included in this paper are Angola, Benin, Botswana, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Congo, Congo (Democratic Republic of the), Côte d'Ivoire, Equatorial Guinea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, South Africa, United Republic of Tanzania, Uganda, Zambia, and Zimbabwe. These countries were selected based on the availability of data.

Measurement of Variables

The variables descriptions and measurements included in a model of this paper are discussed as follows:

Economic growth used proxy variable real GDP per capita. According to the World Bank definition of the real GDP per capita, "GDP per capita is gross domestic product divided by midyear population." GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2010 U.S. dollars."

Human Capital Development was measured using a proxy variable Human Development Indicator (HDI). HDI has three dimensions of human development-social indicators' and is a simple average or particularly geometric mean of life expectancy index, educational attainment index, and the adjusted real GDP per capita (PPP$) index. The first is that the longevity as measured by life expectancy at birth in a range of 25 and 85 years. The second is educational attainment as measured by a combination of adult literacy (two-thirds weight) and combined primary, secondary and tertiary enrollment ratios (one-third weight), that is, adult literacy 0 to 100 percent and combined enrollment ratio, 0 to 100 percent. The third is a standard of living as measured by real GDP per capita based on purchasing power parity in terms of dollar (PPP$). In general, its value for each country indicates how far it has to travel to attain certain defined goals: an average life span of 85 years, access to education for all and a decent standard of living. The maximum and minimum values for each variable are reduced to a scale between 0 and 1 with each country at some point on the scale.

Model Analysis

Panel Cross Sectional Dependency Tests

According to Hoyos and Sarafidis (2006), the cross-sectional dependence tests that are designed with their different panel structure, performed by the Lagrange multiplier (LM) test that is apt for a small number of cross-sectional unit and a long period of time (Breusch and Pagan, 1980), the scaled LM test that is valid for large cross-section and time (Pesaran, 2004), the cross-sectional dependence (CD) test that suitable for large cross-section and fixed time (Pesaran, 2004) and the Frees' normal test that considers the interchanging correlation signs (Frees', 1995). In order to avoid bias in the cointegration tests due to cross-sectional dependency among the selected SSA countries that is integrated economically, geographical and political which give rise to strong interdependencies between the countries. Thus, this study applied Pesaran's test.

Stationarity Test

The unit root test is significant to test the stationary of the variables, before estimating the equation. According to Baltagi (2008), these are tests used the Harris-Tzavalis (2003) and the Im, Pesaran, Shin test (2007). Harris-Tzavalis (HT) test with the Null hypotheses of Unit root: assumes common unit root process, while Im, Pesaran and Shin (IPS) test with the Null hypotheses of unit: assume individual unit root process. Im et al. (2003) test specify regression for each cross section as expressed equation (1).

$$y_{it} = \rho_i y_{it-1} + \sum_{j=1}^{\rho_i} \phi_{it} \varepsilon_{it-j} + \delta_i x_{it} + \mu_{it} \quad (1)$$

where ρ_i is the number of lags and the error terms μ_{it} are random variables assumed to be independently and normally distributed for all i and t with zero means and finite heterogeneous variances. The null hypothesis is that each series in the panel contains a unit root (ρ_i =1 for all i) whereas the alternative hypothesis is that at least one of the individual series in the panel is stationary or ρ_i<1 for at least one i (Im et al., 2003).

Panel Granger Causality Test

Granger causality Wald test in Panel Vector Auto-Regression (PVAR) framework is a method of defining whether one variable has causal effect with the other theoretical associated variable when regressing one variable on its own lagged values and on lagged values of the other variable, or vice versa. If the long run relationship is established between the variables, there must definitely be some forms of causal relationship or Granger-causes among the variables; however, it may not be the reverse (Baltagi, 2008).

Panel Co-integration Test

The panel cointegration tests, given that cross-sectional dependence and stationarity, identified, that are applied to figure out the existence of a long-run relationship among the variables. Persyn and Westerlund (2008) cointegration test meaningfully progress the conventional cointegration analysis applied on single country series in which data are pooled to determine the common long-run relationship, as well as the co-integrating vectors, are permitted to vary across the panel units. It also permits cross-sectional interdependence in the co-integrating equation with different individual effects in the intercepts and slopes.

This paper adopted the co-integration tests of both Persyn's and Westerlund's to test the long-run relationships between human capital development and economic growth. The regression model of the co-integration test is given as: $\varepsilon_{it} = \rho_i \varepsilon_{it-1} + \mu_{it}$

Where ε_{it} is the residual term made from the regression including the variables of interest, human capital development and economic growth; and ε_{it-1} is a period lag residual.

