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REVIEW

Financial Inclusion in Nigeria: A Gender Gap Approach

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ABSTRACT

Ability to have access and use financial goods and services such as bank and mobile money accounts indicates the overall financial inclusion level of an economy and the higher the indices are in any economy, the better that economy is. Financial inclusion is important to realize inclusive growth in any country. It has direct impacts on the level of growth and development experienced by any economy. It can however, be skewed along gender lines as noticed overtime in the Nigerian economy and other developing economies. This study examined financial inclusion in Nigeria: a gender gap approach. It also determined the factors responsible for the gender gaps. The Global Findex (2014) dataset of Nigeria from World Bank database was used to analyse the aims of the study. In the study, 61% of the men were financially included, while only 43% of the female were financially included, with 18% gap. The gap in endowments accounted for the huge difference of the gap in outcomes as males seemed to be more naturally favoured by society than females. The level of education, wealth quintile, saved in past 12 months for farm/business purposes, sent domestic remittances in the past 12 months, paid utility bills in the past 12 months, and received wage payments in the past 12 months are the factors explaining the gender gaps in Nigeria. Thus the government and other relevant stakeholders should encourage females along these factors.

1. Introduction

Financial inclusion is a critical factor for improving general well-being. Financial inclusion is a situation in which members of the society have right to use the banking and insurance companies as well as being learned financially. It could also be a condition where everyone has the right to proper financial products and services for effectual and competent organization of their capital; have access to desired capital to run their industries; and finan-

cial power to take up prospects boosting their revenue.

^[1] asserted that in this inclusive growth period, financial inclusion is a crucial means of improving people's welfare considerably thereby achieving national progress and prosperity.

Several studies have reported a gender gap in financial inclusion in developing countries ^[2-4], with female-owned businesses facing more financial constraints than male-owned businesses. This gender gap is worrisome because exclusion of women from economic activities means that

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their important contribution to economic development will be minimal, underestimated or underutilized, if not totally absent. Furthermore, exclusion deprives women of their fundamental human rights which should allow them to have equal opportunity to participate in social and economic activities as the male gender. This study attempts to reveal this current gender gap in financial inclusion in Nigeria in details and suggest ways in which this gap can be narrowed down or totally closed up.

It is noteworthy that there exist many profit gotten from financial inclusion varying from small to big rewards^[5-8]. The small rewards such as the capacity to begin and break even in businesses, long term asset in education, risk management and incorporation of financial shocks. Women are better than men when they have access to financial services because they spend more on food, education, and healthcare thus improving the livelihood and welfare of their people^[9-11]. On a bigger scale the advantages are gainful employment, creating wealth, reducing income inequality, facilitating economic growth, improved savings and poverty reduction among the public. Improving women's rights to finance through formal financial services add to inclusive and healthy development of nations. As a result of these advantages, policy makers and financial regulators have put so much value on financial inclusion in their pursuit to attain a totally expanded financial sector^[12,13].

Nations such as Nigeria are possibly not wanting in good economic policies and strategy formulation; the trouble has always been on how the policies are put to use. As the decades have gone by, the number of people living in poverty continues to increase. There are therefore growing worries that the model of economic growth in Nigeria is distorted towards a few rich people, predominantly males, exempting the vast majority of the weaker persons in the public, whereas an economy cannot fully develop on a small percentage of its citizens while leaving the others^[14].

Whereas strategy execution, monitoring and evaluation is of great importance, little attention has been given to the concept of financial inclusion in terms of strategy formulation and actual policy implementation in Nigeria. There is a disturbing dearth in knowledge about the current state of financial inclusion in Nigeria. Existing studies on financial inclusion in Nigeria are very scanty and have neither revealed the current state of financial inclusion in Nigeria along gender lines, assessing the extent to which national initiatives and programs and strategies have attained their set targets. This study therefore assessed the current state of financial inclusion in Nigeria, particularly along gender lines and attempts to proffer suggestions to policymakers that would help in promoting national financial inclusion.

2. Literature Review

Several authors have come up with literature as a result of their findings while conducting research on financial inclusion globally and in different parts of the world. Most of the studies^[15-17] focused on secondary data which is available on Reserve Bank of India (RBI) data source to study the determinants and extent of financial inclusion.

Allen et al. (2012) examined whether greater account ownership and use of accounts are associated with affordable cost and greater proximity to financial intermediaries and discovered that lower-fee accounts, exempting depositors from documentation requirements, allowing correspondence banking and using bank accounts to receive government financial benefits are the special effective initiatives that promote financial inclusion among those likely to be excluded^[18].

Kohli (2013) investigated the factors which significantly impact financial inclusion and identified that there is a relationship between financial inclusion and levels of human development^[19]. He found out those socio-economic factors. Income levels among individuals were found to have a significant influence on the level of financial inclusion. On the other hand, technology and education about the banking services were also found to be important factors that influence the growth of financial inclusion.

Efobi et al. (2014) explored the factors influencing the access to and use of banking services in Nigeria^[20]. The results reveal that the individual attributes, income and ICT inclination are significant factors influencing the use of bank services in Nigeria.

The Central Bank of Nigeria has been at the fore front of encouraging and supporting financial products that are specifically targeted at the low income and financially excluded, while the government has focused more on both interventionist financing arrangements and building institutions and frameworks that promote financial inclusion. One of the critical initiatives in this direction was the incorporation of financial inclusion as one of the cardinal objectives of the Nigerian Financial System Strategy 2020. The Nigerian Financial System Strategy 2020 represents a holistic and strategic road map and framework for developing the Nigerian financial sector into a growth catalyst that will help Nigeria have one of the top 20 largest economies in the world by the year 2020.

3. Methodology

The scope of this study is Nigeria. Secondary data from The Global Findex conducted in 2014 by Gallup Inc., in collaboration with the Nigerian Bureau of Statistics (NBS) was used in this study to reveal the financial

inclusion status of one thousand households across the federation along gender lines. Nigeria is divided into thirty-six states and a Federal Capital Territory and sub-divided into 774 Local Government Areas (LGAs). The country is viewed as a multiethnic state as it is inhabited by 250 ethnic groups of which the three largest are the Hausa, Igbo and Yoruba; these ethnic groups speak over 250 different languages and are identified with a wide variety of cultures. The official language is however, English.

3.1 Analytical Procedure

Descriptive statistics was used to profile the socio-economic characteristics of the respondent by gender and reveal the gender differential in access to financial inclusion among respondents while the Oaxaca-Blinder Decomposition method was used to decompose gender differentials into two components: a portion which arises because both male and female respondents on the average have the same treatment (equal right to use financial products and services) and a portion which arises because one group (in this case, males) is more favourably treated than the other (in this case, females) given the same individual characteristics (unexplained component). Mathematically, according to ^[21], it can be shown as:

$$\text{Gap} = Q + U \quad (1)$$

Where Q = explained component of the indicators of financial inclusion and U = unexplained component of the indicators of financial inclusion.

Fortin et al. (2011) refer to this as the composition effect where Q is denoted as:

$$Q = [E(Xm)' - E(Xf)'] \beta^* \quad (2)$$

The remaining part (U) which is the “unexplained” part according to ^[22] is due to the possibility of variables being omitted and thus creating biased estimates. It is attributed to discrimination (or differences in financial inclusion).

