Determinants of Per Capita Alcohol Consumption in Africa: A Cross-section Approach

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Abstract

This paper analyses the determinants of alcohol consumption in Africa, including North African countries. The descriptive data analysis is complemented with a formal quantitative cross-sectional analysis that includes 51 African countries that have data on alcohol consumption. The results show that economic, demographic and religious factors are statistically significant in explaining the patterns of alcohol consumption per capita. Given that the coefficients for price responsiveness are very low, there is considerable room for the use of taxation instruments to earn some revenue rather than to reduce alcohol consumption. By extension, the low coefficients for price and GDP/capita serve to explain the rapid rise of black markets for alcohol observed in both South Africa and Namibia during the Covid-19 lockdown.

Keywords: Africa, alcohol, alcohol consumption per capita

1. Introduction

This paper examines the economic, social and cultural factors that determine the per capita alcohol consumption in Africa. Empirical studies on alcohol consumption are very few, despite its negative social effects—especially of excessive alcohol consumption—on health and social behaviour, for example, gender-based violence. Some governments in Africa—e.g., South Africa and Namibia— responded to the Covid-19 pandemic by banning the purchase of alcohol, even for consumption in private residences, as an initial response to the pandemic. This was the motivation for this study: an attempt to understand the factors that determine the consumption of alcohol as excessive drinking of alcohol has sometimes been frowned upon even at the highest levels of government.[1] This paper takes both a descriptive and formal analytical approach to the question of the levels of alcohol consumption on the continent, making use of the World Health Organization (WHO) database on alcohol, which is discussed in the section on data.

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[1] President Kenneth Kaunda, the founding president of Zambia, famously said in November 1973 that he would quit politics unless they (Zambians) drank less. He went on to say he would rather die than "run a drunken nation." see *New York Times* June 2, 1974 https://www.nytimes.com/1974/06/03/archives/kaundas-appeal-on-drinking-draws-attention-to-urban-problem-in.html downloaded March 5th 2021. When President Kaunda died at the age of 96, Zambians were on average amongst the middle ranking drinkers on the continent.

The paper is organized as follows. The next section presents the literature in two parts. The first part reviews various economic and social studies of the determinants of alcohol consumption globally; while the second reviews studies on alcohol consumption in Africa. The third section is on the methodology, whereby the first part analyses the data used and presents the descriptive statistics; and the second part presents the empirical model that shows the relationship between economic, social, religious, and historical factors and the levels of alcohol consumption per capita in Africa. The last section presents the conclusion and discusses policy considerations.

2. Literature Review

The total volume of global alcohol consumed per year increased from approximately 20,999m litres to 35,676m litres per year between 1990 and 2017 (Manthey et al. 2017). Globally, alcohol consumption spans millennia (Freeman & Parry, 2006). On the African continent, as is the case across the world, alcohol has been—and is still—consumed at ritual and/or traditional ceremonies, weddings, funerals, and celebrations; and as a daily practice it is commonly used to relieve stress (Abbey et al., 1993; Freeman & Parry, 2006). Various studies have analysed the effects of alcohol consumption including health, psychological, social, and economic effects; and the determinants of alcohol consumption (Freeman & Parry, 2006; Xu & Chaloupka, 2011; Ferreira-Borges et al., 2016; Pryce, 2016; Pryce et al., 2019). The relationship between alcohol consumption and its various determinants is complex. Though seemingly similar, factors may have varying effects and explanations as to how much alcohol is consumed, why it is consumed, and what determines its consumption. The continued consumption of alcohol and the passing down of the habits of consumption does not explain adequately the continued consumption of alcohol. This section of the study is confined to a discussion of some of the issues that sheds light on the understanding of the determinants of alcohol consumption, and not on its effects on the consumer or parts of society.

Price as a determinant of alcohol consumption continues to receive considerable attention. The law of demand states that an increase in the price of a good leads to an eventual reduction in the consumption of the good, particularly so for ordinary goods such as alcohol (Fogarty, 2009; Pryce et al., 2019). Governments commonly use price— and/or price effects—to balance the twin objectives of containing excess alcohol consumption, and collecting tax revenue from its consumption. The price effects vary among individual consumers, depending on whether an individual is a light drinker, a moderate drinker or a heavy drinker (Xu & Chaloupka, 2011; Pryce et al., 2019). For example, heavy drinkers may not be as responsive to price in terms of the quantity of alcohol consumed as other categories of drinkers since they are more likely to go for cheaper substitutes when prices increase. Yet, several studies have found a negative relationship between price and alcohol consumption, as per the law of demand (Xu & Chaloupka, 2011; Cook et al., 2011; Institute of Alcohol Studies, 2017; Sharma et al., 2017; Pryce et al., 2019).

Income is another factor that has been identified as having a significant influence on alcohol consumption. Various studies assert that alcohol is a normal good (Fogarty, 2009; Pryce, Hollingsworth & Walker, 2018). A normal good in this

instance is one where the quantity demanded increases as income increases. Sobhe, Kasseeah, Tandrayen-Ragoobur and Gopaul (2015) found a positive relationship between alcohol consumption per capita and income in Mauritius; Hoffer et al. (2017) found that an increase in household income increases alcohol expenditure; Murakami and Hashimoto (2019), in a study on Japan, found that lower-income individuals are less likely to become heavy drinkers. However, some studies have found that alcohol consumption could have a negative relationship with income (de Oliveira & de Souza, 2018).

Unemployment, which generally characterizes low or no income by the populace, is also considered a significant determinant of alcohol consumption. Several studies have found a positive relationship between alcohol consumption and unemployment (Bryden, Roberts, Petticrew & McKee, 2013; Popovici & French, 2013; Bosque-Prous et al., 2015; Kossova, Kossova & Sheluntcova, 2017). Kossova, Kossova and Sheluntcova (2017) focus particularly on wine consumption. This positive relationship between alcohol consumption and unemployment is generally attributed to the 'leisure time' that unemployment affords. Even with low- to no-formal income, alcohol acts as a means of dampening the negative socio-psychological effect of being unemployed. However, others have occasionally found an inverse relationship between alcohol consumption and unemployment. For example, Lee et al. (1990) found that unemployed people were reported to be non-drinkers in Scotland. Thus, the relationship between unemployment rates and alcohol consumption per capita in the literature is inconclusive.

Education is another factor commonly attributed to influence alcohol consumption. It is generally assumed that educated people have less leisure time and are aware of the health hazards associated with alcohol consumption. Thus, education is taken to be inversely related to alcohol consumption. However, several studies have found that this is not necessarily the case. Wuyts, Barbier and Loosveldt (2016) found that individuals with higher levels of education in European countries are less likely to abstain from alcohol consumption, and consume it more frequently. Similarly, Rosoff et al. (2019) studied the causal association between alcohol consumption and education attainment, and found a positive and significant relationship. Assari and Lankarani (2016) also found in the USA that higher education was associated with a higher probability of drinking—particularly among older American adults. Assari and Lankarani's (2016) study also included interactions between education and race as regards alcohol consumption, and found that the impact of education on alcohol use is considerably smaller among black Americans as compared to white Americans.

An individual's background is influential in shaping his/her behaviour. Thus, a certain behaviour is a result of one's culture, even though it cannot be readily quantified. Bloomfield et al. (2003) argued that the consumption of alcohol depends on whether a country has a 'dry' or 'wet' culture. South European cultures (e.g., European countries bordering the Mediterranean) have alcohol consumption integrated into their daily lives like meals, and are categorized as wet

cultures/countries in this regard. On the other hand, in dry cultures (e.g., Scandinavian countries, the US and Canada), the consumption of alcohol is not common in everyday activity. Bloomfield et al. (2003) found that wet cultures were more likely to spend more on alcohol in comparison to dry cultures. This finding is consistent with Brooks-Russell et al. (2013), who found that culture was a predictor of alcohol consumption.