The hypotheses are set as H_0: There is no cointegration ($\rho_i = 1$) and H_1: There is cointegration ($\rho_i < 1$). If the residuals ε_{it} are stationary, then the variables of interest are cointegrated. That means there is a long-run relationship exist between them, otherwise, it does not exist.

PVAR Method

In a PVAR model analysis approach, one of its empirical merits as an explicit dynamic system that is the best method of examining the dynamics of the macro-economies. Rather than simply follow a specific macroeconomic concept, the PVAR method executes a statistical model on the variables contemporary links. It considers all variables included in the method are jointly endogenous, which mean that it does not distinguish the variables as exogenous. It permits modeling of the variables shocks that are the sources of macroeconomic dynamics. Each variable in the PVAR depends on all other variables and its past realization. This modeling empirical result suggests the modeling strategy is more accurate than simple time-series approaches, which is proposed by (Abrigo and Love, 2016; Baltagi, 2008).

This paper used a Panel Vector Auto-Regression (PVAR) analysis after Abrigo and Love (2016) to examine the dynamic link of human capital development and economic growth. Adopting the PVAR methodology is letting for unobserved individual or country heterogeneity. It undertakes the endogeneity of both variables in the system and studies the dynamics of exogenous shocks. The country-specific fixed effects addressed cross-sectional heterogeneity and reduce the bias risk of omitted variable. The multivariate (k-variate) panel VAR of order p can be mathematically defined as:

$$Y_{it} = \sum_{j=1}^{p} \alpha_j Y_{i,\,t-j} + \mu_i + \varepsilon_{it} \quad ;\ i \in \{1,2,...,N\}\ ,\ t \in \{1,2,...,T\} \qquad (2)$$

Where Y_{it} is a 2x1 vector of endogenous variables, comprising Human Capital Development (HCD_{it}) and Economic Growth (EG_{it}), that vary by country i and time t; μ_i and ε_{it} are vectors of endogenous variable-specific fixed-effects and idiosyncratic errors, respectively. The (kxk) matrices $\alpha_1, \alpha_2, ..., \alpha_{p-1}, \alpha_p$ are parameters to be estimated. And it is assumed that the innovations have the following properties: $E[\varepsilon_{it}] = 0$, $E[\varepsilon'_{it}\varepsilon_{it}] = \Sigma$, and $E[\varepsilon'_{it}\varepsilon_{is}] = 0$ for all t>s.

GMM Estimation

Afore the GMM estimation of the equation 2, according to Abrigo and Love (2016) and Baltagi (2008) shown there are parameters estimators' that would be biased even with a large number of a cross-section. These estimators are fixed effects-equation-by-equation ordinary least squares (OLS) that are after some transformation independent of the fixed effects. Much more consistent GMM estimators of the model have been proposed particularly in the case of short panel data. One of the assumptions of the model is errors are serially uncorrelated, instrumenting lagged differences with differences and levels of an endogenous variable from earlier periods by equation-by-equation estimation of the first-difference (FD) transformation is more consistent than former estimates.

Instruments with a longer set of lags can advance efficiency, which still reducing observations particularly with unbalanced panels or with missing observations. Overcame this problem, Holtz-Eakin, Newey and Rosen (1988) proposed equation-by-equation GMM estimators that generate instruments by observed realizations with missing observations replaced with zero ground on the standard assumption that the instrument list is uncorrelated with the errors. A system of equations of the model estimation may result in efficiency gains.

Assume the common set of instruments is given by the row vector Z_{it}, and equations are indexed by a number in superscript. Consider the next transformed PVAR model based on equation (2) in a compressed formula:

$$Y_{it}^{*} = \overline{Y}_{it}^{*}\alpha + \varepsilon_{it}^{*} \quad (3)$$

Where

$$Y_{it}^{*} = \left[y_{it}^{1*} \quad y_{it}^{2*} \quad \text{L} \quad y_{it}^{k*} \right] \qquad \overline{Y}_{it}^{*} = \left[Y_{it-1}^{*} \quad Y_{it-2}^{*} \quad \text{L} \quad Y_{it-P}^{*} \right]$$

$$\varepsilon_{it}^{*} = \left[\varepsilon_{it}^{1*} \quad \varepsilon_{it}^{2*} \quad \text{L} \quad \varepsilon_{it}^{k*} \right] \qquad \alpha' = \left[\alpha_1' \quad \alpha_2' \quad \text{L} \quad \alpha_p' \right]$$