Fortin et al. (2011) also refer to this portion (U) as the structure effect, which is equal to:

$$U = (\alpha m - \alpha) + [E(Xm)'(\beta m - \beta^*)] + (\alpha - \alpha f) + [E(Xf)'(\beta^* - \beta f)] \quad (3)$$

This equation can be subdivided into two distinct parts. One part quantifies the discrimination in favour of one group (or the structural advantage), in this case males as shown below:

$$Um = (\alpha m - \alpha) + [E(Xm)'(\beta m - \beta^*)] \quad (4)$$

The other part, which quantifies the discrimination against (or the structural disadvantage) the other group, in this case females is as shown below:

$$Uf = (\alpha - \alpha f) + [E(Xf)'(\beta^* - \beta f)] \quad (5)$$

This method then discerns the portion of the gap which may be due to differences in characteristics, and the differences due to the structural effect. The structural effect

permits the disaggregation of a possible advantage for males and a possible disadvantage for females. Thus, the method estimates a financial inclusion structure which is not obligatorily identical to that of either group ^[22].

Lastly, we analyzed the determinants of financial inclusion in Nigeria using logistic regression (logit model). The model is as shown below:

$$Y_i = \beta X_i + e_i \quad (6)$$

$$\text{Prob}(Y_i = 1) = F(\beta' X_i) \quad (7)$$

$$\text{Prob}(Y_i = 0) = 1 - F(\beta' X_i) \quad (8)$$

Where: Y_i is the observed response for the i^{th} individual adult who is either financially included or not financially included. This means that $Y_i = 1$ for an individual adult who is financially included and $Y_i = 0$ for an individual adult who is financially excluded. X_i is a set of independent variables such as age, sex and level of education among others, associated with the i^{th} individual, which determine the probability of financial inclusion (P). The function, F may take the form of a normal, logistic or probability function. The logit model uses a logistic cumulative distributive function to estimate, P as follows ^[23]:

$$\text{Prob}(Y_i = 1) = \left[\frac{e^{\beta' X}}{1 + e^{\beta' X}} \right] \quad (9)$$

$$\text{Prob}(Y_i = 0) = 1 - \left[\frac{e^{\beta' X}}{1 + e^{\beta' X}} \right] = \left[\frac{1}{1 + e^{\beta' X}} \right] \quad (10)$$

According to ^[24], the probability model is a regression of the conditional expectation of Y on X giving:

$$E(Y/X) = 1 [F(\beta' X)] + 0 [1 - F(\beta' X)] = F(\beta' X) \quad (11)$$

Since the model is non-linear, the parameters are not necessarily the marginal effects of the various independent variables. The relative effect of each of the independent variables on the probability of financial inclusion by every person across Nigeria is obtained by differentiating equation (11) with respect to X_{ij} and this results in equation (12) ^[24]:

$$\frac{\partial P_i}{\partial X_{ij}} = \left[\frac{\beta_j F(X)}{(1 + F(X)^2)} \right] \beta = F(\beta' X) [1 - F(\beta' X)] \beta \quad (12)$$

The maximum likelihood method was used to estimate the parameters. This estimation procedure resolves the problem of heteroscedasticity associated with other estimation procedures such as the Linear Probability Model (LPM). It constrains the conditional probability of inclusion of individual adults in the formal financial market to lie between zero (0) and one (1). The empirical model for the logit estimation is specified as follows:

$$\log \frac{P_t}{1-P_t} = \alpha + \beta X_i + e_i \quad (13)$$

Where:

$\log \frac{P_t}{1-P_t}$ = the log-odds in favour of inclusion in the formal financial market;

X_i = the combined effects of X explanatory variables that determine or otherwise the financial inclusion of individual adults and ranges from X_1 to X_{13} defined as follows:

q1 = X_1 = Sex (Dummy: 1 = Male; 0 = Otherwise)

q2 = X_2 = Age of the individual adult (Years)

q3 = X_3 = Educational status (Dummy: 1 = Literate; 0 = Otherwise)

inc_q = income quintile

q16 = made payments online using the internet

q17a = saved in past 12 months for farm/business purposes

q26 = sent domestic remittances in the past 12 months

q28 = received domestic remittances in the past 12 months

q30 = paid utility bills in the past 12 months

q32 = paid school fees in past 12 months

q34 = received wage payments in the past 12 months

q39 = received government transfers in the past 12 months

q43 = received agricultural transfers in the past 12 months

4. Results and Discussion

4.1 Socio-economic Characteristics of Respondents

Table 1. Distribution of respondents by gender

Gender	Frequency	Percentage
Male	555	55.6
Female	444	44.4
Total	999	100.00

Source: Findex, 2014

Table 2. Distribution of respondents by age

Age (yrs.)	Frequency	Male Percentage	Female Freq.	Female Percentage	All Freq.	All Percentage
30 and below	309	55.67	267	60.41	576	57.77
31-60	209	37.65	149	33.71	358	35.90
61 and above	37	6.67	26	5.88	63	6.32
Total	555	100.00	442	100.00	997	100.00
Mean						33.35707
Std. Dev.						14.09773

Source: Findex, 2014

Table 3. Distribution of respondents by educational level

	Frequency	Female Percentage	Frequency	Male Percentage	Frequency	Total Percentage
Primary	146	32.88	106	19.09	252	25.23
Secondary	284	63.96	413	74.41	697	69.77
Tertiary	14	3.15	36	6.49	50	5.01
Total	444	100.00	555	100.00	999	100.00
Mean						.7977978
Std. Dev.						.5115452

Source: Findex, 2014

Table 1 presents the distribution of respondents according to their gender. The table revealed that 55.6 percent of the respondents were male while 44.4 percent were female. Table 2 presents the distribution of respondents according to their age. It reveals that 57.77 percent of the respondents were 30 years and below and 35.90 percent were between 31 and 60 years old. It could be inferred from here that Nigeria's population are predominantly youth. Furthermore, table 3 reveals that 32.88% of female respondents completed primary school, 63.96% completed secondary school while only 3.15% completed tertiary education. Among the male respondents, 19.09% completed primary education while 74.41% completed secondary and 6.49% completed tertiary education. This reveals that males are generally more educated than females in Nigeria. In total, only 5% of the respondents have completed tertiary education; this reveals a very poor literacy rate in Nigeria.

4.2 Gender Differential in Access to Financial Inclusion

Table 4 presents a summary of respondents with regards to their account ownership with a financial institution. It reveals that 62% of male respondents have accounts with a financial institution while 44% of female respondents have accounts with financial institutions and in total, 54% of respondents have accounts with financial

institutions. This also reveals that men are generally financially included than women and slightly above half of the total respondents are financially included in the area of account ownership with financial institutions.

Table 5 further presents a summary of respondents with regards to their mobile money account ownership information. It reveals that 3.1% of male respondents have mobile money accounts while 2.944% of female respondents have mobile money accounts. This reveals that men are generally financially included than women.

4.3 Explaining Gender Differential in Financial Inclusion in Nigeria

Table 6 reports the mean values of decomposition generated, of owning an account with a financial institution for the two groups (male and female), and the difference between them. It reveals that the financial inclusion z values among the male (0.618) is higher than that of the females (0.434) with a gap of 0.184. It then goes further to show the contribution attributable to the gaps in endowments (E) at 0.095, the coefficients (C) at 0.092, and the interaction (CE) at -0.003. The results reveal that the gap in endowments accounts for the great bulk of the gap in outcomes. Males seem to be more naturally favoured by society than females, and this perception makes it easier for a male to be financially included than a female. This result supports that of ^[25] which highlighted some of the

natural endowments enjoyed by the male gender to include better financial capability and literacy, better asset ownership level/ base for use as collateral, easier mobility, lesser play of discriminatory laws on males amongst others. As further revealed from table 7, the coefficient of group one (males) is seen to be 0.616 while that of the female group (2) is seen to be 0.434 with a difference of 0.182 observed between the two groups and a coefficient of 0.092 is observed for the explained part and 0.091 for the unexplained part of the decomposition. Is also reveals and compares the individual explained and unexplained coefficients.

