Democracy and Human Development in sub-Saharan Africa: A quantitative perspective, 1990-2014

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Abstract: This research analyses the effects of democracy on human development in sub-Saharan Africa. Theoretically, the idea of development of freedom is incorporated into the classical debate of democracy's impact on development. Empirically, this is tested in a number of quantitative methods and regression models covering the period 1990-2014. Democracy is measured by Freedom House's political rights and civil liberties. Human development is measured by Human Development Index (HDI) factors, such as the Education Index, Life expectancy at birth (LEB) and Gross National Income (GNI). This study covers 48 sub-Saharan African countries and the results support the hypothesis that democracy is the variable with the greatest variance on human development. Moreover, the results indicate that democracy has positive effects on changes in human development. This finding strongly supports the claim that human development is compatible with and even strengthened by political democracy.

I. INTRODUCTION

Recent decades have seen a positive improvement in the levels of democratic and human development in the world. While social scientists from different disciplines have searched for relations of development, political scientists have an interest in research about empirical and theoretical connections between democracy and human development. Scholars argue the importance political democracy has on improving the standard of living of a nation's citizens. The effects of democracy on human development research date as far back as to the seventeenth century (Hobbes 1651; Harrington 1656) and more recent findings illuminate a "third wave of democratization"(Huntington, 1991).

Over the years, ample research has been conducted on human development and democracy, but findings remain questionable when economic growth is used as a measure of development (Sirowy & Inkeles, 1990); (Przeworski & Limongi, 1993). This paper takes a different approach by focusing on the impact of democracy on human development. The research primarily seeks to explain how the status of democracy based on regime type in sub-Saharan African states affected human development in the region from the 1990-2014.

The human development literature has focused on political economy by economists such as asMahbubulHaq (1995). In addition, other scholars have proposed and argued for the use of human development index (HDI) as a measurement of development (Sen, 1999). Amartya Sen believes HDI is a preferred indicator to measure human wellbeing and development. This paper researches and applies a quantitative methodology to analyze potential effects of democracy on human development in sub-Saharan Africa.

II. METHODOLOGY

This paper uses a quantitative analysis, statistical model approach as the methodological framework to substantiate points in the analysis to test the effects of democracy on human development. This study covers 48 sub-Saharan African countries at the country level data. The research relies on both primary and secondary sources. Country level data is obtained mainly from documented sources. The primary sources include Freedom House: Freedom in the World data, United Nations Development Programme (UNDP) and human development reports from 1990- 2015. This time period is based solely on data availability. The country level data on democracy from Freedom House provides two indicators of Civil Liberties (CL) and Political Rights (PR) for this analysis. Finally, data on human development is collected from the UNDP data of International Human Development Indicators used to measure HDI.

The methodology uses severalregression models in order to analyze the effect of democracy on human development with use of independent and dependent variables obtained in 48 sub-Saharan African countries detailed below. The independent variable of the study is the Freedom Status (FS) of democracy. Freedom

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statusconsists of two indicators; Political Rights and Civil Liberties ratings. A country is assigned two ratings (1 to 7), one for political rights and one for civil liberties based on its total scores for political rights and civil liberties questions. Each rating of 1 through 7, with 1 representing the greatest degree of freedom and 7 the smallest degree of freedom, corresponds to a specific range of total scores(FreedomHouse, 2017). The dependent variables of research interest are measures of human development consisting of three indicators; (LEB), (EDU), (GNI) which is used for different analysis (UNDP, 2016).A description of all the variables used in this study, definitions and sources, are shown in Table 1.

Table 1: Variable Description

Variable	Definition	Source
Democracy	Inverted mean of political rights and civil liberties, ranging from 1 (lowest degree of freedom) to 7 (highest degree of freedom).	Freedom House (2016b) FIW
Democratization	Annual percentage growth rate of the inverted mean of political rights and civil liberties.	Freedom House (2016b) FIW
Human Development Index (HDI)	Measure of human development combining indicators of health (life expectancy at birth), education (mean and expected years of schooling) and living standards (gross national income per capita), ranging between 0 (minimum) and 1 (maximum).	UNDESA (2015a), UNESCO Institute for Statistics (2016), United Nations Statistical Division (2016a), World Bank (2016a), Barro and Lee (2016) and IMF (2016).
Life Expectancy at Birth (LEB)	Number of years a newborn infant can be expected to live if prevailing patterns of age-specific mortality rates at the time of birth stay the same throughout the infant's life.	UNDESA (2015a).
Education Index (EDU)	Calculated using Mean Years of Schooling and Expected Years of Schooling.	UNESCO Institute for Statistics (2016), ICF Macro Demographic and Health Surveys and UNICEF Multiple Indicator Cluster Surveys.
Gross National Income per capita (GNI)	Aggregate income of an economy generated by its production and its ownership of factors of production, less the incomes paid for the use of factors of production owned by the rest of the world, converted to international dollars using PPP rates, divided by midyear population.	IMF (2016), UNSD (2016) and World Bank (2016).
Logarithm of Gross national income per capita (LOG_GNI)	Variable GNI is highly right skewed and had large number of outliers. Transformed GNI by taking the base 10 logarithm	IMF (2016), UNSD (2016) and World Bank (2016). Transformed by the researcher
Freedom Status (Status)	The average of a country's or territories political rights and civil liberties ratings is called the Freedom Rating. Free, Partly Free, Not Free Status – The average of a country's or territory's political rights and civil liberties ratings is called the Freedom Rating, and it is this figure that determines the status of Free (1.0 to 2.5), Partly Free (3.0 to 5.0), or Not Free (5.5 to 7.0)	Freedom House (2016b) FIW
Freedom Status Score (Democracy score)	The average of a country's or territory's political rights and civil liberties ratings is called the Freedom Rating The figure that determines the status (Free, Partly Free and Not Free) Ranges from 1-7. Higher value indicates the country is less	Freedom House (2016b) FIW. Average

	democratic and vice versa.	
Political Rights (PR)	A country or territory is assigned two ratings (7 to 1)—one for political rights and one for civil liberties—based on its total scores for the political rights and civil liberties questions. Each rating of 1 through 7, with 1 representing the greatest degree of freedom and 7 the smallest degree of freedom, corresponds to a specific range of total scores (see tables 1 and 2).	Freedom House (2016b) FIW
Civil Liberties (CL)		Freedom House (2016b) FIW

Source: The researcher
Notes: Table 1 shows a description of all the variables, definitions, and sources.