Suppose the estimator stack observations over panels then over time. The asterisk denotes FD transformation of the original variable. The GMM estimator is given by:

$$\alpha = \left(\overline{Y}_{it}^{*\prime} Z\hat{W}Z' Y_{it}^{*} \right)^{-1} \left(\overline{Y}_{it}^{*\prime} Z\hat{W}Z' Y_{it}^{*} \right) \quad (4)$$

The estimator used to estimate equation 4 is the system General Method of Moments (GMM) that employs lags of regressors as instruments for the endogenous variables. The system GMM estimator helps to get exactly identified system as it generates the equal numbers of instruments as the endogenous variables. Then, the first difference transformation used to wipe-out the country-specific fixed effects that are the source of endogeneity problem due to the correlation between the fixed effects and lag(s) of the endogenous variable(s).

Optimal Lag Order Selection

Andrews and Lu (2001) developed a consistent moment and model selection criteria (MMSC) for GMM models based on Hansen's (1982) J-statistic of over-identifying restrictions. The MMSC used to choose the optimal lag order in panel VAR model specification and moment condition, which is model selection criteria analogous to the three usually used in instead of a normal likelihood function, on quasi-likelihood functions estimation. These criterions consist of a vector construction that aims to minimize the modified AIC (MAIC), the modified BIC (MBIC) and the modified QIC (MQIC). Another criterion, the overall coefficient of determination (CD) was proposed that captures the proportion of variation explained by the panel VAR model.

Variance Decomposition and Impulse Response Functions

Abrigo and Love (2016) and Baltagi (2008) showed the stability of the PVAR can be realized by its invertible representation known as an infinite-order vector moving-average (VMA) model. For that sake, it is used both the estimated impulse-response functions (IRFs) and forecast error variance decompositions (FEVD). In order to ensure the model identification implementing Cholesky decomposition that the system model followed the recursive order of the fitted model.

When the panel VAR model is re-expressing as an infinite Vector Moving-Average (VMA) may give an impulse-response function Φ_i. Where, Φ_i is the VMA parameter?

$$\Phi_i = \begin{cases} I_K = 0 & , \quad i = 0 \\ \sum_{j=1}^{i} \Phi_{t-j}\alpha_j & , \quad i = 1,2,\ldots \end{cases}$$

(5)

Concurrently the innovations are correlated that means a shock on one variable is also to be complemented through shocks in the other one. So, the IRFs have no any causal implication. Analytically, established on the PVAR parameters of the asymptotic distribution and the cross-equation error variance-covariance matrix, the confidence intervals of the IRF can be derived.

The multivariate PVAR model can produce IRFs that display the time path of each variable following a shock to the other variables in the system. The orthogonal impulse-response functions were estimated. Accordingly, this analysis, for example, the response of economic growth following a shock to human capital development, the magnitude of this shock, and whether this effect was statistically significant over time. Thus, as the PVAR model can see the magnitude of the shocks between variables. The IRFs can also give an estimate of the magnitude of the shocks given by human capital development on economic growth, and vice versa.

Result and Discussion

Exploratory Data Analysis (EDA)

EDA was used to get descriptive results about the study variables using numerical and graphical data presentation method of statistics.

Numerical Statistics

The numerical descriptive statistics in Table 1, for the two variables in the level and logarithm forms, shows that this study included 684 total number of observations with 38 SSA countries and 18 years of annual data. The mean and standard deviation of the economic growth was 2360.51 and 3437.80, respectively. These imply there was high variation about the mean of real GDP per capita or economic growth in SSA countries.

The mean and standard deviation of human capital development was 0.4857 and 0.113, respectively. These indicate that the SSA countries mean human capital development was categorized under low human development with the value less than 0.550 cutoff points as UNDP-HDI classifications while among the SSA countries HDI of Mauritius 0.797 maximum value was classified under high human development country because it lied in the range 0.700–0.799 (UNDP, 2016).