4.4 Determinants of Financial Inclusion in Nigeria

The results of the logistic revealed a strong negative relationship between being a female and owning an account in a financial institution which indicates that a female is less likely to be financially included in the society at large. The coefficient indicates that being a female makes a person 47% less likely to be financially included. This finding supports the earlier assertions of ^[26] and the earlier published ^[27] reports on gender and financial inclusion. Furthermore, the results reveal that there is also a negative relationship between the income quintile to which an individual belongs and the rate of financial inclusion, hence, people of all quintiles are less likely to own an account in a financial institution, no matter the quintile to

Table 4. Distribution of respondents by account ownership with a financial institution

Gender	Has an account with a financial institution?				Total
	Frequency	Percentage	Frequency	Percentage	
Male	343	63.99	212	45.79	555
Female	193	36.01	251	54.21	444
Total	536	100	463	100	999

Source: Findex, 2014

Table 5. Distribution of respondents by mobile money account ownership

Gender	Has a mobile money account?				Total
	Frequency	Percentage	Frequency	Percentage	
Male	17	56.67	538	55.52	555
Female	13	43.33	431	44.48	444
Total	30	100	969	100	999

Source: Findex, 2014

Summary of decomposition results:

High: female==male; Low: female==female

Table 6. Mean values of decomposition generated

Mean prediction high (H):	0.618
Mean prediction low (L):	0.434
Raw differential (R) {H-L}:	0.184
- due to endowments (E):	0.095
- due to coefficients (C):	0.092
- due to interaction (CE):	-0.003

Source: Findex, 2014

Table 7. Coefficient estimates, means, and predictions for each of the factors that influence the rate of financial inclusion

account_fin	Coefficient	Robust Standard Error	Z	P> z	[95% Conf. Interval]	
Overall						
group_1	.6159376	.0208258	29.58	0.000	.5751197	.6567555
group_2	.4340655	.0230509	18.83	0.000	.3888866	.4792444
Difference	.1818721	.0310654	5.85	0.000	.120985	.2427591
Explained	.0995736	.0170636	5.84	0.000	.0661296	.1330176
unexplained	.0822985	.0282471	2.91	0.004	.0269351	.1376618
Explained						
Age	.0029616	.0023662	1.25	0.211	-.0016761	.0075993
Educ	.0382878	.0088723	4.32	0.000*	.0208983	.0556772
inc_q	.0112818	.0044261	2.55	0.011**	.0026068	.0199568
Saved	.0130785	.0053033	2.47	0.014**	.0026842	.0234728
Sent DM	.009174	.0045369	2.02	0.043**	.0002818	.0180661
Rec DM	.0013027	.0037024	0.35	0.725	-.0059539	.0085592
Util B	.0178357	.0061223	2.91	0.004*	.0058362	.0298352
Sch Fees	.0018771	.0020008	0.94	0.348	-.0020445	.0057986
Wage P	.0066621	.0039832	1.67	0.094***	-.0011447	.014469
Govt trf	-.0014968	.0020591	-0.73	0.467	-.0055326	.002539
Agric Trf	-.0013909	.0022932	-0.61	0.544	-.0058854	.0031037
Unexplained						
Age	.0912407	.0628079	1.45	0.146	-.0318604	.2143419
Educ	.03495	.0448693	0.78	0.436	-.0529923	.1228922
inc_q	-.0364762	.0298849	-1.22	0.222	-.0950495	.022097
Saved	-.0279635	.0181135	-1.54	0.123	-.0634653	.0075382
Sent DM	.0317977	.0268169	1.19	0.236	-.0207626	.0843579
Rec DM	.0128508	.0308248	0.42	0.677	-.0475646	.0732663
Util B	-.0039961	.0212185	-0.19	0.851	-.0455836	.0375913
Sch Fees	.018303	.0160893	1.14	0.255	-.0132315	.0498374
Wage P	-.0150001	.0163945	-0.91	0.360	-.0471327	.0171326
Govt Trf	.0146193	.0105411	1.39	0.165	-.0060409	.0352795
Agric Trf	.0256995	.017216	1.49	0.135	-.0080433	.0594423
_cons	-.0637265	.0983316	-0.65	0.517	-.2564529	.1289998
Number of obs				997		
N of obs 1				555		
N of obs 2				442		
Model				Probit		
Group 1				female = 0		
Group 2				female = 1		

* Significant at 99%,

** Significant at 95%

*** Significant at 90%

Source: Findex, 2014

Table 8. Logistic regression results

account_fin	Coef.	Std. Err.	Z	P> z	[95% Conf. Interval]	
Female	-.4796217	.1526358	-3.14	0.002*	-.7787824	-.1804611
Age	.0111193	.0056548	1.97	0.049**	.0000361	.0222025
Educ	1.208653	.1758274	6.87	0.000*	.8640374	1.553268
inc_q	-.1854936	.0526705	-3.52	0.000*	-.288726	-.0822613
Internet P	.2092496	.2121826	0.99	0.324	-.2066206	.6251198
Sent DM	.593079	.1409989	4.21	0.000*	.3167262	.8694318
Rec DM	.5615653	.1426196	3.94	0.000*	.2820361	.8410946
Util B	.7263235	.1349345	5.38	0.000*	.4618567	.9907903
Sch Fees	.2297873	.1350348	1.70	0.089***	-.034876	.4944505
Wage P	.488423	.1636377	2.98	0.003*	.1676989	.809147
Govt Trf	-.1215348	.2100707	-0.58	0.563	-.5332658	.2901962
Agric Trf	-.1494187	.1168706	-1.28	0.201	-.3784809	.0796435
_cons	-1.672945	.3160041	-5.29	0.000*	-2.292302	-1.053588
Number of obs				997		
LR chi ² (12)				310.80		
Prob > chi ²				0.0000		
Log likelihood				-532.99189		
Pseudo R ²				0.2257		

* Significant at 99%,

** Significant at 95%

*** Significant at 90%

Source: Author's Computation MICS (2016/2017)

which they belong. We also find negative relationships between receiving government and agricultural transfers in the past 12 months and owning an account in a financial institution. This also reveals that generally, people who have family members and trusted persons who are already financially included do not mind receiving government and agricultural transfers through such people if need be. The results show that gender (being a female), age, educational qualification attained, the income quintile to which an individual belongs, sending and receiving domestic remittances (especially in the past 12 months), utility bills payment, school fees payment and reception of wage payments (especially in the past 12 months) are all significant factors that affect the rate of financial inclusion in Nigeria. Age, education, sending domestic remittances in the past 12 months, receiving domestic remittances in the past 12 months, paying utility bills in the past 12 months, paying school fees in past 12 months and receiving wage payments in the past 12 months were significant and showed positive relationships with owning an account in a financial institution or being financially included. The results indicate that people are more likely to be financially included as they grow older (by 1%), get more educated (by 120%, which indicates total certainty), send domestic remittances (by 59%), received domestic remittances (by 56%) pay utility bills (by 72%), pay school fees (by 23%) and receive wage payments (by 48%).