Similar to culture, religion has also been found to influence alcohol consumption. Holt et al. (2006) scrutinized the relationship between religious affiliation and alcohol consumption among different religious denominations in the US, and found no statistically significant association between the two variables at the national level. However, the study's findings at the regional level were different. The study found an inverse correlation in the Southeast regions and a positive correlation in the Midwest and Northeast regions between religion (categorized by religion adherence rates), and alcohol consumption (categorized by binge drinking rates). The authors note that their findings on the relationship between religion and alcohol may not be religion-based, but rather denomination-specific. After stratifying alcohol consumers into major religious denominational groupings, they found that rates in states with high Catholic adherence corresponded to high drinking rates, whereas rates in states with Evangelical Protestant adherence tended to be lower. Their findings contradict the perception that religious adherence is associated with less alcohol consumption. Similarly, Kalema et al. (2016) studied how religion sways alcohol consumption in Muslim majority countries (MMC). As is generally assumed, their study states that religious institutions, beliefs, and practices offer moral guidance that deters the use of alcohol. Their findings support this assertation as they found that consuming alcohol and drugs by individuals who follow a religion that prohibits the use of alcohol and drugs was low. However, Luczak et al. (2014) suggest that the mitigation of alcohol use among religious believers does not solely depend on religious commitment, but also on whether believers view their religious commitments as a way of promoting alcohol abstinence. These religious commitments highlight the intricate and complex link between alcohol consumption and its various determinants.

Furthermore, demographic factors, such as gender and age—among others—are significant predictors of variations in alcohol consumption (Mutisya & Willis, 2009; de Oliveira & de Souza, 2018; Aksoy et al., 2019). de Oliveira and de Souza (2018) found that alcohol use varied across gender, with men consuming more than women—particularly among public maintenance workers. Similarly, Aksoy et al. (2019) found that male individuals spend more on alcohol than females do. The study further found that one's marital status was significant in explaining alcohol consumption: with married individuals spending more on alcohol than unmarried ones. Some studies have found that alcohol consumption varies with age, particularly when the type of alcohol and the occasions for drinking are considered (Rebholz et al., 2011; Chaiyasong et al., 2018). However, Kuntsche et al. (2004) found that younger people are more likely to engage in heavy episodic drinking than others.

Most of the studies on alcohol consumption in Africa have been undertaken at country level (Mutisya & Willis, 2009; Padrão et al., 2011; Stafström & Agardh, 2012; Teshome & Gedif, 2013). Very few studies have been undertaken at a continental or regional level. Additionally, a majority of the literature focuses on the health and social consequences of alcohol consumption (Kalichmanet al., 2007; Roerecke et al., 2008; Asiimwe et, al., 2015; Ferreira-Borges et al., 2015, Pilleron et al., 2015).

Bryceson's (2002) book, *Alcohol in Africa. Mixing Business, Pleasure and Politics,* addresses how issues of business, pleasure, and politics influence alcohol consumption. This book is a collection of studies by various authors on alcohol from several countries on the continent. In the introduction, the book presents a general background about alcohol's utilitarian value in African societies, and provides a historical overview. Bryceson—with the work of Willis, Tanzarn, and McCall—then discusses the various business aspects of alcohol, as regards some case studies in Tanzania and Uganda. The book then discusses what Bryceson calls the 'political context'. With the respective works of Gewald, Heap, Abbink, Drift, and Pietilä, Bryceson discusses colonial liquor controls in Windhoek, Namibia; issues of liquor revenue in Nigeria; alcohol and cultural hegemony in Maji, southern Ethiopia; cashew wine and the authority of elders among the Balanta in Guinea-Bissau; and issues on drinking among market women and gender politics in Kilimanjaro, Tanzania. The fourth part of Bryceson's collection discusses what she calls social comforts and discomforts. In this section, the book discusses issues of youth drinking in Ghana; and issues of religion and alcohol in Malawi, with the works of Akyeampong and Van Dijk, respectively. The book concludes by discussing what Bryceson terms the darker side of alcohol consumption. She discusses excessive alcohol consumption—or what may be deemed as socially undesirable alcohol consumption—and how various sects of society can discourage the so-called 'vice'.

Moreover, Odejide (2006) reviewed studies on the patterns of alcohol use and consumption in Africa, and found alcohol consumption to have been on the increase among the underaged and young persons (ages 10 to 25 years). The study further found that excessive drinking by youths was found to be facilitated by free drinks at social occasions, marketing, and the production of new alcoholic beverages produced specifically for youth markets. The study also reviews alcohol control policies that are effective in the industrialized world, and recommends policies relevant to Africa to complement the existing alcohol policies in different African countries.

Willis (2006) undertook a historical survey of drinking cultures in Africa and dwelt on why Africans consume alcohol. The study attributes alcohol consumption to the differences between independence and colonization, gender, and one's ability to earn an income (particularly the youth). In regards to the differences between independence and colonization, the study discusses how the consumption of potent liquor was frequently restricted for Africans during the colonial era, which is not the case today; and how this could explain the increase in alcohol consumption. In regards to gender, the study found that gender explained differences in alcohol

consumption. It was found that men generally consumed more alcohol than women; except in Nigeria, South Africa, and Ethiopia, where it was found that women consumed more alcohol than men. Furthermore, the study discusses how in Western and Eastern Africa the ability to earn money through labour wages and the sale of crops has allowed the youth to earn money, and in turn increased their ability to purchase and consume more alcohol.

Lastly, Peer (2017) focuses on alcohol control strategies in Africa, rather than on factors that determine alcohol consumption. Peer contends that alcohol consumption is a threat not only to health but also to sustainable human development, highlighting that alcohol consumption is higher among men, which is consistent with the findings of Willis (2006).

It has been contended elsewhere that alcohol consumption has a large impact on the burden of disease and mortality (Ferreira-Borges et al., 2015); and Africa may not be exceptional. Thus, this study has examined not only the health and social factors linked to alcohol consumption, but also the economic and/or social issues that determine alcohol consumption on the continent to get a more holistic view. As argued earlier, there is no clear or single particular reason as to why alcohol is consumed, or why different cultures or people drink in varying degrees. As the literature has evidenced, alcohol consumption is influenced by a host of factors—income, education level, culture, religion, age, gender, and accessibility, among others—which have motivated this study on Africa in general.

3. The Data and Descriptive Statistics

The data used is for the year 2018, on the average per capita alcohol consumption in several African countries. It was collected from various official website(s) of country reports of the United Nations (UN), World Health Organization (WHO), International Monetary Fund (IMF), World Bank (WB), and the Central Intelligence Agency (CIA). The data constitutes alcohol consumption per capita (WHO), GDP per capita (WB), alcohol price index (IMF), youth unemployment (WB), and educational attainment (WB). The number of people belonging to various religions and denominations was extracted from the World Factbook by the CIA. Christians have been further categorized as Catholic, Protestants and other Christians (consisting of new divisions such as Pentecostals, Born Again, and Free Evangelical Churches, among others). Observations are from 51 African countries, which exclude South Sudan, Eritrea and Ethiopia due to insufficient data.

In this section, the basic features of the selected data are described using the correlation matrix and cross-sectional and trend analyses. Table 1 presents the correlation matrix between alcohol per capita consumption, and the selected social and economic variables of interest. The table shows positive correlations between alcohol consumption and GDP per capita and being Catholic Christian; whereas the correlation of alcohol consumption is negative between all other variables, including the price of alcohol, being Muslim, being a Protestant or belonging to other Christian sects, education attainment, and youth unemployment.