Table 1: Summary Statistics of the Variables

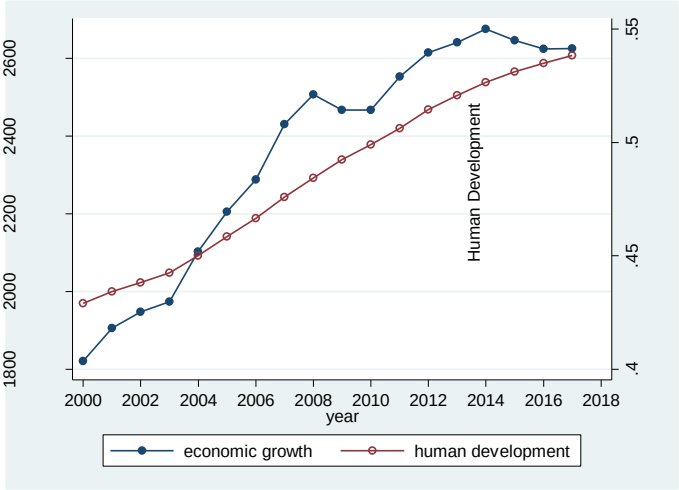
Variable	SSA**	years	Obs.	Mean	Std. Dev.	Min	Max
EG (in level)	38	18	684	2360.510	3437.807	193.866	20333.940
HCD (in level)	38	18	684	0.4857	0.113	0.252	0.797
EG (in log)	38	18	684	7.0338	1.128	5.267	9.920
HCD (in log)	38	18	684	-0.748	0.231	-1.378	-0.2269

Note: EG and HCD are economic growth and human capital development, respectively.

* All variables measured in 2010 constant price.

Graphical Statistics

In Graph 1, the mean profile plots of the variables were illustrated. The mean profile graphical representation of the variable economic growth and human capital development in SSA countries had an increasing trend in the period 2000-2017. It has also been observed that the mean profile for the variables had a linear pattern.



Graph 1 Mean Profile Plot of the Study Variables in 2000-2017

Panel Unit Root Test

The stationarity tests for human capital development and economic growth were presented in Table 2. The null hypothesis states that a variable is unit root, without including a trend and with a trend. And, both variables were not rejected the null hypothesis in level.

Table 2: Panel Unit Root Tests

	IPS unit root tests				**Harris-Tzavalis unit-root test**			
	Level		**difference**		**level**		**difference**	
	EG	**HCD**	**DEG**	**DHCD**	**EG**	**HCD**	**DEG**	**DHCD**
No TD*	2.257	0.597	-6.760	-4.060	0.904	0.950	0.207	0.075
	(-0.988)	(0.725)	(0.000)	(0.000)	(0.991)	(1.000)	(0.000)	(0.000)
Trend	1.865	5.505	-5.449	-5.007	0.775	0.760	0.282	0.216
	(0.969)	(1.000)	(0.000)	(0.000)	(1.000)	(1.000)	(0.000)	(0.000)
Demean	0.829	-3.257	-7.111	-6.962	0.845	0.839	0.204	-0.004
	(0.797)	(0.001)	(0.000)	(0.000)	(0.548)	(0.453)	(0.000)	(0.000)
TD*	1.223	0.855	-5.596	-4.764	0.771	0.689	0.284	0.164
	(0.889)	(0.804)	(0.000)	(0.000)	(1.000)	(0.957)	(0.000)	(0.000)

Note: * Trend and Demean. P-values are in parentheses. EG and HCD are economic growth and human capital development, respectively. DEG and DHCD are first differences of the EG and HCD, respectively.

Then, their first differences became unit root since the null hypotheses were rejected. These imply that human capital development and economic growth were variables integrated of order one, I (1). So, it is possible to consider their long run or cointegration relationship.

Optimal Lag Order Selection

The moment and moment selection criteria (MMSC) implied that consistent with a theoretical recommendation for short panel data, an optimal lag of the endogenous variables of this study economic growth and human capital development was lag order one based the modified lag length selection criteria of MAIC, MBIC, and MQIC, Table 3.

Table 3: Panel VAR Lag Order Selection on Estimation Sample

Lag	**CD**	**J**	**J-p value**	**MBIC**	**MAIC**	**MQIC**
1	0.976	32.273	0.803	-140.957	-47.727	-84.986
2	0.862	28.577	0.806	-127.330	-43.423	-76.956

PVAR Model Regressions

In this paper, the generalized method of moments (GMM) estimators of the Panel vector auto-regression (PVAR) regression model was used and estimated. The first difference GMM estimator was applied to wipe-out fixed individual effects of the model. Then, the specification tests such as Hansen over-identification test, Moment and Model Selection Criterion (MMSC) lag selection test and the PVAR model stability test were implemented. Moreover, based on the PVAR model estimate, future related analyses like Granger causality, Impulse Response Functions (IRFs) and Forecast Error Variance Decompositions (FEVDs) were held. The panel cointegration test was also implemented.