Out of all the significant determinants of financial inclusion, educational qualification seems to have the greatest certainty which implies that the most certain way to get people financially included is to get them more educated. This explains why the older generation with lesser educational attainment seems to be more comfortable engaging in cash transactions compared to the younger generation who are generally more educated and less likely to engage in cash transactions.

5. Summary of Major Findings

Fifty eight percent of the respondents were 30 years and below and 35.90% were between 31 and 60 years old, inferring that the younger generation are generally more financially included than the older generation. With only 5% of the respondents shown to have completed tertiary education, males were revealed to be generally more educated than females in Nigeria with 74.41% seen to have completed secondary education as against their female counterparts who showed 63.96%; and 6.49% males found to have completed tertiary education as against 3.15% in females. Also, the 5th (richest) quintile had the highest number of respondents compared to the others and men were found to earn more income than women

in Nigeria. The results further revealed that 62% of male respondents have accounts while 44% of female respondents have accounts and in total, 54% of respondents have accounts thus revealing that men are generally financially included than women and slightly above half of the total respondents are financially included, owning accounts (with a financial institution).

Furthermore, the differences in the effects of the determinants of financial inclusion play a minimal role in explaining the gender gap in financial inclusion in Nigeria. Also, the only gaps that favoured the females were received government transfers in the past 12 months and received agricultural transfers in the past 12 months whereas the gaps in the remaining variables all disfavoured the females. The gap in educational qualification, however accounted for the bulk of the explained gap.

The logistic regression results revealed a strong negative relationship between being a female and owning an account in a financial institution thereby indicating that a female is less likely to be financially included in the society at large. Educational qualification had the greatest certainty of all the significant determinants of financial inclusion, implying therefore that the most certain way to get people financially included is to get them more educated.

6. Conclusions and Recommendations

The study concluded that there is a significant gap in financial inclusion in Nigeria along gender lines, with males being more financially included than females. Among all the determinants of financial inclusion, education played the most crucial role from the results gotten. The study therefore recommends that the Nigerian government should intensify efforts to drive financial inclusion, giving special consideration to females. Government should look more closely into creating equal opportunities for males and females during socioeconomic planning and give women equal access to assets, training, education and other human capital development activities. This would address the gap in endowments between females and their male counterparts considerably. Financial institutions should come up with incentives and strategies that encourage females to own and use accounts with financial institutions such as special training, grants, loans, lesser interest rates among others. Such developments will encourage females to own and use accounts with financial institutions. Government should look closely into policies and frameworks surrounding the Nigerian educational sector. The more educated Nigerians are, the more financially included they will be. Special attention should also be given to educating the female section of the Nigerian

populace. This would ensure that there is a balance when forming better educational frameworks in the future.

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ARTICLE

Followness of Altcoins in the Dominance of Bitcoin: A Phase Analysis

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ABSTRACT

Due to the transparency, simplicity, and blockchain system, cryptocurrencies gained popularity in the modern world. This led to more use of cryptocurrencies for speculation and investment rather than a medium of exchange. It is crucial to analyse the nature of the crypto market before investing in such currencies. With this intention, the paper tried to know the extent of following (Followness) of altcoins to the bitcoin in the different dominance phases like High Dominance, Low Dominance, and Moderate Dominance. For this purpose, daily closing prices of the Bitcoin and five major altcoins (Ethereum, Litecoin, Namecoin, Doge, and Ripple) are collected for the last five years and analyse the relationship between bitcoin and altcoins. Pearson's correlation coefficient test is used to know the direction of the relationship, and Vector Error Correction Model is used to see the extent of the relation. In general, the empirical result of the study showed cointegration between bitcoin and Altcoin. It also depicted that Altcoin showed a high level of followness in the moderate dominance phase and low followness in the low dominance phase. The study developed a price estimation equation to predict the price of altcoins depending upon the price of bitcoin and its dominance in the crypto market. This paper concludes that the dominance of Bitcoin also has a significant role in the price movement of altcoins.

1. Introduction

Cryptocurrencies are circulated in the market for a decade now, and they have reached every corner of the Global Financial system due to their instant transmission of value without the mediators of third parties. In the year of 2008, Satoshi Nakamoto invented Bitcoin as a peer-to-peer digital currency with the help of a blockchain system. In later stages, other digital currencies are introduced to the market as Alternative Coins such as Lite coin, Ethereum, Doge, etc., and it is shortly named Altcoins. The Market Price of Bitcoin increased tremendously ($\pm 12000\%$) in the last five years, and its total capitalisation reached \$660Billion^[1]. The innovative features, transparency, and

simplicity led to increasing popularity among traders. The excessive use of Bitcoin for trading in the last couple of years distinguishes the application between the medium of exchange and speculative^[2,3]. The correlation analysis between the return of bitcoin and the return of other financial assets concluded that bitcoin is used as a speculative investment than a medium of exchange^[4]. Many governments and Companies stopped accepting Bitcoin due to the high fees and extreme volatility of bitcoin, and it posed an increased threat to policymakers, entrepreneurs, economists, and consumers^[5]. While Bitcoin did not meet all-purpose, Altcoins are introduced with a different purpose. According to the Cornmarket cap, the total market

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capitalisation of Altcoins reached its peak of 2.5 trillion dollars indicating that Altcoins gained importance in the market and waiting for a breakout.

Despite differences in extreme volatility, the previous studies identified the interdependency of Altcoin with bitcoin and the price mechanism system of cryptocurrency. Due to large Market capitalisation, first in history, and most coins execution systems made Bitcoin dominance in the virtual currency world. The recent study identified 'High liquidity,' 'Dominance,' 'Similar behaviour (Both are digital currencies)' and 'Limited options (As investors first purchase Bitcoin to purchase alternative coins)' are the reasons for the correlation between Bitcoin and Altcoins^[6]. The literature exhibited the cointegration in the market eminence of cryptocurrencies^[7], and demonstrated cointegration between Bitcoin and other altcoins by using the Johansen Cointegration test, Vector Error Correction Model (VECM) and, Engle-Granger two-step approach^[8]. Even though few studies identified a positive correlation between the price movements of Bitcoin and Altcoins, but no studies were conducted to evaluate the interdependencies and price formation of Bitcoin and Altcoins by considering the dominance of Bitcoin in the market^[9-11]. Thus, this study helps to identify the relationship between Bitcoin price and Altcoin's price during Bitcoin's High dominance Phase, Moderate dominance, and Low Dominance Phase.

2. Review of Literature

In recent days the bitcoin showed supremacy in the cryptocurrency committee and showed that the acceptability and success of altcoins largely depend on the performance of Bitcoin^[12-14]. Until 2019, the investors have to purchase bitcoin to invest in Altcoins, increasing the dominance of Bitcoin in the crypto market. However, it does not clear the reason for increasing the price of Bitcoin and the price relationship between Bitcoin and Altcoins. The increasing popularity of Bitcoin gained not only the attention of Media and Investors but also researchers on the area of Price formation^[6,15], portfolio implications^{[10], [16]}, blockchain technology^[17,18] Market efficiency^[19], Asymmetric relationship with Altcoins^[7] legal issues^[20] and risk-return analysis^[21]. According to Crypto & Market survey, Bitcoin demonstrated bubble-like features, and if correlation remained zero with the return of other assets, then there is a significant fall in the value of bitcoin^[11]. On the other hand, it affects the recovery of other assets and increases margin call if the investment is made on bitcoin through debt. It is argued that cryptocurrencies do not entirely eliminate fiat currency, and rather if the world accepts digital currency as a medium of exchange, it co-

exists with other currencies^[4].