Table 1: Spearman Rank Correlation Table

Correlation t-Statistic	Y	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
Y	1.0000								

X_1	0.3142	1.0000							
	2.2454	------							
X_2	-0.2602	-0.0814	1.0000						
	-1.8279	-0.5539	------						
X_3	0.2336	-0.2154	-0.1434	1.0000					
	1.6296	-1.4966	-0.9827	------					
X_4	-0.3929	-0.1996	-0.2996	0.1087	1.0000				
	-2.8978	-1.3813	-2.1299	0.7414	------				
X_5	-0.0534	-0.2205	-0.0083	0.4684	0.1369	1.0000			
	-0.3628	-1.5332	-0.0566	3.5958	0.9372	------			
X_6	-0.2804	0.1013	-0.0555	0.3259	0.4142	0.5194	1.0000		
	-1.9814	0.6908	-0.3768	2.3378	3.0868	4.1228	------		
X_7	-0.0747	0.0991	-0.0446	0.0879	0.1539	0.1539	0.3373	1.0000	
	-0.5083	0.6758	-0.3029	0.5981	1.0565	1.0565	2.4304	------	
X_8	-0.2096	0.2007	-0.1157	0.3781	0.3535	0.5542	0.8168	0.2233	1.000
	1.4541	1.3896	-0.7902	2.76998	2.56354	4.51530	9.60098	1.55340	------

Notes: Variables Y = Alcohol per capita consumption; X_1 = GDP per capita; X_2 = Alcohol Price Index X_3 = Catholic Christians; X_4 – Muslims; X_5 = Protestants and other Christian divisions; X_6 = Educational attainment-secondary school; X_7 = Educational attainment-Tertiary; & X_8 = Youth Unemployment

Source: Authors' Compilation of Eviews' Output

In terms of magnitudes, the correlation matrix shows GDP per capita and being Muslim to have strong influences on alcohol consumption in Africa relative to other variables (even though this does not mean causation); and that these are the only significant variables (with t-statistics respectively greater than 2). However, the coefficients on the variables are low, approximately 0.3 or lower.

Figure 1 indicates that in most countries, relatively low prices of alcohol record higher levels of alcohol consumption. However, in Sudan, with a large population of Muslims, the price index of alcohol is high and consumption of alcohol is very low.

Figure 2 shows the per capita consumption of alcohol for each African country, and the population of selected religions in those countries. The figure indicates that countries perceived to be largely religious generally have lower levels of alcohol consumption per capita, particularly in countries where the population is predominantly Muslim. In addition, per capita alcohol consumption is relatively low in countries with a high Muslim population in comparison to countries where the population of Catholic Christians is relatively high. Protestants and other Christian denominations, such as Pentecostals, preach against alcohol consumption. As indicated in Figure 2, in countries where these Christian denominations outnumber Catholics, per capita consumption of alcohol is low (Figure 2).
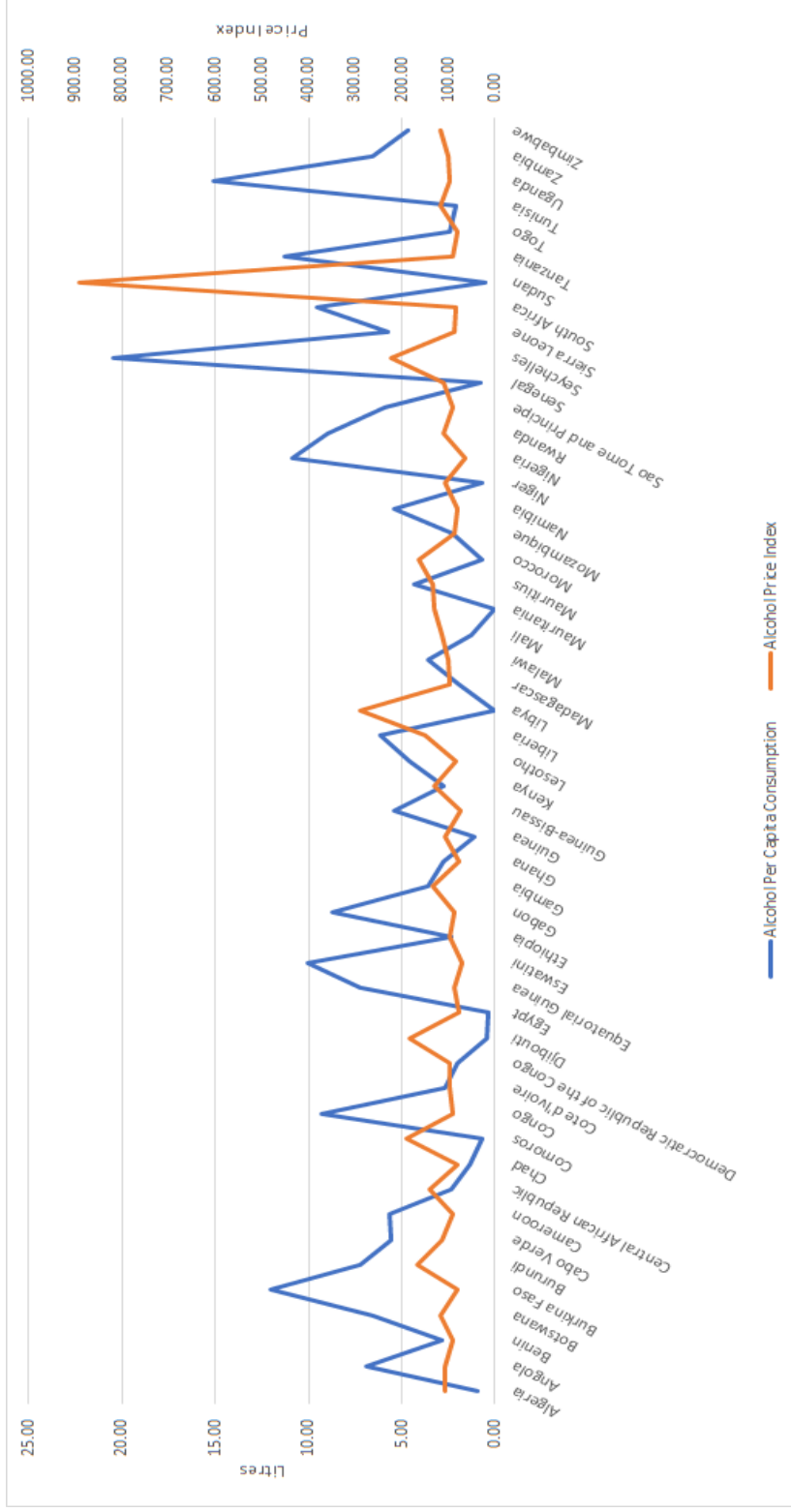
Figure 1: Alcohol Price Index vs Consumption Per Capita Trend
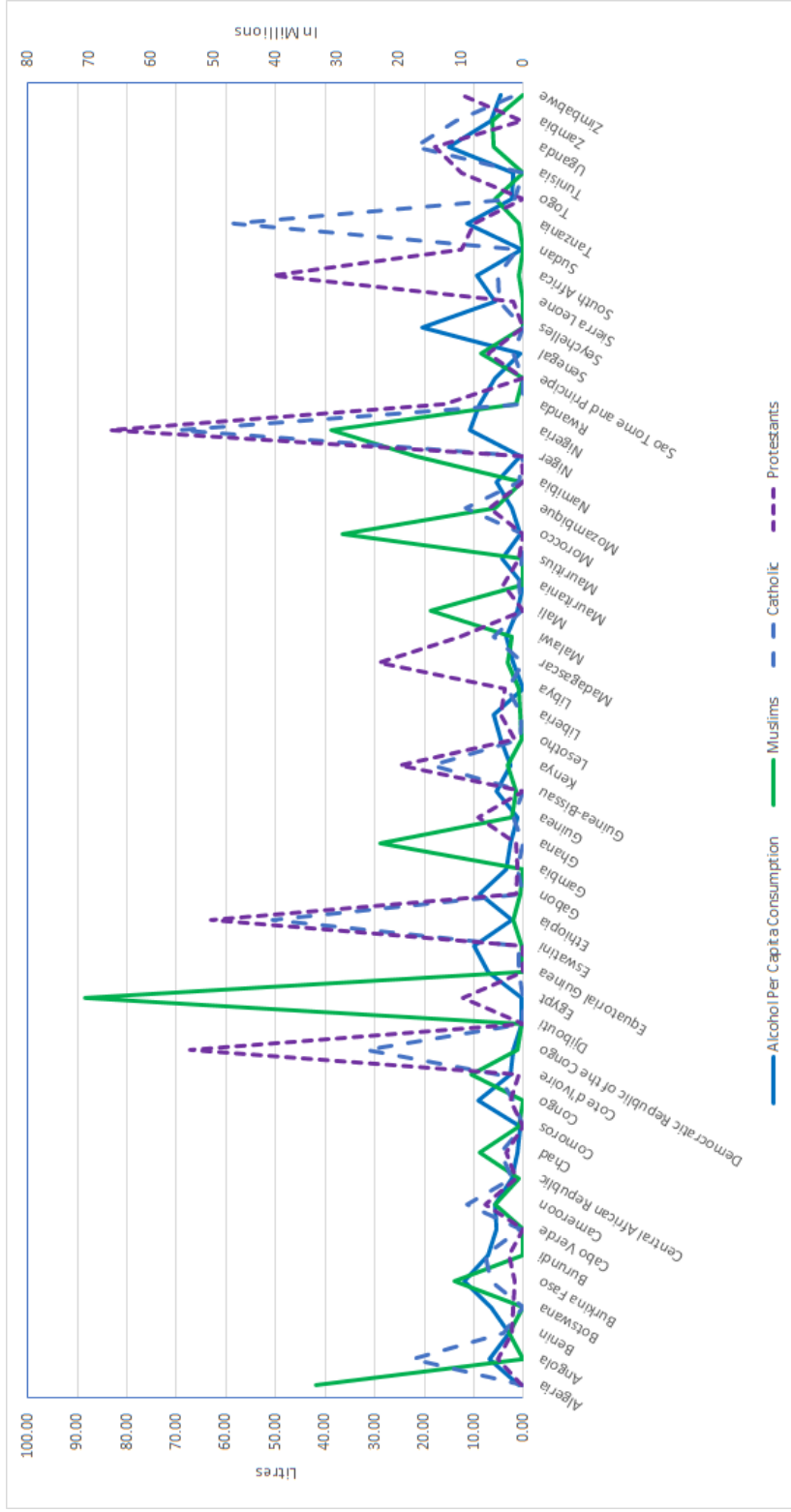
Fig 2: Alcohol consumption and religion