The specified two multivariate systems in the model analysis were Human Capital Development (HCD) and Economic Growth (EG). The PVAR equations given as:

$$EG_{it} = \sum_{j=1}^{p} \alpha_{1j} EG_{i,t-j} + \sum_{j=0}^{p} \beta_{1j} HCD_{i,t-j} + \varepsilon_{1it}$$

$$HCD_{it} = \sum_{j=1}^{p} \alpha_{2j} HCD_{i,t-j} + \sum_{j=0}^{p} \beta_{2j} EG_{i,t-j} + \varepsilon_{2it}$$

In line with model and moment selection criteria of Andrews and Lu (2001), one lag period was taken for both variables, since this has the smallest MBIC, MAIC and MQIC.

The PVAR model estimated by the efficient system GMM estimation reported in Table 6 shows that the direct impact of one endogenous variable on another, given the past history of the endogenous variable. Also, the estimated model stability was checked and confirmed by its eigenvalue stability condition in Table 6 and Graph 2. The Graph showed, all the eigenvalues lie inside the unit circle that implied the PVAR satisfies stability condition.

Table 4 PVAR Model Regressions: GMM Estimation

Response	**Explanatory**	**Coef.**	**Std. Err.**	**z**	**P>z**
DEG	**DEG(-1)**	0.396	0.112	3.540	0.000
	DHCD(-1)	0.847	0.354	2.400	0.017
DHCD	**DEG(-1)**	0.018	0.030	0.590	0.558
	DHCD(-1)	0.826	0.118	6.990	0.000

Note: DEG and DHCD are first differences of economic growth and human capital development, respectively.

Table 5 Hansen's Test of OIR's

Test of OIR's	**Test Statistic (TS)**	**TS-Value**	**DF**	**P-Value**
Hansen's J	**chi-square**	48.628	40	0.164

The Hansen's tests of over-Identifying Restriction (OIR) implied that the set instrument was valid. Since it failed to reject the null hypothesis the set of the instrument is valid in Table 5.

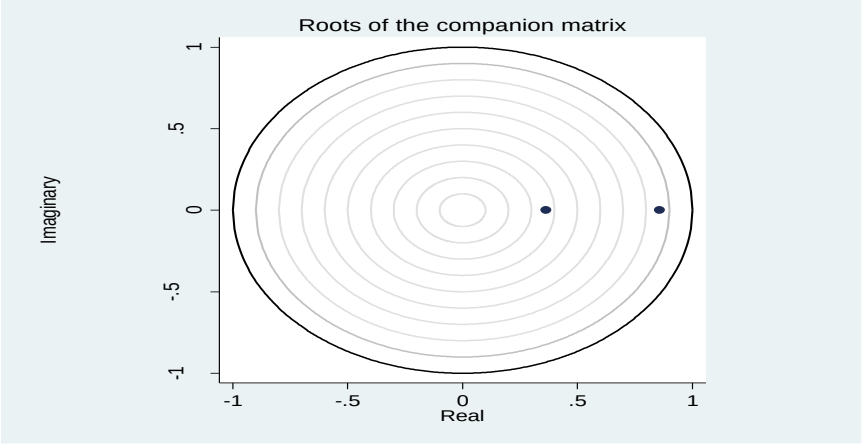
When the dependent variable became economic growth as the results presented in Table 4, the economic growth was a significant, positive and weak degree of inertia with an auto-regression coefficient of 0.396 for SSA countries and it was significant and highly affected by past human capital development of the coefficient value 0.847. One percent increase in the past human capital development leads to an increase of around 0.847 percent on the current economic growth of SSA countries. Moreover, one percent increase in the past economic growth leads an increase of around

0.396 percent on the current economic growth of SSA countries. The SSA countries would increase their human capital development as their economic growth gets higher.
On the other hands, as presented in Table 4, when human capital development became dependent variable, it was found that human capital development had a significant, positive and high degree of persistence with an auto-regression coefficient of 0.826 for SSA countries and it was insignificantly affected by economic growth. One percent increase in the past human capital development of SSA countries founds an increase of about 0.826 percent on human capital development. Moreover, it shows that the economic growth in the SSA countries had no statistically significant impact on human capital development.

The results of the study were in conformity with Girma et al (2013) that studied the contributions of physical capital, human capital, and unskilled labor to economic growth using panel data model for 31 selected SSA countries, and they found that the positive impact of labor and human capital on economic growth but much higher in high-income countries than in SSA countries. Kolawole and Titus (2018) also considered that the measures of human capital independently as health and education to examine their contribution on economic growth that used a dynamic panel data model established on the system GMM estimator which covers 35 SSA countries from 1980–2008. And they suggest that human development had an impact on economic growth.