Simple linear regression models:
　　　Regression analysis is a statistical methodology that utilizes the relationship between two or more quantitative variables so that an outcome variable can be predicted from other or others. This methodology is widely used in social and behavioral sciences and many other disciplines.
This research investigates how freedom status scores, the independent variable affects three dependent variables: Life expectancy at birth, Education Index and the Logarithm of the GNI individually.
1. We want to investigate the relationship between the freedom status score and life expectancy at birth. We will test if the freedom status score is high (if a country is less democratic) the life expectancy would decreases.Hence,the research uses a simple linear regression model to test if there is a negative linear relationship between the freedom status score and the life expectancy at birth. The independent variable of interest is the freedom status score and the dependent variable for this model is life expectancy at birth.
2. In addition, if a country's freedom status score is high a country is less democratic, it may lower the country education index of the. The simple linear regression model will test if there is a negative linear association between the freedom rating score and the Education index with the independent variable of freedom status score and the dependent variable used is education index.
3. Similarly, it will be interesting to investigate the relationship between the freedom status score and the logarithm of gross national income per capita. Again, we can expect to see the less democratic country with higher freedom status score will have lower logarithm of GNI (LOG_GNI). Again to test for this relationship the simple linear regression model is appropriate. The independent variable of interest is the freedom rating score and the dependent variable is the logarithm of GNI.

We will investigate these three relationships for 1990,1995,2000,2005 and 2014 to see if there are any recognizable patterns.
One-way Analysis of variance model (ANOVA):
It will be interesting to investigate if there are significant differences among free, partly free and not free countries. We will investigate how average life expectancy, education index and GNI differ for these three different types of regimes. We can expect to see that at least one of the regime types will differ from the rest.
1. A one way ANOVA model will test if there are any differences in mean life expectancy at birth for free, partly free and not free freedom status. The independent variable of interest is the freedom types (free, partly free and not free) and the dependent variable of interest is the life expectancy at birth.
2. A one way ANOVA model will test if there are any differences in mean education index at birth for free, partly free and not free freedom status. The independent variable of interest is the freedom status (free, partly free and not free) and the dependent variable of interest is the education index.
3. A one way ANOVA model will test if there are any differences in mean logarithm of GNI for free, partly free and not freedom status. The independent variable of interest is the freedom status (free, partly free and not free) and the dependent variable of interest is the logarithm of GNI.
One-way ANOVA models will be constructed for years 1990,1995,2000,2005 and 2014.

Multiple comparisons using Tukey-Cramer HSD for all pairs:
　　　If a one-way ANOVA leads to the conclusion that there is a significant difference in mean life expectancy at birth, education index and Logarithm of GNI among free, partly free and not free countries, further analysis will be done using the Tukey-Cramer HSD method for all pairwise comparisons to investigate where the differenceslie. Under the pairwise comparisons we will compare free and partly free regimes, free and not free regimes and partly free and not free regimes, using average life expectancy at birth, education index and logarithm of GNI

The Logarithm of GNI replaces GNI. The variable GNI is highly right skewed and had a large number of outliers. A logarithmic transformation was necessary to make the data more symmetrical in order to use it in the models in this study. JMP PRO 13 statistical software was used to analyze the data for the models.
Theoretical Framework and Definition of Terms

Democracy
There are several different definition used to explain the nature, structure and functionality of democracy in the scholarly literature. My working definition of democracy is a synthesis of these scholarly definitions; which is articulated in the following way.
Democracy: *The right to vote for all citizens to compete in a multi- party political system under regularly contested elections conducted in fair and free manner by allowing citizens to support and vote through freedom of association and freedom of expression with effective individual political rights and civil liberties.*
Human development

In 1990, the first annual Human Development Report (HDR) transformed the landscape of *development theory*, measurements and policy by introducing the Human Development Index (HDI) in the United Nations Development Program (UNDP). The HDR presented "human development" as progress towards greater human well-being and provided country-level data for a wide range of well-being indicators that expanded measurement and comparison tools for government agencies, NGOs and research institutions.HDI is a combination of statistical indicators which use three indicators such as of life expectancy, per capita income (GNI) and educationto rank countries into four tiers of human development by the Pakistani economist MahbubulHaq.In HDI, the component indices for life expectancy, literacy, school enrollment and income are combined together into a single index that can be used to compare the level of human well-being among countries or to monitor one country's progress over time. HDI has played two key roles in the field of applied development economics: 1) as a tool to popularize human development as a new understanding of well-being, and 2) as an alternative to GDP per capita as a way to measure levels of development for comparison across both countries and time (UNDP, 1990).

The limitations of the Study
There are three main limitations ofthisstudy has faced in research. The first limitation is due to the choice of definitions. Both democracy and human development are complex and subjective concepts, which led to various definitions(Przeworski, Alvarez, Cheibub, & Limongi, 2000). In addition, former studies found different definitions and measurements of democracy that highly correlated(Dahl R. A., 1998). Also, UNDP and the Freedom House definitions used in this research are commonly applied in previous studies(Johansson, 2002). Second, there was a difficulty in finding complete data sets for given variables. For example: Lack of data availability of Somalia for 1990 to 2014, due to Somalia's war torn nature with dysfunctional institutions in place. This leads to disaggregated HDI values. Lastly, due to the research methodology in use as Bryman explains in his study, "As in all quantitative studies, a particular difficulty is the risk of only determining correlation rather than causality"(Bryman, 2008).

III. LITERATURE REVIEW
The theoretical context of this research is mainly based on two major disciplines; political science and developmental studies.
What is the Human Development Paradigm?
The major scholars who studied human development theory argue that development should focus on the capabilities of people rather than their resources or welfare and economic growth(Sen, 1999). Sen's research on China argues that a high economic growth rate with limited democracy lacks civil and political rights. On the other hand, the example on India points out high democratic rights and human development, regardless of low economic growth rates (Sen, 2008).
On the other hand, since 1990, the UNDP Human Development Report argues that human development is more than economic factors; which was introduced by Pakistani economist MahbubulHaq in 1990 with shifting the focus of development from national income to create policies to serve people(UNDP, 1990; Haq, 1995). The UNDP has defined human development as "a process of enlarging people's choices and the level of their achieved well-being" (UNDP, 1990). Over the years, scholars have different criticisms on HDI, mainly with HDI's higher correlation with GDP per capita measure for redundancy (McGillivray 1991; McGillivray and White 1993).
Democracy and Human Development
The second theoretical context this paperdiscusses is democracy and development. In the field of political science, many leading scholars have different views and arguments on democracy and its uses.

What is Democracy?

Theorizing about 'Democracy' is one of the most challenging tasks in the field of political science. Some scholars believe that the definition of democracy is based not on procedures but substantive policies, which guided by the influential scholarly work of Schumpeter (1947) and Dahl (1971) (Collier & Levitsky, 1997). In 1976, Schumpeter defines Democracy such as "the institutional arrangement for arriving at political decisions in which individuals acquire the power to decide by means of a competitive struggle for the people's vote" (Schumpeter, 1976 [1942]) He identifies freedom of discussion as a key requirement for successful functional democracy.

Robert Alan Dahl in 1999 define democracy by listing eight standards for measure democracy such as: the right to vote, the right to be elected, free and fair elections, the right of political leaders to compete for support and votes freedom of association, freedom of expression, institutions that depend on votes and other expressions of preference and alternative sources of information (Dahl R. A., 1971)

Robert A. Dahl argues, "most of the world proclaimed the superiority of nondemocratic systems both in theory and in practice" (Dahl, 1998, p. 44). According to Dahl, democracy helps foster human development more fully than any feasible alternative. This is highly plausible but unproved (Dahl, 1998, p. 55).Empirically, Dahl's claim has been investigated through concepts of development by use of economic development, GDP, and growth that produced inconclusive results (Sirowy and Inkeles 1990; Przeworski and Limongi 1993).