However, countries like Nigeria and Burkina Faso, where the population of Muslims is high, show relatively high levels of alcohol consumption per capita (Figure 3). Nigeria and Burkina Faso seem to be outliers for countries with a large population of Muslims as Islam prohibits the consumption of alcohol.

Concerning education attainment, it is generally expected that people with high educational attainment levels—for example, up to secondary and tertiary education—tend to consume lower amounts of alcohol, as was shown in Table 1. Figure 4 illustrates varying relationships between education attainment and alcohol consumption. In the case for Burkina Faso, Burundi, Cape Verde, Congo, Nigeria, and Seychelles, high levels of alcohol per capita consumption correspond to relatively low levels of secondary educational attainment; whereas in Egypt, high levels of secondary educational attainment correspond with relatively low alcohol per capita consumption, and vice versa.

On employment, in recent years the status-quo of African youth has remained largely unchanged, and continues to be an issue of concern, despite huge investments in the extractive sector and high GDP growth in several countries. These developments continue to impact negatively on socio-economic development in Africa in general (Ackah-Baidoo, 2016). In Table 1, the correlation matrix shows a negative relationship between alcohol consumption and youth unemployment in the continent, which was contrary to expectations. Figure 5 shows varying relationships across African countries between alcohol consumption and youth unemployment. The figure shows Egypt and Tunisia—which are predominantly Muslim states—to have relatively high levels of unemployment, but considerably low alcohol consumption levels. Nigeria and South Africa, on the other hand, have both relatively high levels of youth unemployment and alcohol consumption. However, most states in Africa reflect low levels of youth unemployment and relatively high levels of alcohol consumption, which corresponds to the correlation matrix in Table 1.

GDP growth, or GDP per capita (which is normally used as a proxy for income), is another factor that has been identified to influence alcohol consumption, or expenditure on alcohol. Six (6) out of the top 10 fastest growing economies (GDP growth) in 2020 were African (Bajpai, 2020). It is hypothesized that higher purchasing power leads to more consumption of alcohol. This assertion corresponds with the correlation of GDP per capita with alcohol consumption, which is indicated to be positive. Figure 6 depicts the patterns that correspond with the results of Table 1 concerning the relationship between alcohol consumption and GDP per capita, except for a few countries such as Rwanda and Burundi.