In the early stage of the crypto era, due to the extreme dominant of bitcoin in the market (See Figure 1), the altcoins were unnoticed, but in a recent couple of years, altcoins gained track, especially Ethereum, XRP ADA, and Doge. While analysing the bitcoin dominance and price formation of Altcoins, it showed that Super pumping of Large Altcoins when bitcoin dominance less than 40% and it is the beginning of Altcoin season^[9]. Similarly, if dominance above 50% leads to the extinction of Altcoins from the market, and it showed that risk and return spillovers flow from bitcoin to altcoins, i.e., before the bifurcation. However, the direction will be reversed after the bifurcation, and it pointed out that bifurcation significantly weakened the pricing impact and market position of bitcoin in the cryptocurrency market^[8,22]. Few studies explored the factors influencing the bitcoin trading volume and investigated the relationship between bitcoin and economic indicators, which founds that, Dow Jones index, WTI oil price euro-dollar exchange rate prognostic influence in elucidation the Bitcoin Price formation in the long run^[2,15]. In many circumstances, bitcoin dominance and Altcoin market price showed an inverse relationship. At the same time, the behaviour of Bitcoin on fiat currencies (e.g., USD, Euro) is relative, but the asymmetric relationship with Altcoins is unexplored^[23]. The market movement showed that cryptocurrencies are significantly more unpredictably and vary much widespread than fiat currencies^[1,24,25]. Since July 2017 crypto market witnessed a boom in ICO (Initial Coin Offerings), and this paradigm decreased the dominance of Bitcoin from 85% to below 45%^[26]. As bitcoin lurched with its dominance, it stood at an all-time low by the end of January 2018.

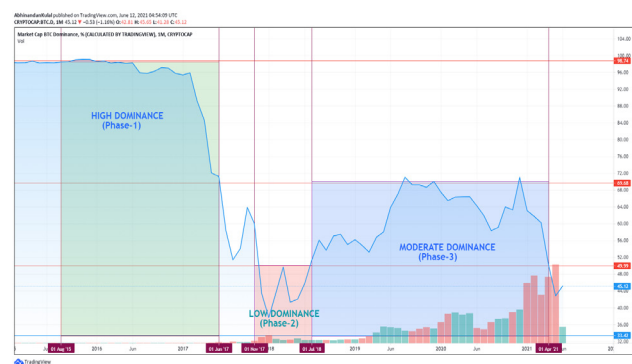


Figure 1. Bitcoin Dominance %

(Source: Trading View, 31.05.2021)

The more evocative disparities that happened during the price formation of altcoins are overstated and converted into a bubble, but later it converted into equilibrium

level in the medium or long term. The level of equilibrium per bitcoin dominance reduced from 80% before 2007 to below 50% in 2021. The dominance of bitcoin stood at 60% during the post-pandemic period, but after Elon Musk tweet about Bitcoin and environmental issues, it fell to below 40%. The bitcoin and altcoins had developed a unique kind of relationship pattern, stated that if Bitcoin price goes up, then altcoin price fell down, and if Bitcoin goes down, then Altcoins goes further down^[27]. Few studies pointed out rising dominance of bitcoin makes reset the support level of Altcoins^[28] and observed progress in the price movement of Altcoins when the dominance of bitcoin is decreased^[29]. The crypto market showed explosive behaviour among cryptocurrencies except for NEM coin, which supported the earlier literature^[5,10,22,30,31].

On the other hand, few studies identified the cointegration among cryptocurrencies by using Johansen and Engle-Granger cointegration tests and found a robust relationship between cryptocurrencies and information transmission by employing Vector Auto-Regression (VAR)^[32-34]. Few studies were carried out to know the relationship between Cryptocurrencies and other financial assets. GARCH model was used to examine the effect of Bitcoin on other variables like Gold, Interest rate, and exchange rate, and the study revealed the similarity of Bitcoin with Gold^[35].

Likewise, Ciaian et al. investigated the relationship between Bitcoin, Stock index, Litecoin, Facebook, Gold, and Google. The study also revealed that online news related to Bitcoin, despite good or bad, reacts quickly and follows efficient market hypothesis, and it also confirmed that vicissitudes in Bitcoin value are due to investors' curiosity by searching queries and information about bitcoin in Wikipedia and Google trends^[36]. This study also demonstrated a bidirectional causality and positive rela-

tion between Bitcoin price and search queries in Google. NRDL approach was used to examine the connectedness of Bitcoin and Altcoins and showed asymmetry in the short run.

Thus, this paper significantly contributes to the results of previous literature, and it additionally increases the knowledge about the connectedness of Bitcoin and altcoins. Uniquely, this study shows the relationship in price formation of Bitcoin and Altcoins in three different Bitcoin dominance phases.

3. Methodology

The dataset consists of daily closing prices for cryptocurrencies that have been in existence for over five years and had a market capitalisation exceeding \$500m as of June 2021. Consequently, our dataset comprises daily figures for Bitcoin and major five altcoins, namely Ripple (XRP), Ethereum (ETH), Doge, Litecoin (LTC), and Namecoin (NMC), from 7th August 2015 (as the earliest date available for Ethereum) to 30th May 2021, resulting in 2065 observations for each cryptocurrency. The prices are listed in US Dollars, and the data are sourced at Yahoo finance^[37]. After collecting data, the researcher segregated the entire data into three groups based on the dominance level. Dominance phase identified with the help of Bitcoin Dominance index^[38], and classification done like (See Figure 1), High Dominance Phase (Dominance ranging from 69.98% to 98.7%) starting from 7th August 2015 to 1st July 2017, Low Dominance Phase (Dominance less than 50%) starting from 1st November 2017 to 1st July 2018 and Moderate Dominance Phase (Dominance ranging between 69.98%-49.98%) commencing from 2nd July 2018 to 30th May 2021. Later all calculations and analyses were made dominance-wise with the help of EViews 10 software.

Table 1. Descriptive Statistics

	BTC*	DOGE*	ETH*	LTC*	NMC*	XRP*
Mean	8.164205	-6.581128	4.506270	3.353480	-0.386847	-2.281761
Median	8.749656	-6.061029	5.232847	3.860461	-0.642167	-1.421350
Maximum	11.02261	-2.540525	7.589476	5.881471	1.992321	1.217228
Minimum	5.349462	-9.079312	-0.832802	0.968177	-1.775315	-5.499210
Std. Dev.	1.389473	1.419715	2.021270	1.420500	0.738377	1.837449
Skewness	-0.410298	-0.059828	-0.933925	-0.501284	0.673734	-0.679386
Kurtosis	2.112073	2.707166	2.908980	1.783454	2.586788	1.812290
Jarque-Bera	125.5314	8.593441	300.3176	213.4101	170.5835	279.6876
Probability	0.000000	0.013613	0.000000	0.000000	0.000000	0.000000
Sum	16826.43	-13563.70	9287.422	6911.522	-797.2920	-4702.709
Sum Sq. Dev.	3977.111	4152.117	8416.199	4156.708	1123.115	6955.008
Observations	2061	2061	2061	2061	2061	2061

In closing prices of cryptocurrencies

4. Data Analysis

Before analysing the inter-relationship between cryptocurrencies, it is important to understand the study's descriptive statistics of considered cryptocurrencies. Table 1 demonstrates descriptive statistics of closing prices (ln values) Bitcoin and selected Altcoins.