Over the years, there has been strong support as well as criticism of the effects of political democracy on human development expansionin the world. The key arguments on different regime types play a role, which helps to understand the growth of democracy (Przeworski and Limongi 1993, p. 51).

In a reproduction of Lipset's (1959) classical study on democracy, the 1990 cross- country study analyses the correlation between HDI and democracy furtherto per capita national income, affirming "the relationship between democracy and development is even stronger when the HDI is used as the development indicator" (Diamond, 1992, p. 458). Diamond's study shows that GDP per capita, the socioeconomic HDI, has the benefits of "greater validity in indicating real levels of human well-being" (Diamond, 1992, p. 458). In addition, Inglehartand Welzelconducted another study byapplying data on national values from the World Values Survey by analyzed the relationship between democratization and human development (Welzel & Inglehart, 2005).

On the contrary, Olson argues, from a rational self-interest perspective that the central issue to lasting development in autocracies is that individual rights cannot be secured (Olson, 2003).

Income inequality is another concept that is often involved in both the theoretical and empirical literature on the association between democracy and human development.Persson and Tabellini find that economic growthis significantly and negatively correlated with inequality (Persson & Tabellini, 1994). However, Persson and Tabelliniargue"this relation is only present in democracies" (Persson & Tabellini, 1994). In support of Persson and Tabellini's findings, Knack and Keefer discover "that inequality's impact on growth does not differ significantly by regime type"(Knack & Keefer, 2003). It remains uncertain how the relationships between democracy, civil liberties, political rights and gross income per capita will be included as a control variable in this study, due to its suggested impact on human development. In addition, one of the original team members of the HDI report has been further criticized for not taking inequality into account (Seth, 2009). On the other hand, Collier and Levitsky argue that both Dahl and Schumpeter have focused and defined democracy in "minimal" terms by focusing on the smallest number of features for a sustainable democracy in the field of democratization studies (Collier & Levitsky, 1997). In addition, several different institutions have carried out studies to measure democracy and elections in the world such as; Freedom House and Polity IV with guarantees of free elections with effective civil liberties and political rights and no voter fraud.

Freedom House categorizes democracy under 'Electoral Democracy', by assigning countries numerical ratings, which help, determine a country's current democratic status along with several key factors. Freedom House observes four qualifying criteria to meet free electoral democracy standards: competitive, multiparty political system, Universal adult suffrage for all citizens (with exceptions for restrictions that states may legitimately place on citizens as sanctions for criminal offenses), regularly contested elections through secret ballot, reasonable ballot security, the absence of massive voter fraud, results that yield a representative of the public will, significant public access of major political parties to the electorate through the media and through generally open political campaigning(FreedomHouse, 2017).

The Third Wave of Democracy in sub-Saharan Africa

In the study of sub- Sharan African politics, 'Third Wave of Democracy' plays a major role in the surge of democracy, which was coined by the political scientist Samuel P. Huntington in 1990's. According to his study, there are three different waves of global democratic transition and democratization in the early 19th century such: First Wave- Jacksonian democracy in the United States in the early 19th century to 1922, Second Wave – After World War II till later in 1962 and Third Wave – from 1974 towards the democratic transition by

leading sub-Saharan Africa starting in 1989, focusing the 'War on terrorism" since post 9/11 in the United States. Huntington clearly identifies five main factors for the rise of 'Third Wave' democracy (Huntington, 1991). In addition, Huntington identifies the problems related to democratic consolidation as contextual, transitional, and systemic.

Throughout the post-Cold War era, a majority of sub-Saharan African nations was governed by different political concepts of democracy by single party, military (armed conflict), transitional democracies and selected "big man" elite regimes, where the minority rules the majority. Despite the trends of promising democratization, sub-Saharan Africa was successful in implementing the African Union (AU), which focuses its principle energy towards 'good governance" with political rights as well as civil liberties. In addition, most sub-Saharan African countries have formally adopted market-based reforms with 'strings attached' external actors from the Western world like the World Bank or International Monetary Fund (IMF) to assist with much needed financial assistance with limited mobility unlike Chines investments in sub-Saharan Africa.

Finally, taking all these possibilities into account, this paper analyses how the status of democracy (regime type) in sub-Saharan Africa affects human development in the region from the 1990-2014.

Hypotheses

This research uses two models to test the hypotheses; a simple linear regression and aone-way analysis of variance.

Hypotheses for the simple linear regression models
1. There is a negative linear association between regime status score and Life expectancy at birth.
   i.e.if the freedom rating score is high then the average life expectancy at birth will be low.
2. There is a negative linear association between regime status score and the Education index.
   i.e.if the freedom rating score is high then the averageEducation index will be low.
3. There is a negative linear association between the regime status score and the logarithm of gross national income.
   i.e.if the freedom rating score is high then the average logarithm of gross national income will be low.

We will investigate these hypotheses for years 1990, 1995,2000,2005,2010and 2014.

Hypotheses for the one way Analysis Of Variance (ANOVA) models
1. The mean life expectancy at birth for free, partly free and not free countries are not the same.
2. The mean Education Index for free, partly free and not free countries are not the same.
3. The mean logarithm of (Gross National Income) for free, partly free and not free countries is not the same.

We will investigate these hypotheses for years 1990,1995,2000,2005, 2010 and 2014.

IV. ANALYSIS/DISCUSSION

Table 2 shows the simple linear regression model results between dependent variables Life Expectancy at Birth (LEB), Education Index (EDU), Logarithm of Gross National Income per capita (LOG_GNI) and the independent variable Democracy Score for years 1990, 1995, 2000, 2005, 2010 and 2014.The simple linear regression analysis is a statistical technique that attempts to explore and model the relationship between two or more quantitative variables.

Simple linear regression analysis results

The results ofLEB, EDU and LOG_GNI as dependent variables in the simple linear regression analysis are shown in Table 2.

Table 2 results of series of simple linear regression models such as this:

$$Dependent\widehat{Variable} = y intercept + slope \times DemocracyScore$$

For example; simple linearregression model for the LEBfor year 1990 is
LEB_90 = 67.91-2.85*DEMOCRACY_90 (shown in Appendix A)

P- Value corresponds to a statistical test that tests whether there is a significant linear relationship between the independent variable and each dependent variable for years 1990, 1995, 2000, 2005, 2010 and 2015. By definition, p-value measures the probability of getting samples as extreme as or more extreme than ours under the assumption that there is no linear association between our dependent and independent variables. We will compare the p-value to the 0.05 level of significance. If the p-value is less than 0.05 we will reject our initial, assumption of there is no linear association and conclude that there is a significant linear association between our independent and dependent variables.

In Table 2, the p-values marked with asterisk have low p-value significance at an alpha level of 0.05. Both LEB and EDU variables have a significant linear relationship with the independent variable Democracy score for all the years considered here. This is an important finding as democracy has a direct impact on average life expectancy at birth and education of a country. The only linear relationships that are not significant are LOG_GNI with the Democracy score for years 2005, 2010 and 2014. There may be another underlying reason for this, which needs to be investigated. Refer to Figure 1 and Appendix for scatter diagrams that visualize these linear associations.