3.1 Colonial Past and Alcohol Consumption
The literature has not examined extensively how Africa's colonial past has influenced the consumption of alcohol. However, culture has a bearing on social-economic behaviour, and one has to consider that colonization affected the various cultures across the continent.
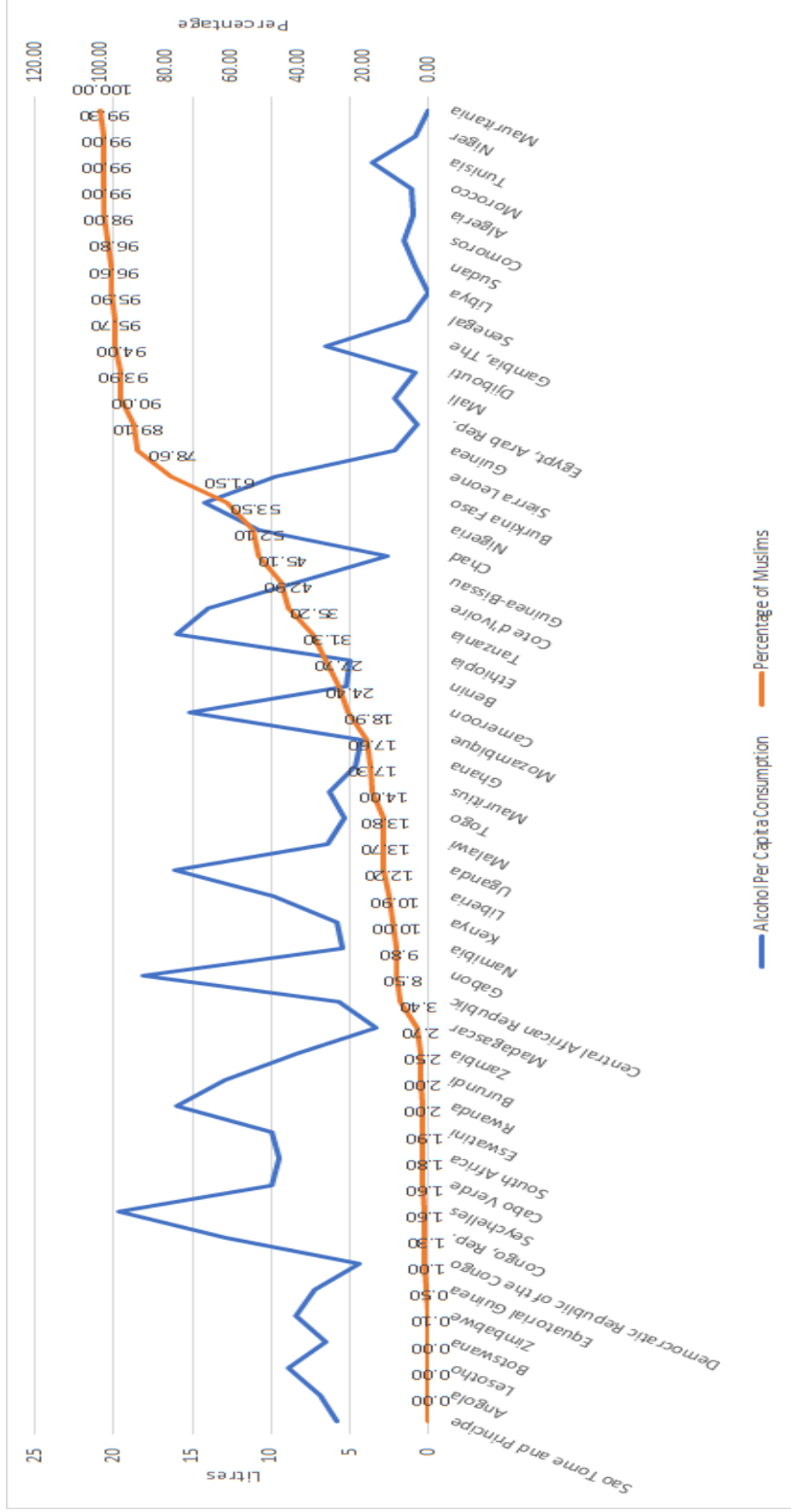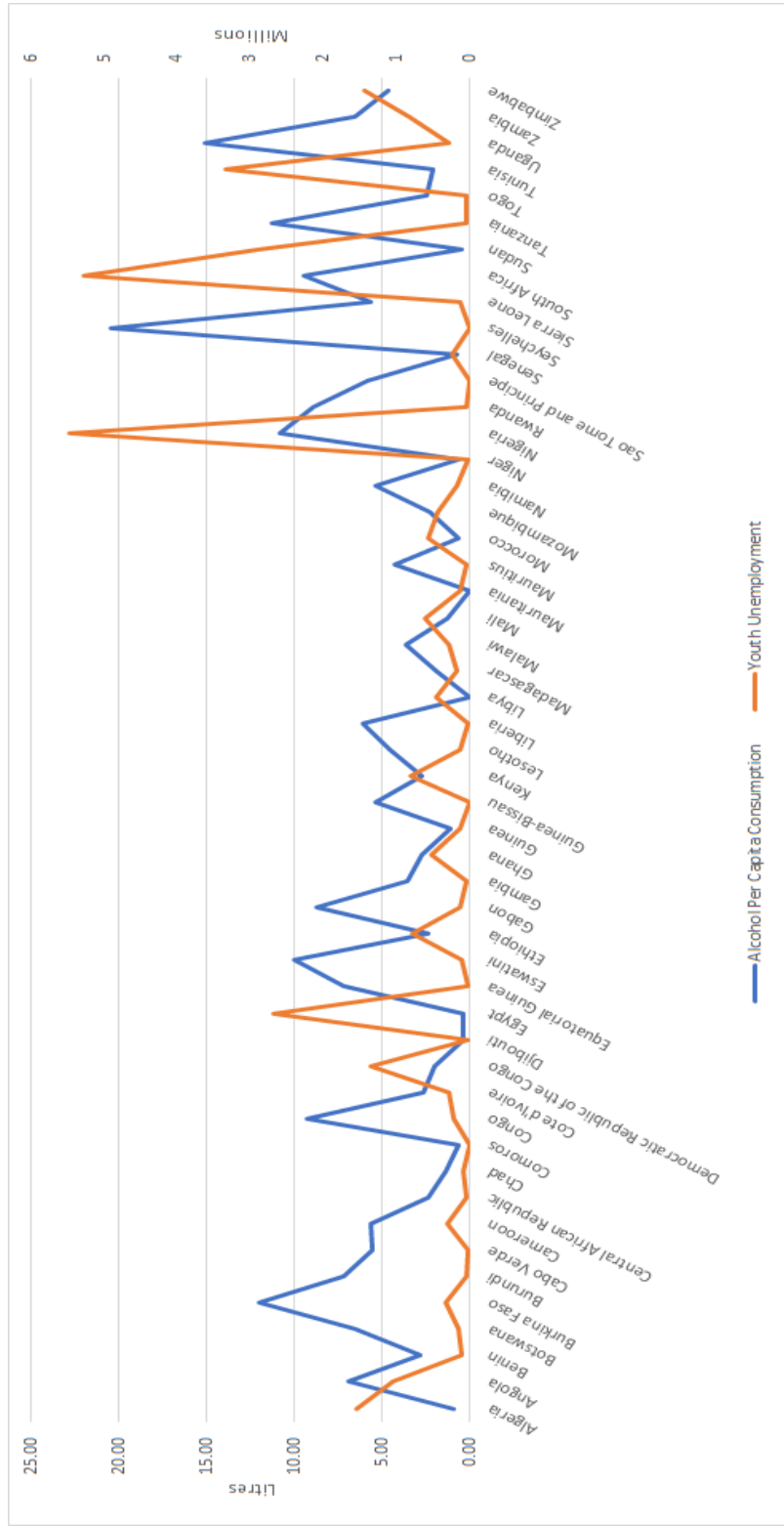
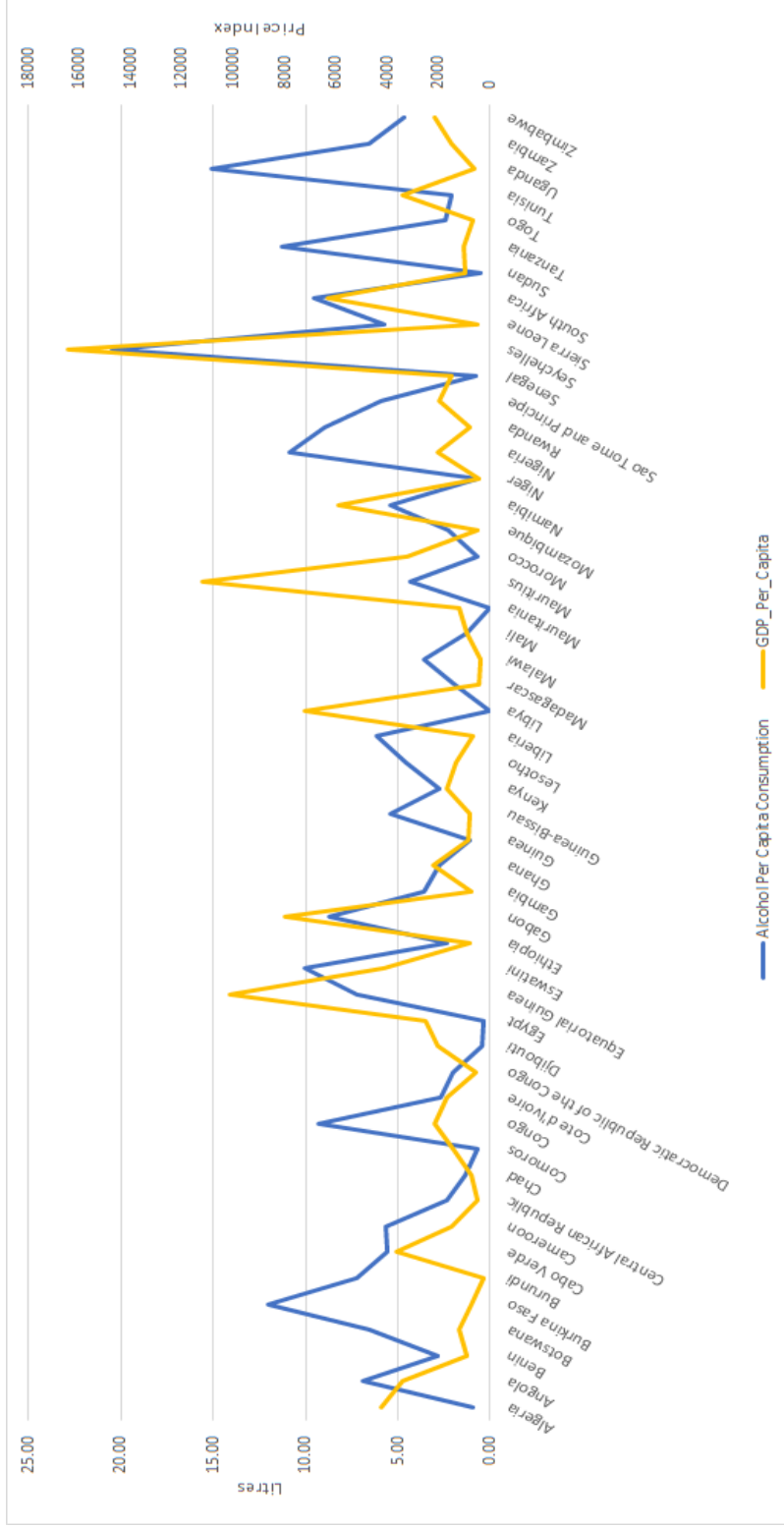**Fig 3: Alcohol per Capita Consumption and the proportion of Muslims**
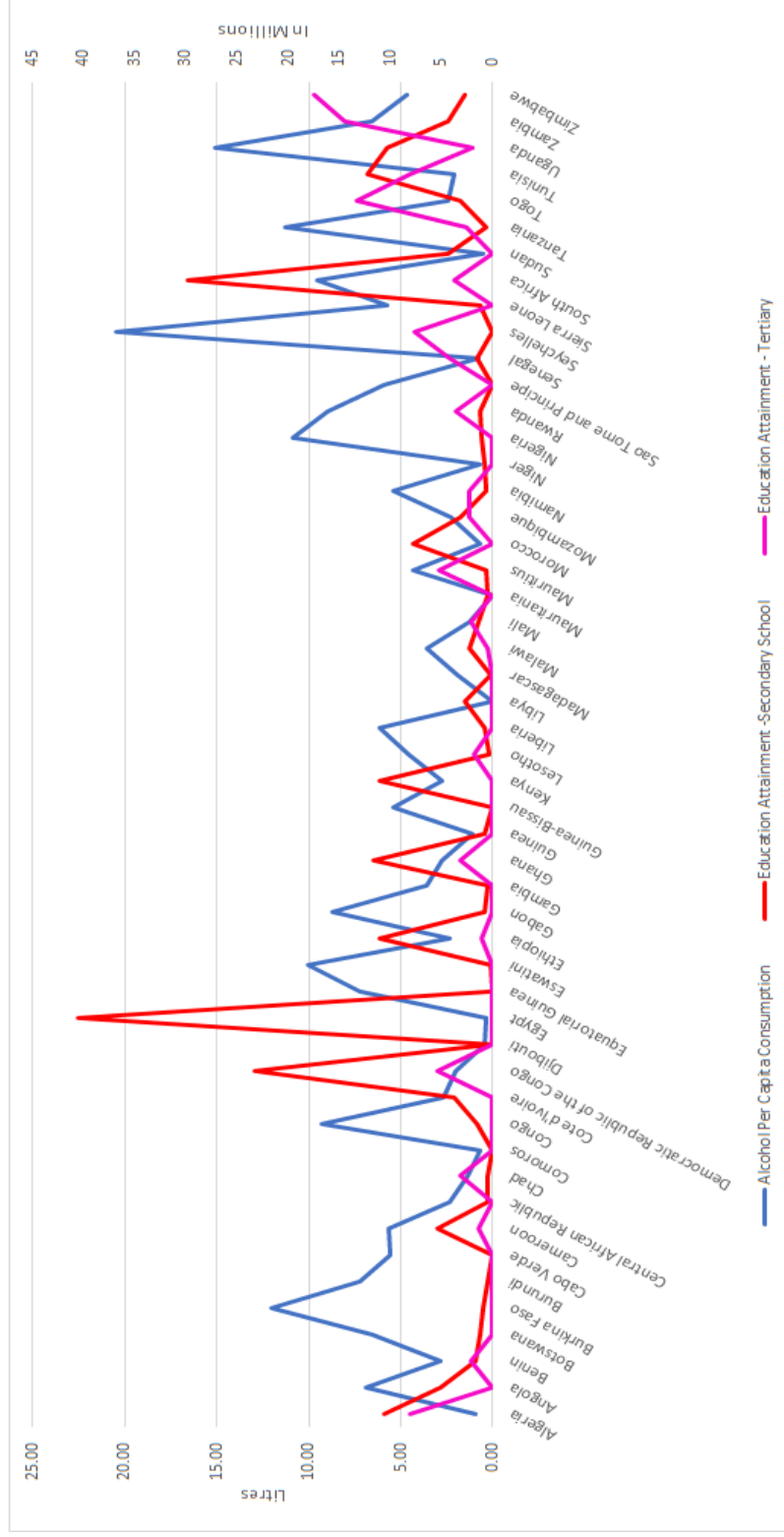
Fig 4: Alcohol Consumption Per Capita and Education Attainment