Figure 1 helps us to understand the daily price movement of cryptocurrencies for the last five years, and it shows high spikes in all currencies in the previous couple of years. The co-movement of six selected cryptocurrencies from the period of 07.08.2015 to 01.04.2021 is depicted in Figure 2, and the line movement of each currency showed a positive correlation between currencies in the long run. Before employing VEC Granger Causality/Block Exogeneity Test between Bitcoin and Altcoins, it is necessary to check the stationery and cointegration of variables. Table 2 demonstrates the Unit root test result based on Augmented Dickey-Fuller Test, Phillips-Perron test statistic, and Kwiatkowski-Phillips-Schmidt-Shin test statistic. According to Augmented Dickey-Fuller Test and Phillips-Perron test statistic, the null hypothesis is that time-series data are non-stationary, and the alternative hypothesis says stationery. Whereas the Kwiatkowski-Phillips-Schmidt-Shin test indicates, data are stationary in null hypothesis and non-stationary at alternative hypothesis. The test results showed that time series data are stationary at the first difference at 1%, 5%, and 10% significance levels.

The Johansen Co-integration test is employed to check the long-run relationship between six selected cryptocurrencies. The Null hypothesis indicates that variables

are not cointegrated. The result values rejected the null hypothesis at a 5% significance level. The researcher used Akaike Information Criteria by Rank (rows) and Model (columns) to determine the lag interval. The test suggested second lags interval with a minimum value in the fourth column. Therefore, this study concludes that there is a long-run relationship among selected cryptocurrencies.

Table 3. Johansen Co-integration Test Results

Hypothesised No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
None *	0.023203	119.3786	117.7082	0.0390
At most 1	0.016141	71.25251	88.80380	0.4586
At most 2	0.007834	37.89375	63.87610	0.9079
At most 3	0.005848	21.77041	42.91525	0.9191
At most 4	0.003274	9.746205	25.87211	0.9354
At most 5	0.001474	3.023150	12.51798	0.8738

Johansen's cointegration test helps us know that selected cryptocurrencies are cointegrated, and Table 4 helps us identify the correlation of bitcoin with Altcoins. It shows the correlation coefficient between variables chosen in four sections. The first section explains the correlation of currencies in the long run (Full sample), the second section describes the correlation during the High dominance phase, the third section presents the correlation during the moderate dominance phase, and the fourth section explains the correlation during low dominance phase.

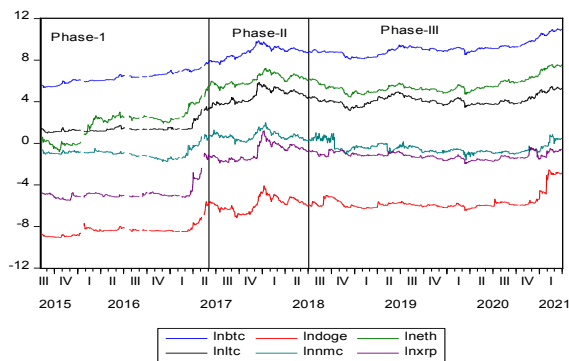
Table 2. Unit Root Test results

Test	Cryptocurrencies	At level		First Difference		Conclusion
		Constant	Trend	Constant	Trend	
Augmented Dickey-Fuller Test Equation	BTC	0.0140	4.54	0.0023***	2.73***	D(1)
	ETH	-0.0014	3.26	0.0062**	-2.50*	D(1)
	XRP	-0.0052	3.15	0.0027*	-8.13*	D(1)
	LTC	0.0044	3.31	0.0020**	-9.33**	D(1)
	NMC	-0.0035	1.86	-0.0042**	1.03**	D(1)
	Doge	-0.0223	7.54	0.0048**	2.29**	D(1)
Phillips-Perron test statistic	BTC	0.014*	4.54*	0.0023**	2.73**	D(1)
	ETH	0.0064	3.26	0.0062**	2.50**	D(1)
	XRP	-0.0039	2.43	0.0031*	-1.05*	D(1)
	LTC	0.0044	3.31	0.0020*	-9.33*	D(1)
	NMC	-0.0046	2.16	-0.0004*	9.49**	D(1)
	Doge	-0.0223	7.54	0.0004*	2.29*	D(1)
Kwiatkowski-Phillips-Schmidt-Shin test statistic	BTC	5.9939***	0.0021***	0.002199	3.65	D(1)
	ETH	1.7677***	0.0026***	0.0038	-7.09	D(1)
	XRP	-4.669***	0.0023***	0.0032	-1.12	D(1)
	LTC	1.4708***	0.0018***	0.0018	2.42	D(1)
	NMC	-0.529***	0.0001***	-0.0006	1.09	D(1)
	Doge	-8.58***	0.0019***	0.0003	2.39	D(1)

Note: ***, ** and * indicates null hypothesis rejected at 1%, 5%, and 10% significance level and D(1) indicates the first difference.

Table 4. Correlation of BTC with Altcoins in Different Phase

		BTC	LTC	NMC	XRP	DOGE	ETH
Full Sample	Pearson's Correlation	1	.944**	.468**	.903**	.944**	.939**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	2061	2061	2061	2061	2061	2061
High Dominance	Pearson's Correlation	1	.715**	.257**	.596**	.747**	.858**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	664	664	664	664	664	664
Low Dominance	Pearson's Correlation	1	.778**	.888**	.494**	.633**	.601**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	243	243	243	243	243	243
Moderate Dominance	Pearson's Correlation	1	.776**	.188**	.794**	.917**	.218**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	1001	1001	1001	1001	1001	1001

**Figure 2.** Co-Movement of Cryptocurrencies

The correlation matrix explains that Lite coin ($r=.776$), Ripple ($r=.794$), and Doge coins ($r=.917$) are highly following Bitcoin when the dominance of Bitcoin is moderate, whereas Name coin highly follows the Bitcoin when dominance is low. Ethereum is a good competitor for Bitcoin in the crypto market, and the relation between these two coins ($r=.858$) is high during the high dominance stage. While analysing individual altcoins, Name coin and Ethereum coins have significantly less correlation ($r=.188$) during the moderate dominance phase, and Ripple coin follow less ($r=.494$) during the low dominance phase. Even Figure 2 helps us understand the co-movement of cryptocurrencies in each phase. The correlation results only tell us the relation between variables, but it does not explain the cause. Therefore, it is inaccurate to measure the followness of coins only based on correlation. If coins both have correlation and causation, then we can conclude that there is a significant followness of Altcoins in the dominance of Bitcoins. For this purpose, the VEC Granger causality test was employed for this purpose, and the result is depicted in Table 5.

The Granger (1969) approach to the question of whether 'x' causes 'y' is to see how much of the current 'y' can

be explained by past values of 'y' and then to see whether adding lagged values of 'x' can improve the explanation. 'y' is said to be Granger-caused by 'x' if 'helps in the prediction of 'y', or equivalently if the coefficients on the lagged x's are statistically significant. It is important to note that the statement "x Granger causes y" does not imply that 'y' is the effect or the result of 'x'. Granger causality measures precedence and information content but does not by itself indicate causality in the more common use of the term.

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \dots + \alpha_{p-1} y_{t-p+1} + \beta_1 x_{t-1} + \dots + \beta_q x_{t-q} + \epsilon_t \quad (1)$$

Here (1), Y is the price of Altcoin, and x is the price of X. Y_{t-1} is the lag price of Altcoin, and X_{t-1} is the lag price of Bitcoin. Here, the researcher investigated whether the price formation of Altcoin depends on its lag price and lag price of Bitcoin. To answer this research question, a set of hypotheses is developed and tested using the VEC Granger causality test. Table 5 exhibits the test result and decision.