Table 2: Simple Linear Regression Analysis Results

Year	Dependent Variable	Intercept Constant	Slope	Correlation	P-value
1990	LEB_90	67.91	-2.85	-0.4582	0.0015*
	EDU_90	0.49	-0.04	-0.4018	0.0307*
	LG_GNI_90	3.95	-0.12	-0.4397	0.0032*
1995	LEB_95	62.47	-2.19	-0.4600	0.0012*
	EDU_95	0.5	-0.04	-0.4628	0.0077*
	LG_GNI_95	3.64	-0.09	-0.3496	0.0211*
2000	LEB_00	59.94	-1.61	-0.3627	0.0132*
	EDU_00	0.5	-0.033	-0.4037	0.0098*
	LG_GNI_00	3.63	-0.07	-0.30	0.0451
2005	LEB_05	61.34	-1.55	-0.3717	0.011*
	EDU_05	0.507	-0.02	-0.3694	0.0125*
	LG_GNI_05	3.58	-0.06	-0.1416	0.128
2010	LEB_10	64.23	-1.41	-0.3717	0.011*
	EDU_10	0.57	-0.03	-0.4203	0.004*
	LG_GNI_10	3.61	-0.05	-0.1950	0.1997
2014	LEB_14	66.49	-1.43	-0.4318	0.0022*
	EDU_14	0.58	-0.03	-0.4422	0.0019*
	LG_GNI_14	3.69	- 0.06	-0.2543	0.0845

*significant at P-value level of 0.05

•   Independent variable is regime status score.

Source: The researcher

Notes: Table 2 shows the simple linear regression results with all the intercepts, slopes, correlations and P-values.

Refer to Table 2. Correlation coefficients in the correlations column shows that democracy has a moderate negative linear relationship with LEB and EDU for all 6 years. Correlation measures the strength of a linear association between two quantitative variables and could range from -1 to 1. Correlation values are categorized into three levels; 1- 0.7 strong, 0.7-0.3 moderate, and 0.3 - 0 is weak; values are absolute as shown in Table 2, LOG_GNI and democracy have a weak association based on correlation coefficient for years 2005, 2010, 2014. This pattern is worth investigating further.

The column Slope in Table 2 explains the relationship effects of a change, in the independent variable and dependent variables. This study shows all negative slopes, that also implies higher the democracy score (less democratic the countries are) the lower the LEB, EDU and LG_GNI is going to be. For example, LEB for 1990 has a slope of -2.85. Which we interpret as follows: If the Democracy score goes up by one point, the life expectancy at birth decreases by 2.85 years on average. The number in column Intercept Constant tells us, the average value of our LEB, EDU and LOG_GNI are when the Democracy score is 0. The y-intercept is not meaningful here in this context as this score is not defined at 0.

Simple linear regression results for the dependent variable Life Expectancy at Birth

According to the simple linear regression model, there is a moderate negative linear association between LEB and Democracy Score for years 1990, 1995, 2000, 2005, 2010 and 2014. For example in year 1990, LEB decreases 2.85 years on average for one point increase in Democracy score. Life Expectancy at Birth decreases 2.19, 1.61, 1.55, 1.44 and 1.43 years on average for 1995, 2000, 2005, 2010 and 2014 respectively. This is possibly a good trend. It may indicate an improvement of economy, health facilities, increase in external funding and people's awareness of health issues contributing to the well-being of societies.

Simple linear regression results for the dependent variable Education Index

According to the simple linear regression model, there is a moderate negative linear association between EDU and Democracy Score for years 1990, 1995, 2000, 2005, 2010 and 2014. The EDU decreases 0.04 units on average for an additional democracy score in year 1990. In addition, Education Index decreases .04, .03, 0.02, 0.03 and 0.03 units on average for 1995, 2000, 2005, 2010 and 2014 respectively following the same pattern as the LEB.

Logarithm of GNI

According to the simple linear regression model, there is a moderate negative linear association between Logarithm of GNI and average democracy score for years 1990, 1995, and 2000. There is no statistically significant linear relationship between logarithm of GNI and average democracy score for years 2005, 2010 and 2014. For example, the logarithm of GNI decreases 0.12 units on average for an additional democracy score in year 1990. The logarithm of GNI decreases 0.09 and 0.07 years on average for 1995 and 2000 respectively.

As seen in Figure 1, the data indicate that the country level human development indicators for dependent variables such as LEB-14, EDU_14, and LG_GNI_14 are negatively correlated with the independent variable democracy (F- Free, NF- Not Free, PF- Partly Free).

Figure 1: Scatter plot of human development indicators vs. Democracy in 2014
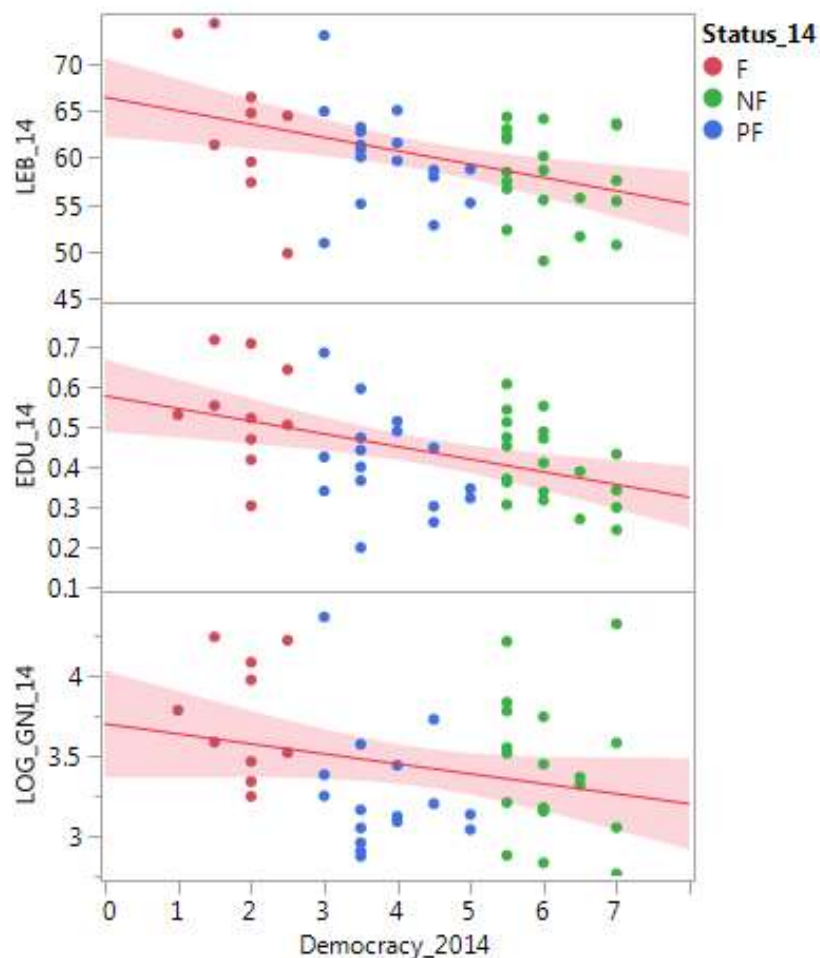
Source: Authors calculation based on data from UNDP (2016), Freedom House (2016b).