Source: Alcohol Per Capita Consumption was extracted from the WHO see https://apps.who.int/gho/data/node.imr.SA_0000001400?lang=en; whereas the various levels of educational attainment were extracted from the World Bank. See https://data.worldbank.org/ indicator/ SE.SEC.CUAT.UP.MA.ZS?locations=ZG

Fig 5: Youth Unemployment *vs* Alcohol Consumption
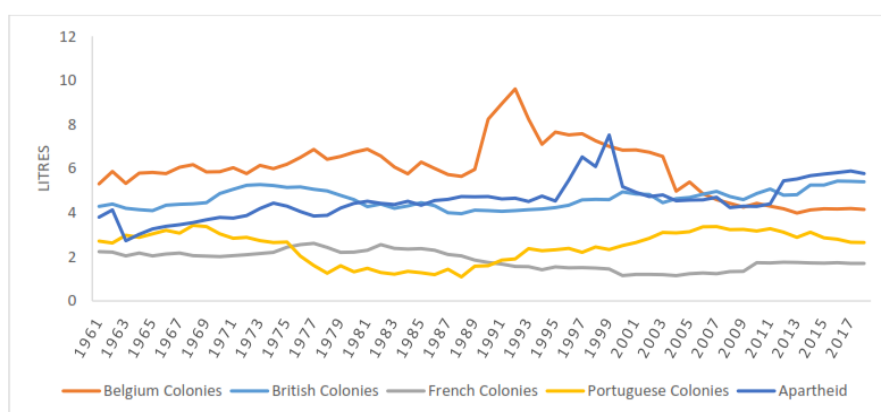
Source: Alcohol Per Capita Consumption was extracted from the WHO see https://apps.who.int/gho/data/node.imr.SA_0000001400?lang=en; whereas youth unemployment was extracted from the World Bank. See https://data.worldbank.org/indicator/SL.UEM.1524.ZS

Fig 6: Alcohol Consumption and GDP per capita

African countries were colonized mainly by the British, French, Portuguese and the Belgians. Historically, the French, Belgians, and the Portuguese were primarily considered to have a wet culture (where alcohol is integrated into their daily lives and activities); whereas the British were not. However, Bloomfield et al. (2003) assert that the previous wet/dry division seems to be disappearing, especially in Europe, and the homogenization of consumption rates and beverage preferences is increasing. Out of the 51 African countries that were considered in this study, 18 were former British colonies or protectorates, 20 were former French colonies, 5 were former Portuguese colonies, and 4 were former Belgian colonies. The average per capita alcohol consumption was calculated for all these African colonies for the period 1961–2018, and the results showed that, on average, former French and Portuguese colonies consume less alcohol than the former British and Belgian colonies, which consistently have higher alcohol consumption levels.