Table 6: Eigen Value Stability Condition

Eigenvalue			
Real	**Imaginary**		**Modulus**
0.8582	0.000		0.8582
0.3639	0.000		0.3639



Graph 2: Eigen Values Unit Circle tests

Panel Impulse Response Analysis

Panel Forecast-Error Variance Decomposition (FEVD) and Impulse Response Functions (IRFs) of human capital development, economic growths are for SSA countries. To evaluate the two-way effects among human capital development and economic growth in SSA countries, it used IRFs

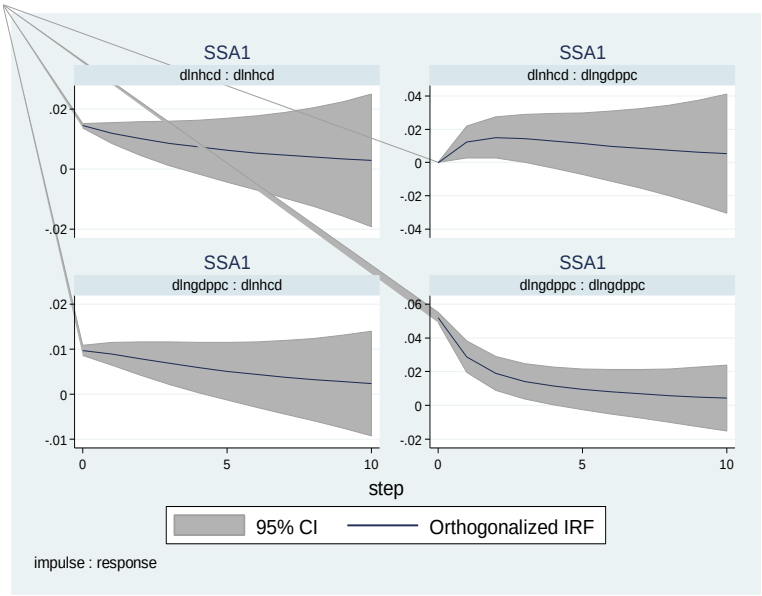
and FEVDs of the PVAR model. The IRFs plots generated through Monte Carlo simulations of 200 repetitions with 5 percent errors bands, which describes the shock of one variable to innovations in another variable of the system, keeping all other shocks equal to zero.

The IRFs plots showed that the impulse and response variable relationship to a one standard deviation shock for ten years. Both variables human capital development and economic growth responds positively to a shock of one on another.

Impulse Response Functions (IRFs)

Through the process of assessing the shock-impacts to the path of human capital development used proxy HDI and economic growth used proxy Real GDP Per Capita, the IRFs of Panel VAR model estimated and employed as a methodical instrument. The IRFs used to show the direction and magnitude of the impacts of one standard deviation shock overtime to one variable share on other structure variables. The results presented in Graph 3.

The impulse and response relationship statistical estimated results or coefficients interpretation in the IRFs should mostly depend on the direction or sign then its magnitude. The directions show the sign of impact analysis given that the magnitude provides the size of statistical influence.



Graph 3: Impulse Response Functions (IRFs) of SSA countries

The Impulse Response Functions (IRFs) plots showed that the impulse and response variable relationship to a one standard deviation shock for a ten years. Both variables human capital development and economic growth responds positively to a shock of one on another. As the IRFs of SSA countries plot shows that the contemporary shock in both human capital development and economic growth have positive yet momentary impacts on economic growth. It is also notable

that the impacts of contemporary shock on economic growth and human capital development have a persistent positive impact on medium-term human capital development.

Panel Forecast-Error Variance Decompositions (FEVDs)

The panel FEVDs of human capital development and economic growth are for SSA countries. After estimation by PVAR model, Cholesky Forecast-Error Variance Decomposition (FEVD) used to find the share of an impulse variable to the forecast-error variance of a response variable. According to a theoretical explanation of Holtz-Eakin et. al. (1988), it asserted that shocks in economic growth have a direct short-run impact on concurrent human capital development, comparatively than human capital development affects economic growth in the long run. Thus, the Cholesky Order becomes the first economic growth than human capital development.

The results, in Table 7, of panel forecast error variance decomposition of the human capital development and economic growth for SSA countries, reveals that about 35 percent of the variation in human capital development by SSA countries could be explained by their economic-growths'. On the other hand, human capital development could explain only about 20 percent of the variation in the future economic growth of the SSA countries.

As shown inTable 7 column 2 and 3, a shock to economic growth-proxy for real GDP per capita- and a shock to human capital development - a proxy for HDI- had a positive direct impact on economic growth in the short and long runs. Since, the estimated FEVDs of the PVAR model coefficient was positively signed during the whole periods of its forecasting horizon, showing its expansionary nature.