<u>Notes</u>: Figure 1 shows linear association between dependent variables Life Expectancy at Birth (LEB_14), Education Index (EDU_14), and Logarithm of GNI (LOG_GNI_14) and independent variable Democracy Score FOR (F- Free, NF- Not Free, PF- Partly Free) countries. Their correlations and regression models are based on average country level data for the years 1990- 2014.

One-way ANOVA results:

The one-way analysis of variance (ANOVA) issued to determine whether there are any statistically significant differences between the means of three or more independent (unrelated) groups. in this study, we will be comparing free (F), partly free (PF) and not free (NF) regime types considering their average LEB, EDU and LOG_GNI. We used a one-way ANOVA model to test the null–hypothesis; average LEB is same for all three-regime types against the alternative the average LEB is different for at least one regime type. Similar models were constructed for dependent variables EDU and LOG_GNI. These models were constructed for years 1990, 1995, 2000, 2005 and 2010. Table 3 shows the results of a series of tests for each dependent variable for each year.

Table 3: One way ANOVA Results

Year	Dependent Variable	n	F statistic	P-value
1990	LEB_90	45	3.96	0.0306*
	EDU_90	30	2.92	0.0708
	LG_GNI_90	43	4.52	0.0169*
1995	LEB_95	47	3.97	0.0261*
	EDU_95	33	2.81	0.076
	LG_GNI_95	46	2.11	0.134
2000	LEB_00	47	4.03	0.024*
	EDU_00	41	3.59	0.037*
	LG_GNI_00	46	3.77	0.031*
2005	LEB_05	47	3.03	0.059
	EDU_05	46	3.03	0.059
	LG_GNI_05	46	3.06	0.057
2010	LEB_10	47	4.15	0.022*
	EDU_10	46	4.08	0.024*
	LG_GNI_10	46	6.01	0.005*
2014	LEB_14	48	3.22	0.0494*
	EDU_14	47	4.61	0.0152*
	LG_GNI_14	47	4.84	0.0126*

*Significant at alpha =0.05
- Independent variable is Regime Type(F, PF, NF)
- Dependent variables are LEB, EDU and LOG_GNI.

Source: The researcher

<u>Notes</u>: Table 3 shows results of one-way ANOVA models for dependent variables LEB, EDU and LOG_GNI for years 1990, 1995, 2000, 2005, 2010 and 2014

Again the low p-values, the ones marked with * indicate differences between average LEB, EDU and LOG_GNI for free, partly free and not free countries. The one way ANOVA model uses an F-test to compare the fit of different linear models in this study by assessing multiple coefficients simultaneously.
The hypotheses for the F-test in one way ANOVA for the dependent variable LEB are as follows:
- Null hypothesis: mean LEB for free = mean LEB for partly free = mean LEB for not free (against)

▪ Alternative hypothesis: At least one regime type has different mean LEB

Similar hypotheses were tested for EDU and LOG_GNI for years 1990, 1995, 2000, 2005, 2010 and 2014. Based on the one way ANOVA tests the following results were obtained.

Life Expectancy at Birth

There is a significant difference in mean LEB for free, partly free and not free countries. This was consistent for years 1990, 1995, 2000, 2005 and 2014, but not for year 2010.

Education Index

A statistically significant difference in mean EDU exist free, partly free and not free counties in years 2000, 2010 and 2014.

Logarithm of GNI

In addition, it can be concluded that there is a significant mean difference in logarithm of GNI free, partly free and not free countries for years 1990, 2000, 2010 and 2014.

Pair wise comparisons using Tukey –Cramer HSD for all pairs

When one-way ANOVA results are significant, meaning that at least one a regime type has different average, It is worthwhile to investigate where the differences lie. This was done using Tukey Cramer pairwise comparisons. We compared average LEB for free regimes to not free regimes, free regimes with partly free regimes and finally partly free to not free regimes. Similar procedures were done for EDU and for LOG_GNI also for years 1990, 1995, 2000, 2005, 2010 and 2014. Out of all the pairwise comparisons, only the significant (p-value less than 0.05) Tukey- Cramer pairwise comparisons are given in Table 4.

Table 4: Pair wise comparisons using Tukey –Cramer HSD for all pairs

Year	Dependent Variable	Pair/s	Difference	P-value
1990	LEB_90	F-NF	10.83	0.0331
	LG_GNI_90	F-NF	0.95	0.0306
1995	LEB_95	F-NF	8.48	0.0197
2000	LEB_00	F-NF	7.18	0.0223
	EDU_00	F-NF	0.14	0.0284
	LG_GNI_00	F-NF	0.41	0.0235
2010	LEB_10	F-NF	6.28	0.0319
		F-PF	6.04	0.0293
	EDU_10	F-NF	0.12	0.0401
		F-PF	0.12	0.0277
	LG_GNI_10	F-PF	0.51	0.0051
2014	LEB_14	F-NF	5.41	0.0384
	EDU_14	F-NF	0.13	0.0167
		F-PF	0.12	0.0326
	LG_GNI_14	F-PF	0.48	0.0094

*Significant at alpha =0.05

• Independent variable is Democracy Score

Source: The researcher

Notes: Table 4 shows only significant pair-wise comparisons using Tukey–Cramer HSD for all pairs of independent variable Democracy score between F-NF regimes, F-PF regimes and PF-NF regimes.(F-Free, NF-Not Free, PF- Partly Free).

There is a statistically significant mean difference in LEB between free and not free countries except for year 2005. Year 2005 has different results than rest of the years I have studied in this research. There could be underlying reason for such results in year 2005, which cannot be determined using the data available. In addition, there is a significant mean difference in free and partly free countries when it comes to LEB in year 2010. Table 4 lists only the significantly different pairwise comparisons.Overall, we see the average LEB, EDUand LOG_GNI are significantly different between free and not free countries. This indicates the importance of democracy when it comes to human development.

V. CONCLUSION

This research has analyzed the effects of the political democracy on human development in sub-Saharan countries tested in a number of regression models covering the period 1990-2014. The test of regression included data from 48 sub-Saharan African countries (see Appendix A, Table 6).The empirical findings of this study have confirmed the hypothesis that democracy has a significant effect on human development. According to the results obtained for these analyses, conclude that statistically significant evidence as the dependent variable that Life Expectancy at Birth and Education Indexare negatively correlated with the Democracy Score from Freedom House. This pattern follows in five out of six years in this study. The logarithm of GNI shows a negative linear association in only two years. In addition, results show significantly different mean Life Expectancy at Birth, Education Index and LOG_GNI for most years' free, partly free and not free countries studied based on the ANOVA models.