Fig 7: Average per Capita Alcohol Consumption by Former Colonial Powers

Source: Authors' calculations. Alcohol consumption was extracted from the WHO see https://apps.
who.int/gho/data/node.imr.SA_0000001400?lang=en

4. Empirical Model and Results
4.1 Methodology
To analyse the data, a multiple linear regression equation on cross-sectional data was used in analysing a stepwise forwards regression model. The dependent variable was per capita alcohol consumption in African countries; and the independent variables were GDP per capita, price of alcohol, religious denominations (catholic, protestants and other Christians, and Muslims), secondary educational attainment, tertiary educational attainment, and youth unemployment. The cross-sectional data were obtained for the year 2018. The data was then tested for issues of normality, heteroscedasticity, serial and autocorrelation, and multicollinearity using EVIEWS-10 software.

4.2 Empirical Model
The multiple linear regression model was specified as:

$$Y = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \varepsilon$$

where,

Y = response variable representing Alcohol per capita consumption

X_1 = response variable representing GDP per capita

X_2 = response variable representing Alcohol Price Index

X_3 = response variable representing Catholic Christians

X_4 = response variable representing Muslims

X_5 = response variable representing Protestants and other Christian divisions

X_6 = response variable representing Educational attainment − secondary school

X_7 = response variable representing Educational attainment − Tertiary

X_8 = response variable representing youth Unemployment

The null and alternative hypotheses were the following:

H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = 0$

H_1: at least one of the $\beta_i's$ is not equal to 0.

In other words,

H_0: None of the control variables X_i are significantly related to response variable Y

H_1: At least one of the control variables X_i is significantly related to response variable Y

4.3 Results from the Stepwise-Forwards Regression Method

The Stepwise-Forwards method is a combination of the uni-directional-forwards and backwards methods. Using this method, the results are as shown on Table 2.

Table 2: Results on the Determinants of Per Capita Alcohol Consumption in African Countries, 2018

Dependent Variable: Alcohol Per Capita Consumption				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
X_1 - GDP per capita	0.000304	7.27E-05	4.176841	0.0002
X_2 - Alcohol Price Index	-0.015818	0.004980	-3.175933	0.0029
X_3 - Catholic Christians	2.22E-07	7.11E-08	3.128491	0.0033
$\underline{X_4}$ − Muslims	-0.086859	0.014293	-6.077150	0.0000
X_5 - Protestants and other Christian divisions	-1.29E-07	6.44E-08	-2.002834	0.0522
X_6 - Educational attainment-secondary school	-3.67E-07	8.91E-08	-4.116012	0.0002
X_7 - Educational attainment-Tertiary	-0.322035	0.138835	-2.319555	0.0257
X_8 - youth Unemployment	1.71E-06	6.40E-07	2.669034	0.0110
C	13.11385	1.270633	10.32072	0.0000
R-squared	0.686858	Durbin-Watson stat		2.012394
F-statistic	10.69303	Prob(F-statistic)		0.000000

Source: Authors' Tabulation from EVIEWS output

Table 2 shows that the R-squared value is 69%, and the adjusted R-squared value is 62%. These metrics were found to be good enough to support the assumption that the model explains sufficiently all the variabilities of the response variable in alcohol per capita around its mean. With the Durbin Watson statistic of 2, the model was found to be free of autocorrelation issues.
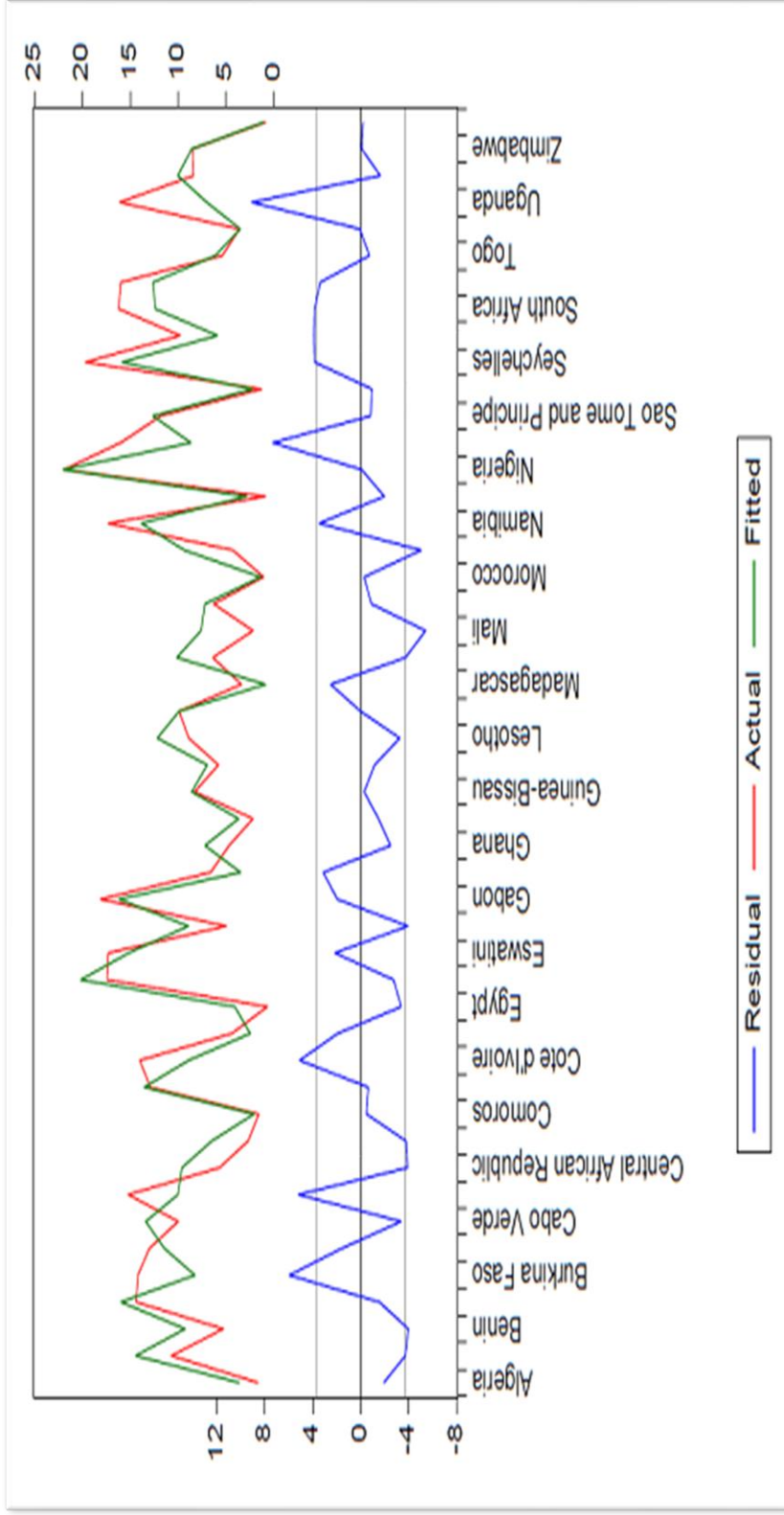
Figure 8: Residual Plots
Source: EVIEWS output