After finding a relationship between bitcoin and altcoins, it is important to know- "Does price movement of Bitcoin influence the price movement of Altcoins." For this purpose, few separate hypotheses are developed and tested using the granger causality test. Results in Table 5 indicate that during high dominance of BTC, it Granger cause XRP and Doge but does not granger cause LTC, NMC, and ETH. During the low dominance of BTC, the price movement of bitcoin Granger cause all of the altcoins. During moderate dominance of the bitcoin, the price movement of Bitcoin does not granger cause LTC, NMC, XRP, and ETH except Doge. From the above analysis, it can conclude that the impact of BTC on altcoins is different depending upon the dominance of Bitcoin in the crypto market. From the above discussion, we understood the nature of the relationship between bitcoin and altcoins,

Table 5. VEC Granger Causality Test

Hypothesis	Dominance Phase	F statistics	Prob	Remark
BTC does not Granger Cause LTC	High Dominance	1.1186	0.2906	Accept
	Low Dominance	13.6088	0.000	Reject
	Moderate Dominance	2.3491	0.1257	Accept
BTC does not Granger Cause NMC	High Dominance	1.86148	0.1731	Accept
	Low Dominance	10.8135	0.001	Reject
	Moderate Dominance	2.0888	0.1488	Accept
BTC does not Granger Cause XRP	High Dominance	3.7734	0.0526	Reject
	Low Dominance	10.788	0.0012	Reject
	Moderate Dominance	1.900	0.1684	Accept
BTC does not Granger Cause DOGE	High Dominance	4.1868	0.0413	Reject
	Low Dominance	9.9137	0.0019	Reject
	Moderate Dominance	6.4129	0.0115	Reject
BTC does not Granger Cause ETH	High Dominance	3.5795	0.0591	Accept
	Low Dominance	9.3766	0.0025	Reject
	Moderate Dominance	3.4774	0.0626	Accept

Table 6. Vector Error Correction Estimates

Phase	Altcoins (Dependent Variables)	Long-run estimates	Short-run estimates	CointEq1	C
High Dominance	LTC	0.53(0.55)	0.09(0.07)	0.0068	-4.76
	NMC	0.44(0.60)	0.14(0.10)	-0.0088	3.70
	XRP	1.16(0.37)	-0.07 (0.11)	-0.0138	12.13
	Doge	2.98 (0.76)	0.083(0.08)	-0.0054	27.13
	ETH	7.84(3.31)	-0.04(0.11)	-0.0018	47.51
Low Dominance	LTC	1.44(0.23)	-0.02(0.11)	-0.074	8.18
	NMC	1.52(0.19)	0.11(0.11)	-0.078	13.08
	XRP	2.23(0.57)	-0.201(0.12)	-0.039	20.86
	Doge	2.09(0.44)	-0.07(0.14)	-0.045	24.63
	ETH	1.43 (0.34)	0.02(0.08)	-0.041	6.62
Moderate Dominance	LTC	0.27(0.15)	-0.06(0.07)	-0.002	-1.71
	NMC	0.62(0.29)	0.025(0.10)	-0.018	6.15
	XRP	0.40(0.21)	-0.08(0.06)	-0.014	4.85
	Doge	2.39 (0.55)	-0.108(0.08)	-0.007	27.60
	ETH	1.09(0.12)	-0.08(0.08)	-0.011	4.36

and in the next section, the researcher identified the extent of relation by using Vector Error correction estimates.

Table 6 indicates the extent of dependence of altcoins on bitcoin in the short run and long run. It identified each phase separately with the error term. It showed that during high dominance of bitcoin, 1% increase in BTC price, increases 0.53% in LTC and increases 0.44% in NMC, increases 1.16% and 2.98% in XRP and Doge respectively. In the high dominance phase, in the long run, altcoins moved highly positive ($\beta > 1$) to the BTC, but in the short run, altcoins drove relatively positive ($\beta < 1$, but $\beta > 0$) to the price of BTC. In the low dominance phase, for 1% change in the BTC price, changes 1.44% in LTC, 1.52% in NMC, 2.23% in XRP, 2.09% in Doge, and 1.43% in ETH in the long run. But in the short run, all altcoins except NMC moves relatively negative ($\beta < -1$). During the moderate dominance phase, 1% increase in BTC price, increases 2.39% in Doge and 1.09% in ETH. While considering other altcoins (LTC, NMC, and XRP), the changes are half of the BTC price changes. Likewise, in all other dominance

phases, altcoins moved negatively to the movement of BTC in the short run.

Price Estimation Equation

After understanding the nature and extent of the relationship between Bitcoin and altcoins, it is possible to develop an equation (Vector Error Correction Model). This equation helps readers and investors predict the price of altcoins based on the price movement of Bitcoin in different dominance phases.

During High Dominance:

$$\text{DOGE} = -0.005468 * \text{DOGE} (-1) - 2.98 * \text{BTC} (1) - 27.1283245511 + 0.00899 * \text{DOGE} (1) + 0.08019 * \text{BTC} (-1) + 0.001731$$

$$\text{ETH} = -0.001795 * \text{ETH} (-1) - 7.84 * \text{BTC} (-1) + 47.51 + 0.10217 * \text{ETH} (1) - 0.036203 * \text{BTC} (-1) + 0.008869$$

$$\text{LTC} = 0.00835 * \text{LTC} (-1) + 0.26 * \text{BTC} (-1) - 3.10 + 0.0190 * \text{LTC} (-1) - 0.0587$$

$$\text{NMC} = -0.008394 * \text{NMC} (-1) - 0.44 * \text{BTC} (-1) +$$

$$3.699 + -0.0047 * \text{NMC} (-1) + 0.1335 * \text{BTC} (-1) + 0.0003 \\ \text{XRP} = -0.0139 * \text{XRP} (-1) - 1.17 * \text{BTC} (-1) + 12.14 + \\ -0.17389 * \text{XRP} (-1) + -0.077934 * \text{BTC} (-1) + 0.002419$$

During Moderate Dominance:

$$\text{DOGE} = -0.007390 * \text{DOGE} (-1) - 2.39 * \text{BTC} (-1) \\ + 27.59 + -0.0002 * \text{DOGE} (-1) + -0.1074 * \text{BTC} (-1) + \\ 0.003566$$

$$\text{ETH} = -0.0105 * \text{ETH} (-1) - 1.09 * \text{BTC} (-1) + 4.37 + \\ -0.0142 * \text{ETH} (-1) + -0.0756 * \text{BTC} (-1) + 0.0008$$

$$\text{LTC} = -0.005 * \text{LTC} (-1) - 0.28 * \text{BTC} (-1) - 1.54 + \\ -0.022 * \text{LTC} (-1) + -0.05 * \text{LTC} (-2) + -0.04 * \text{BTC} (-1) + \\ 0.116 * \text{BTC} (-2) + 0.0001$$

$$\text{NMC} = -0.018 * \text{NMC} (-1) - 0.62 * \text{BTC} (-1) + \\ 6.14386267478 + -0.181 * \text{NMC} (-1) + 0.028 * \text{BTC} (-1) + \\ -0.002$$

$$\text{XRP} = -0.0139 * \text{XRP} (-1) - 0.400 * \text{BTC} (-1) + 4.85 + \\ -0.173 * \text{XRP} (-1) + -0.078 * \text{BTC} (-1) + 0.002$$