All statistical methods show the importance of democracy when it comes to improving the LEB, EDU and LOG_GNI ultimately contributing to better human development in countries.

This study raised several important questions and suggestions for a number of research areas, which will be required for future research. First, while analyzing Freedom House data to test countries democratic status, we could also use the Polity IV and Worldview survey data to run these regression analyses to test given hypothesis. In addition, we can research on the reverse causality of Human development effect on democracy. Further, given the importance of the methodology, we can use mixed methods to test these hypotheses by combining comparative case studies and qualitative methods.

Appendix A
**Table 3: Results of series of simple linear regression models and Linear Fit results**

| Variable	R Square	P-value for the model	Linear Fit
LEB_90	-0.4582	0.0015	LEB_90 = 67.918202 - 2.8484114*AVG_90
EDU_90	-0.4018	0.0307	EDU_90 = 0.4939344 - 0.036851*AVG_90
GNI_90	-0.3726	0.0139	GNI_90 = 8229.9977 - 983.82057*AVG_90
LOG_GNI_90	-0.4397	0.0032	LOG_GNI_90 = 3.954942 - 0.1244771*AVG_90
LEB_95	-0.46	0.0012	LEB_95 = 62.468146 - 2.1911597*AVG_95
EDU_95	-0.4628	0.0077	EDU_95 = 0.5044441 - 0.0398896*AVG_95
GNI_95	-0.3429	0.0211	GNI_95 = 6238.1377 - 746.05832*AVG_95
LOG_GNI_95	-0.3496	0.08186	LOG_GNI_95 = 3.6427915 - 0.0871527*AVG_95
LEB_00	-0.3627	0.0132	LEB_00 = 59.941494 - 1.6073062*AVG_00
EDU_00	-0.4037	0.0098	EDU_00 = 0.5061999 - 0.0331161*AVG_00
GNI_00	-0.2876	0.0554	GNI_00 = 6258.045 - 689.85062*AVG_00
LOG_GNI_00	-0.3	0.0451	LOG_GNI_00 = 3.6335288 - 0.0764058*AVG_00
LEB_05	-0.37168	0.011	LEB_05 = 61.13951 - 1.5528477*AVG_05
EDU_05	-0.36939	0.0125	EDU_05 = 0.5076265 - 0.0293054*AVG_05
GNI_05	-0.14164	0.3533	GNI_05 = 5416.9214 - 416.78729*AVG_05
LOG_GNI_05	-0.2346	0.1208	LOG_GNI_05 = 3.589096 - 0.0616393*AVG_05
LEB_10	-0.37166	0.011	LEB_10 = 64.233281 - 1.4097275*AVG_10
EDU_10	-0.42029	0.004	EDU_10 = 0.5660641 - 0.0323127*AVG_10
GNI_10	-0.06456	0.6735	GNI_10 = 5389.1496 - 240.86022*AVG_10

|			
LOG_GNI_10	-0.19502	0.1992	LOG_GNI_10 = 3.6158678 - 0.052288*AVG_10
LEB_14	-0.43181	0.0022	LEB_14 = 66.490979 - 1.4313741*AVG_14
EDU_14	-0.44215	0.0019	EDU_14 = 0.5774612 - 0.0316237*AVG_14
GNI_14	-0.19092	0.1968	GNI_14 = 7237.9763 - 620.00578*AVG_14
LOG_GNI_14	-0.25432	0.0845	LOG_GNI_14 = 3.6989932 - 0.0622436*AVG_14

Source: The researcher

Note: MP PRO 13 statistical software was used to analyze the data for the models.