Table 7 Result of the Forecast-Error Variance Decomposition (FEVD)

Response*	**Impulse variable**		**Response***	**Impulse variable**	
EG	**EG**	**HCD**	**HCD**	**EG**	**HCD**
1	1	0	1	0.3088	0.6912
2	0.9589	0.0411	2	0.329	0.671
3	0.9115	0.0885	3	0.3405	0.6595
4	0.8742	0.1258	4	0.3473	0.6527
5	0.8475	0.1525	5	0.3515	0.6485
6	0.8289	0.1711	6	0.3543	0.6457
7	0.8159	0.1841	7	0.3561	0.6439
8	0.8067	0.1933	8	0.3573	0.6427
9	0.8001	0.1999	9	0.3582	0.6418
10	0.7954	0.2046	10	0.3588	0.6412

**Note ***Response variable and forecast horizon. EG and HCD are economic growth and human capital development, respectively.

The economic growth variation at period ten forecast horizon, 20.46 percent of the economic growth variation was explained through the past human capital development and 79.54 percent over the past economic growth. That means human capital development shocks are important for explaining economic growth in the long-run, although its shocks account for about one-fourth. The SSA countries economic growth variation could be explained through past human capital development in the long run. Thus, economic growth could be expansionary in the short and long runs, given the factor of human capital development in the model. And an increase in human capital development would drive to enhance economic growth.

A shock to human capital development and economic growth had a positive direct impact on human capital development in the short and long runs as Table 7 column 5 and 6. Their positively signed coefficients through-out the forecast horizon show that expansionary nature of human capital development (HDI) over a time horizon and an increase in economic growth increases human capital development. The variation of human capital development at period ten, 64.12 percent of past human capital development explain the variation of human development and 35.88 percent of past economic growth explain the same variation. In the long-run forecast horizon, past human capital development account for more part in the explanation of human capital development than economic growth. Thus, human capital development in the short-and long-run might be expansionary given that the variable economic growth in the model.

These results were roughly in conformity with Bouhari and Soussi (2017) which examined the relationship between education, material investment and economic growth using the panel vector autoregression (PVAR) models analyses in a panel of five MENA countries (Algeria, Egypt, Morocco, Tunisia and Turkey) in the period of 1975 to 2014 by methods of variance decomposition and impulse response functions. They resolved that past human development lift human capital development than economic growth both in short and long runs.

Panel Cointegration

When the two variables series are cointegrated, then the shocks to one variable series will persist in the other variable. Persyn and Westerlund (2008) developed the test for the absence of cointegration or long-run relation that consider two different classes of tests individual panel members or for the panel as a whole. They evaluated, all variables are assumed to be I(1), the null hypothesis of no long-run relation and the alternative hypothesis: group-mean tests and panel tests by the four-panel cointegration test statistics (Ga, Gt, Pa, and Pt), which are normally distributed. Their estimated standard errors are computed in a standard way for tests of Gt and Pt while the tests of Ga and Pa used adjusted for heteroskedasticity and autocorrelations.

The parametric Cross Dependence (CD) test of the Pesaran's (2004) for panel data models with a small time and large cross-section found that the SSA countries had cross-sectional dependence. Since it strongly rejected the null hypothesis that states there is no cross-sectional dependence with the test statistic value 4.991 and P-value 0.000 of the Pesaran's test of cross-sectional independence.

Table 8: Westerlund's Panel Cointegration Tests with Cross-sectional Dependence

Statistic	Value	Z-value	P-value	Robust P-value
Gt	-2.502	-4.971	0.000	0.000
Ga	-6.770	0.421	0.663	0.000
Pt	-12.492	-3.589	0.000	0.000
Pa	-4.972	-1.029	0.152	0.040

H0: no cointegration.

Thus, the Bootstrap estimation of Westerlund's panel cointegration tests with cross-sectional dependence was applied to consider the cross-sectional dependency of the SSA countries and to get the robust p-value. The lead and lag length was fixed to 1, respectively. The bootstrap error was based on 200 repetitions. The Bartlett kernel window width was fixed at $4(T / 100)(2 / 9) = 2.73 \approx 3$.

The Westerlund' panel cointegration tests results in Table 8 shows that the group statistics estimate (Gt, Ga) tests cointegration as a whole panel and the individual panel statistics estimate (Pt, Pa) tests cointegration as at least one panel is not cointegrated. The results found suggest that there was a cointegration or long-run relationship for human capital development and economic growth in SSA countries. Since the null hypotheses that state no cointegration were rejected. Thus, the economic implication of the long-run relationship was that there was a stable equilibrium cointegration or long-run relationship among the variables human capital development and economic growth.