The findings in Table 2 show that all variables in the model were found to have a statistically significant impact on alcohol consumption, though at varying levels of significance. Apart from GDP per capita (income), youth unemployment, and Catholic Christians; other variables were found to have a negative relationship with alcohol consumption. The regression results show that the relationship between youth unemployment and alcohol consumption in Africa is positive and significant. This finding tends to support the assertion that the youth in the continent turn to alcohol consumption when unemployed. Furthermore, they show that belonging to certain religious sects (namely Islam, and what some may consider as more conservative Christian churches) in Africa has a statistically significant negative effect on alcohol consumption, which would tend to reduce alcohol consumption. The price effect on alcohol consumption is negative and statistically significant, which is consistent with the laws of demand: that more alcohol will be consumed with a decrease in the price of alcohol. Education attainment is also shown to have an inverse relationship with alcohol consumption; implying that higher education attainment would lead to lowering per capita alcohol consumption in Africa, which corresponds to both the results of the correlation matrix and the descriptive statistics as regards this variable.

To confirm the validity of the regression results, several diagnostic tests were performed. These include a check of the residual plots, a check for normality, serial correlation, heteroscedasticity, and multicollinearity. The residual plots given below (see, also, Figure 8) support the findings of the regression results, and illustrate that the variability between the fitted and actual values is not significant; hence, the model is a good fit for explaining the response variable.

4.3.1 Normality
To test the normality of the data, the residuals were analysed. In the histogram in Figure 8, it is noted that the distribution is bell-shaped. From the Jarque-Berra results, normality is further highlighted as the null hypothesis of normal distribution of data cannot be rejected as the probability for the Jarque-Berra test exceeds the significance level of 5%.
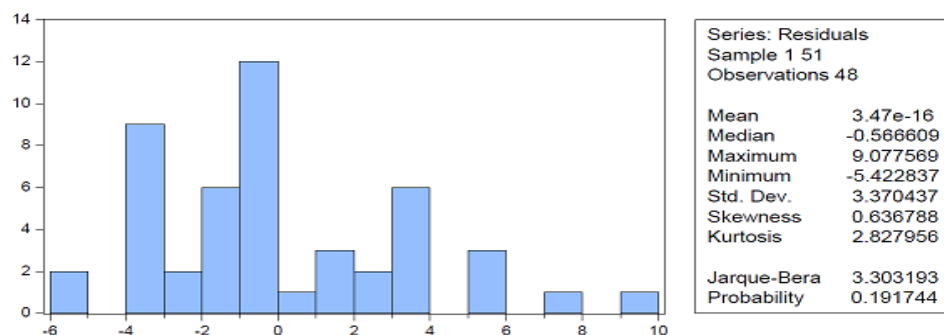
Figure 9: Normality Test
Source: EVIEWS output

4.3.2 Heteroscedasticity

After the data were analysed for normality, they were then analysed for heteroscedasticity, using the Breusch-Pagan-Godfrey test. The results of this test are presented in Table 3. The Obs*R-squared probability value is 73%, which is more than the 5% significance level. This does not allow us to reject the null hypothesis of the Breusch-Pagan-Godfrey test: that the model is not heteroscedastic. In other words, the model is homoscedastic.

Table 3: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.651844	Prob. F(3,29)	0.7295
Obs*R-squared	5.661191	Prob. Chi-Square(3)	0.6851
Scaled explained SS	3.415782	Prob. Chi-Square(3)	0.9056

Source: Authors' compilation of EVIEWS output

4.3.3 Multicollinearity

The model was then analysed for multicollinearity. This was done using the Variance Inflation Factors method. The test results in Table 4 show that the model is not severely affected by multicollinearity as the centred VIF values are less than 5.

Table 4: Variance Inflation Factors

Variable	Coefficient Variance	Uncentered VIF	Centred VIF
X_1 – GDP per capita	5.29E-09	1.847262	1.077371
X_2 – Alcohol Price Index	2.48E-05	2.487302	1.172051
X_3 – Catholic Christians	5.05E-15	3.069235	2.576609
X_4 – Muslims	0.000204	2.057544	1.070795
X_5 – Protestants and other Christian divisions	4.15E-15	3.482110	2.794125
X_6 – Educational attainment-secondary school	7.94E-15	2.348990	1.760584
X_7 – Educational attainment-Tertiary	0.019275	1.471773	1.075785
X_8 – Youth Unemployment	4.10E-13	2.884168	2.176558
C	1.614508	5.660776	NA

Source: Authors' compilation of EVIEWS output

4.3.4 Serial Correlation

Thereafter, the Breusch-Godfrey LM test for serial correlation was analysed. It illustrated that there was no serial correlation present among the independent variables (Table 5).

Table 5: Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.827809	Prob. F (12,27)	0.6224
Ob*R-squared	12.91010	Prob. Chi-Square (12)	0.3756

Source: Authors compilation of EViews output.

5. Conclusion and Policy Implications

The findings of the study contribute to explaining factors that influence per capita alcohol consumption in Africa. However, some variables were dropped from the

analysis: these include poverty rates, unemployment and the Gini coefficient. As previously mentioned, the R-squared value (69%) and the adjusted R-squared value (62%) were good enough to support the conclusion that the model explains sufficiently the variability of the response variable, i.e., alcohol consumption per capita around its mean. With the Durbin Watson statistic at 2, the model was found to be free of autocorrelation issues.

The findings suggest that the economic variables—namely GDP/per capita and price—are significant, and the coefficients are small; which implies that the income and price elasticities would likely be quite small as well. The most significant explanatory variable of alcohol consumption is religion, and Islam most importantly. In Islam, alcohol is considered 'haram'—i.e., forbidden—though as the results indicated, there are exceptions such as Nigeria, which has a relatively large population of Muslims but is one of Africa's largest consumers of alcohol on a per capita basis. Religion is, of course, not a policy variable; but it is nonetheless an important explanatory variable of alcohol consumption per capita.

In terms of policy, the findings have shown three variables that could be used for policy intervention: the price of alcohol; the level of education, especially high school education; and the rate of youth unemployment. Raising the prices of alcohol has been the standard government policy instrument, which depends on the own-price elasticity of demand, consumers' income elasticity of demand, and prices of complements and substitutes, among other factors. The results also indicate a very low, but positive, coefficient on GDP/per capita, which suggests that increases in incomes (through economic growth) will tend to increase alcohol consumption, though moderately, implying that alcohol is a normal good. These results suggest that raising taxes on alcohol may not be an effective 'deterrent' instrument, given that the effect on consumption will be small (due to small alcohol price elasticity of demand (i.e., inelastic demand), and positive income elasticity of demand. Lowering youth unemployment and increasing education (secondary school) attainment may be effective ways of decreasing per capita alcohol consumption.

Lastly, these results indicate that if governments were to ban alcohol sales, as was the case in both South Africa and Namibia during the Covid-19 pandemic, the bans will not succeed. Because of low income and price elasticity, consumers would rapidly shift to purchasing alcohol in the black market, which was found to thrive during the period of alcohol bans in both countries. Governments need to raise tax revenues from alcohol consumption—as was the case of the Indian response of raising taxes on alcohol and allowing home consumption—and using the raised revenues for COVID programs. This approach will also prevent the transfer of revenues from the government to alcohol black marketeers. However, resorting to home consumption may have some negative social implications. Thus, governments should attempt to formulate policies that strike a balance between allowing consumer sovereignty, and invoking measures to contain excessive drinking that would contain alcohol abuse.

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