Figure 2: Scatter plots of human development indicators vs. Democracy in years 1990-2014.
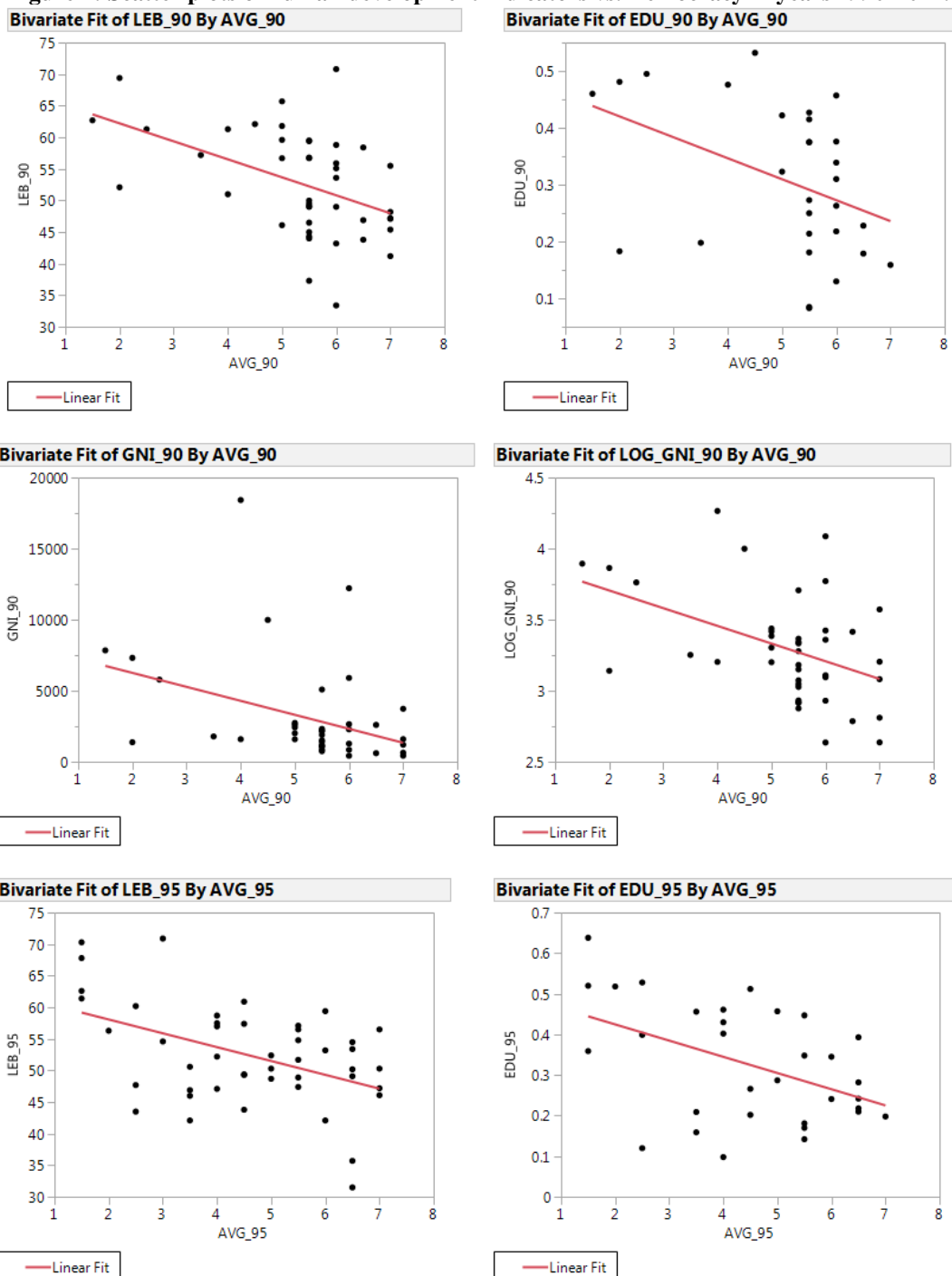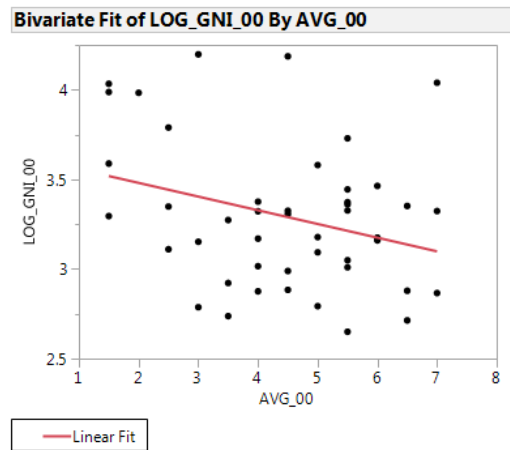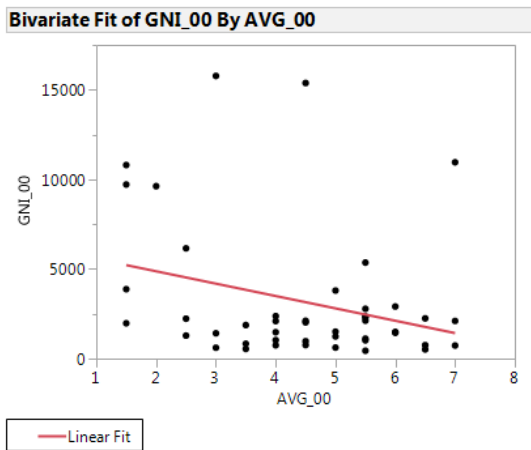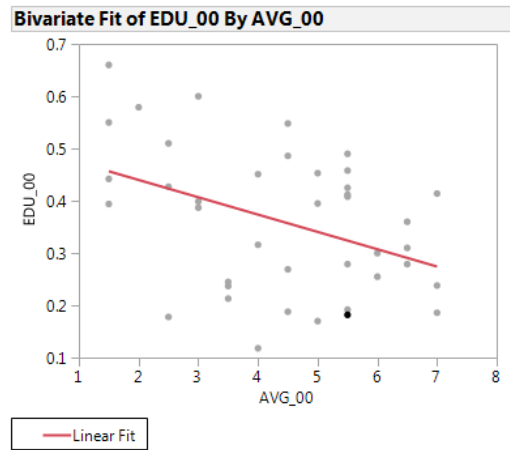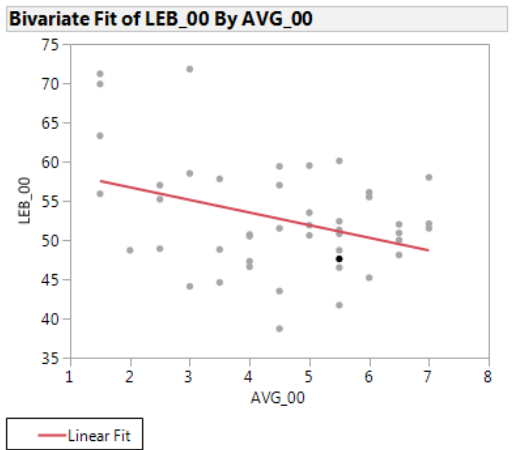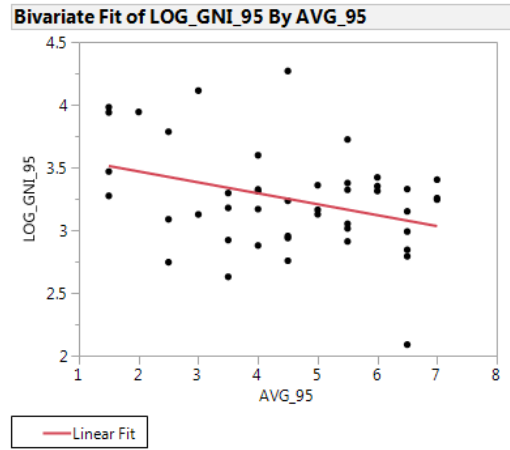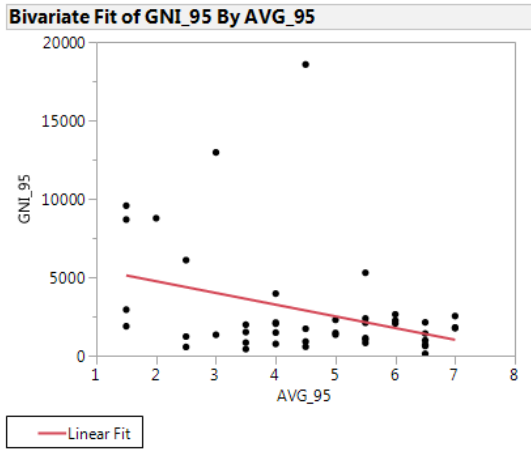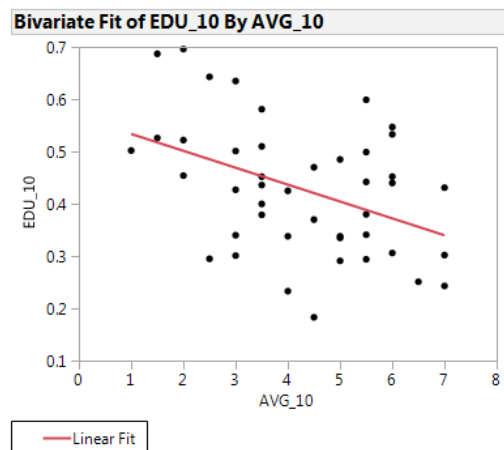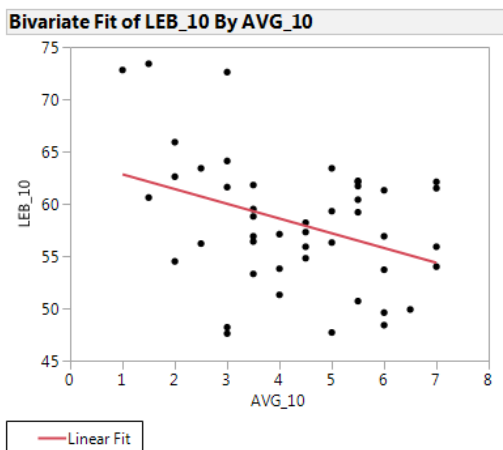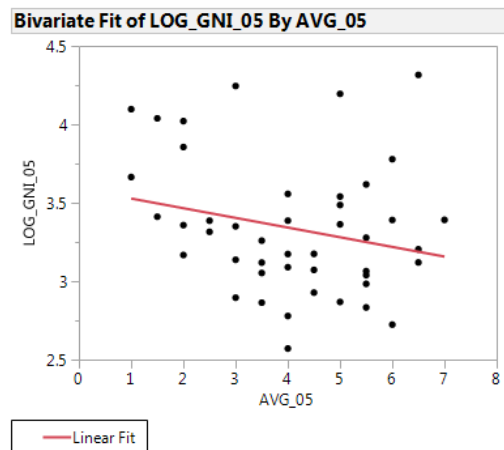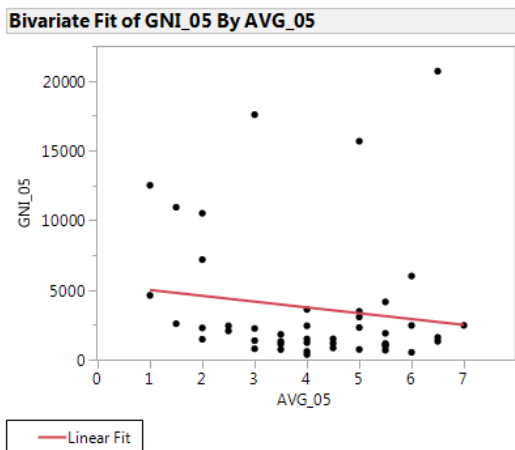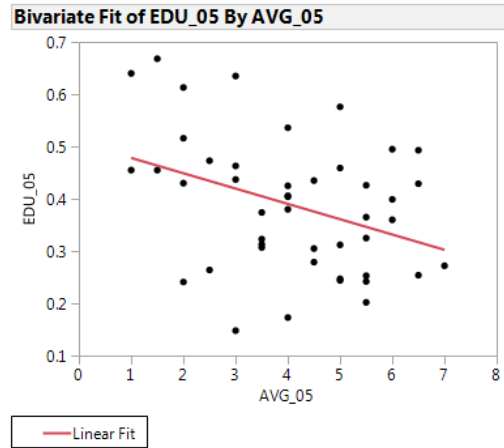