The cointegration relationship result of this study was inconsistent with Bouhari and Soussi (2017) found no cointegration between the variables by examining the relationship between education, material investment and economic growth using the panel vector auto-regression models analyses in a panel of five MENA countries (Algeria, Egypt, Morocco, Tunisia and Turkey) in the period of 1975 to 2014. And this study result conformed with Fang and Chang (2016) studied the panel cointegration and causality analysis of energy, human capital and economic growth in Asia Pacific countries.

PVAR-Granger Causality Test

The causality relationship in some forms must exist between variables if the long run or cointegration relationship is established. Since this paper studied the PVAR Granger Causality Wald Tests for SSA countries. The results found in Table 9 show that there was uni-directional causality that goes from human capital development to economic growth in SSA countries.

Table 9: Results of PVAR Granger Causality Wald Tests for SSA Countries

Equation \ Excluded		Chi-sq	DF	Prob > chi2
D. Economic growth (DEG)*	DHCD	5.736	1	0.017
	ALL	5.736	1	0.017
D. Human capital (DHCD)**	DEG	0.343	1	0.558
	ALL	0.343	1	0.558

Note * and ** are first differences of the economic growth and Human capital development

The economic growth is not a statistically significant cause to human capital development. Although the impulse response analysis results indicated that economic growth had a positive impact on human capital development in the SSA countries, it could be recommended that economic growth would have a significant impact if it engaged towards realizing human capital development in SSA countries.

The empirical bidirectional hypotheses of bivariate causality test between the two variables that were human capital development Granger causes economic growth and vice versa based on Panel VAR model Granger-causality test. It performed pairwise Granger causality tests after PVAR model estimation. The Panel VAR-Granger causality Wald test Ho: Excluded variable does not Granger-cause Equation variable and Ha: Excluded variable Granger-causes Equation variable.

The null hypothesis that states the human capital development does not Granger-cause of economic growth was rejected and the vice versa was not rejected. So, the causality relationship of economic growth (DEG) and human capital development (DHCD) was short-run uni-directional that goes from human capital development (DHCD) to economic growth (DEG) in SSA countries.

This study result was consistent with Kui (2006) of China in the period 1978-2004 and Chaudhary et al., (2009) of Pakistan in the period 1972-2005. They found unidirectional causality which goes from human capital to economic growth. However, Bouhari and Soussi (2017) found that the reverse causality exists between them in a panel of five MENA countries (Algeria, Egypt, Morocco, Tunisia, and Turkey) in the period of 1975 to 2014 and Huang et al., (2009) also found the reverse causality exists in China between 1972 and 2007.

Conclusions

In this study, the interdependences of human capital development used proxy variable human development index and economic growth used proxy variable real GDP per capita examined across 38 Sub-Saharan Africa (SSA) countries in the annual period between 2000 and 2017 by using Panel Vector Auto-Regression (PVAR) model analyses. The fitted PVAR model helped to assess the relationship between the variables' association, causality, cointegration and impulse response.

The Im, Pesaran, and Shin (IPS) and Harris-Tzavalis (HT) unit root tests implied that both variables became stationary after first differences transformation. Based on the Moment and Moment Selection Criteria (MMSC) lag order selection, order one PVAR model was fitted by its minimum MAIC, MBIC, and MQIC. The PVAR model regression results of the study found that human capital development and economic growth had a positive association, while the auto-regression of the economic growth and the human capital development had a weak degree of inertia and a high degree of persistence respectively. It also shows that economic growth had no statistically significant impact on human capital development in SSA countries.

As impulse response analysis indicates the human capital development and economic growth in the SSA countries had expansionary nature in the short-and long-run. The past human capital development had accounted for more part in the explanation of human capital development than the past economic growth. And, the human capital development shock had significantly explained economic growth, although it had shock accounted for about one-fourth.

The Pesaran's Cross Dependence parametric test of the panel data models shows that the SSA countries had cross-sectional dependence. The Bootstrap estimation of Westerlund's cointegration tests indicates that the variables' human capital development and economic growth in the SSA countries had cointegration or long-run relationship. The Wald tests of the PVAR Granger causality suggests that there was short-run uni-direction causality link between the two variables, which runs from human capital development to economic growth.

Based on the results of this study, I recommended the SSA countries should focus on policies that progress the collaboration of human capital development and economic growth. The SSA countries should critically reconsider human development strategies' to more realize the contribution of human development on economic growth and exceedingly invest on the indicators of human development such as health, education, and Standard of living to enhance the impact of economic growth on human capital development.

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