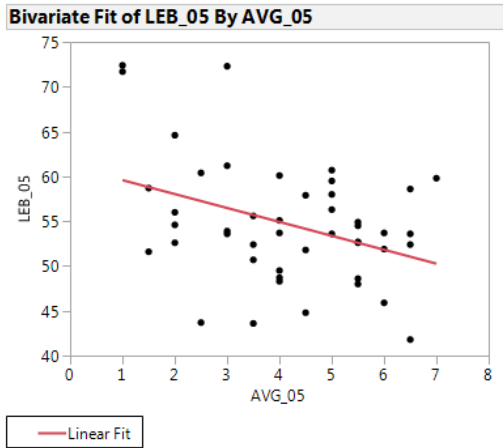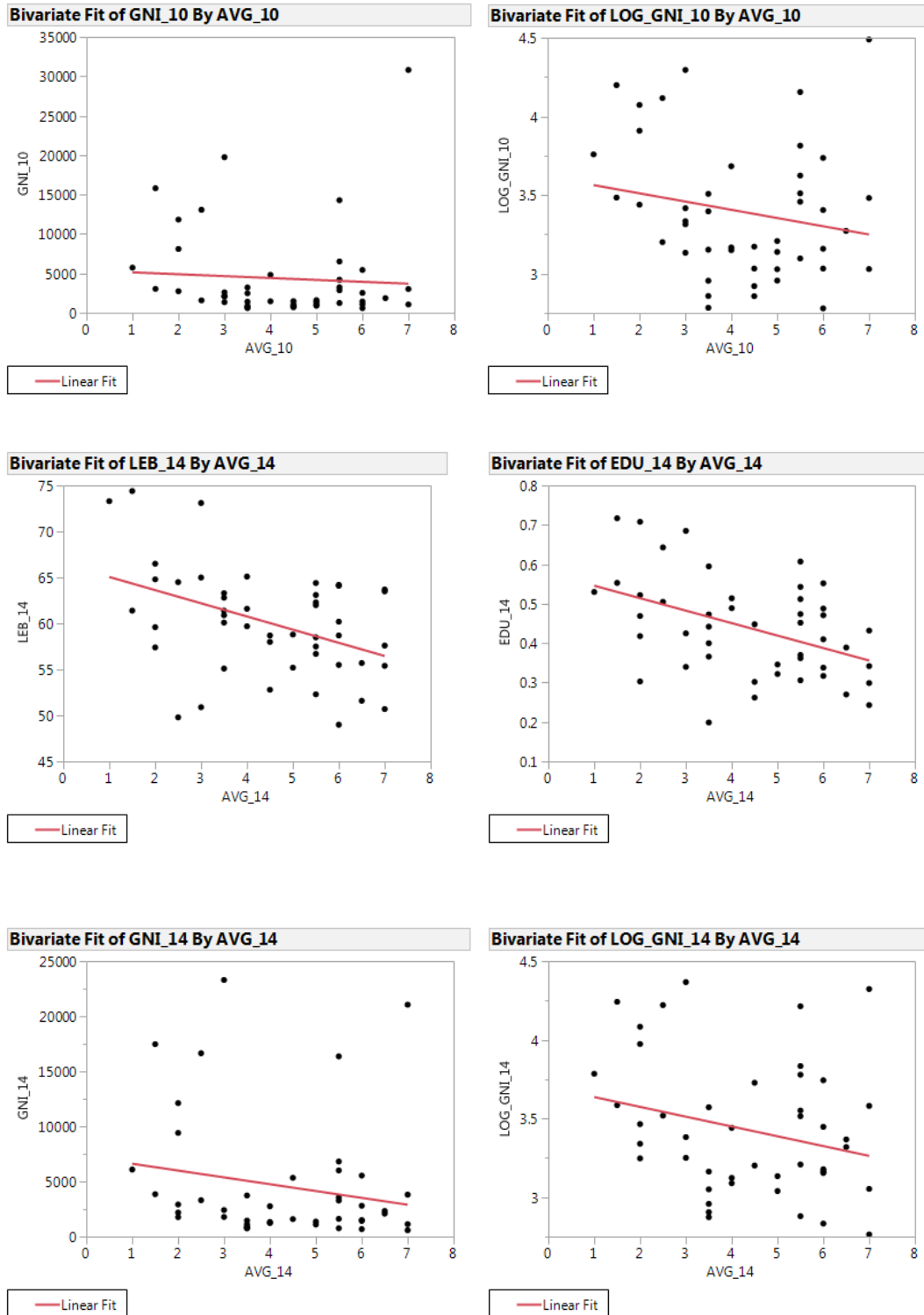
Source: Authors calculation, based on data from UNDP (2016), Freedom House (2016b).

Notes: Figure 2 shows correlations between dependent variables such Life expectancy at birth (LEB), Education Index (EDU), and Logarithm of GNI (LOG_GNI) and independent variable Democracy score (Ave) (F- Free, NF- Not Free, PF- Partly Free) are plotted. Their correlations are based on average country level data for the years 1990- 2014.

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