During Low Dominance:

$$\text{DOGE} = -0.0447 * \text{DOGE} (-1) - 2.087 * \text{BTC} (-1) + \\ 24.63 + -0.0289 * \text{DOGE} (-1) + -0.082 * \text{BTC} (-1) + 0.0005$$

$$\text{ETH} = -0.0737 * \text{ETH} (-1) - 1.43 * \text{BTC} (-1) + 6.62 + \\ 0.002 * \text{ETH} (-1) - 0.002 * \text{BTC} (-1) + 0.0007$$

$$\text{LTC} = -0.018 * \text{LTC} (-1) - 1.44 * \text{BTC} (-1) + 8.18 + \\ -0.181 * \text{LTC} (-1) + 0.028 * \text{BTC} (-1) + -0.0022$$

$$\text{NMC} = -0.078 * \text{NMC} (-1) - 1.52 * \text{BTC} (-1) + 13.08 + \\ -0.0884 * \text{NMC} (-1) + 0.1082 * \text{BTC} (-1) - 0.0008$$

$$\text{XRP} = -0.0389 * \text{XRP} (-1) - 2.23 * \text{BTC} (-1) + 20.858 + \\ 0.0554 * \text{XRP} (-1) + -0.2014 * \text{BTC} (-1) + 0.00154$$

The above equations help investors predict altcoin prices depending upon the price movement and level dominance of bitcoin. Where (1) indicates the current market price and (-1) indicates the previous day's price. Likewise, (-2), (-3) indicate past prices of bitcoin and altcoins. For example, In the first equation; $\text{DOGE} = -0.005468 * \text{DOGE} (-1) + 2.98 * \text{BTC} (1) + 27.13 + 0.00899 * \text{DOGE} (1) + 0.08019 * \text{BTC} (-1) + 0.001731$, where future price of doge can be estimated by using this equation like, $-0.005468 * (\text{previous day closing price of Doge in Natural log}) + 2.98 (\text{current market price of BTC in natural log}) + 27.13 + 0.0089 * (\text{current market price of Doge in natural log}) + 0.08019 * (\text{previous day price of BTC in natural log}) + 0.001731 (\text{error correction term})$

5. Conclusions

This paper aims to study both the long- and short-run followness of major altcoins like Ethereum, Doge, XRP, NMC, and LTC to the price movement of Bitcoin by using the VEC model. The Johansen cointegration test result proved cointegration between Bitcoin and altcoins. The Pearson's correlation coefficients provide evidence of a positive and statistically significant correlation between

Bitcoin price movement and altcoins, but the extents of the relationship are greatest during moderate dominance and low during the low dominance phase. Moreover, the cointegration equation reveals that cryptocurrency returns usually respond similarly to positive and negative changes in Bitcoin returns, with very few exceptions. Furthermore, our tests indicate that asymmetries in the long-run impact of Bitcoin returns are operative on a maximum of only two of nine cryptocurrency returns, but there is strong evidence of asymmetry in the short-run effect of Bitcoin returns in all cryptocurrency returns for all frequencies. While comparing all other altcoins, the Dogecoin moves differently for the movement of Bitcoin. According to the study results, some cryptocurrencies (in concrete XRP and LTC) are more connected to Bitcoin than others. Thus, potential practical applications of our results could be that the least connected virtual coin can be used to diversify positions in Bitcoin, whereas the more connected the Altcoin is, the better it can be used to hedge positions in Bitcoin. Finally, the study concludes that the price movement of Bitcoin significantly influences the price movement of altcoins and the extent of influence high during moderate dominance and low during low dominance phase.

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ARTICLE

Effect of Donor Funding on the Performance of Water Utilities in Kenya

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ABSTRACT

The objective of this study was to analyse the effect of donor funding on the performance of water utilities in Kenya. The study employed the use of a census by targeting all 88 regulated Water Services Providers (WSPs) in Kenya for a period of two years, 2016 and 2017. Data pertaining to the support received from the donors were obtained from the publications of the WSPs, Development Partners, Civil Society Organisations (CSOs), and Office of Auditor General (OAG). Performance data of the various WSPs were extracted from the Impact reports produced by Water Regulatory Board (WASREB), for the periods 2016/7 to 2017/8. Presentation of the data was done through the use of tables and charts with the application of SPSS. The study found that donor funding issued as Output Based Approach (OBA) leads to improved performance. This finding is expected to assist the Kenyan Government in negotiating for the Official Development Assistance (ODA) funding to be aligned to the government flagship projects under the Medium Term Plans (MTP). The study recommends OBA as the best way of issuing donor funding.

1. Introduction

The water sector has received attention over the past fifteen years. During the United Nations summit in the year 2000, 189 countries signed the millennium declaration aimed at improving the lives of poor people, what was referred to as the Millennium Development Goals (MDGs). This was a set of eight goals that were to be achieved by the year 2015, among them being goal number seven which was to ensure environmental sustainability, and its target 7c aimed to halve the proportion of people without access to safe water and sanitation by 2015 ^[1]. According to the World Health Organization (WHO) ^[2], a report on MDG Key facts (2018), target 7c was realized with 90% using improved drinking water

sources in the year 2012 compared to 76% in the year 1990. Government Spending Watch report, 2015, indicates that the Sub-Saharan Africa region never met this goal. The progress made on sanitation was low with 2.5 billion people not having access to improved sanitation facilities and 1 billion people still practicing open defecation. In September 2015, the world leaders adopted the Sustainable Development Goals (SDGs) which is aimed at ending poverty in all its form while ensuring that no one is left behind. SDG 6 aims to ensure availability and sustainable water and sanitation for all. According to the SDGs report 2018 of the Secretary-General, the progress of goal 6 indicated that in 2015, 29% of the global population lacked safely managed drinking water supplies and 892 million people continued to practice open defecation. Though the

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proportion of the population practicing open defecation has reduced, the number of people without access to safe drinking water has increased compared to the WHO 2015 report on MDG key facts.

Owing to the importance placed on access to water, the donor community has supplemented the efforts of governments in enhancing access to water in developing countries^[13]. Though this has been criticised as being undesirable^[10] within the context of the dependency theory,^[8] others have lauded it has been pivotal to solving Africa's water problems^[13]. Regrettably, there is scanty literature on the nexus between donor funding and performance of water utilities in most parts of Africa. In Kenya for example, no documented study has examined the effect of donor funding on the performance of water utilities in Kenya. This happens in spite of the fact that donors fund over 70% of the water sector budget in developing countries^[13]. This study thus seeks to bridge this literature gap. Literature also shows that often, donor aid, irrespective of its type, does not always yield the anticipated returns as posited by Beamon and Balcik^[16]. This creates an interesting research lacuna since the success of water utility projects cannot be taken for granted. Literature also shows that the political context in which donor funded water utility projects are implemented also affects their success as shown by a study by Galvin and Habib in "the politics of decentralisation and donor funding in South Africa's Rural Water Sector."^[17] It is thus pertinent to study the sociopolitical determinants of the success of donor-funded projects in developing countries such as Kenya among others.

In Kenya, the Constitution of Kenya^[3] acknowledges that access to clean and safe water in adequate quantities is a basic human right as per article 43 (1) (d). The Water Act 2016 states that water functions are a shared responsibility between the national government and the county government^[4]. The National government is mandated with policy formulation and regulation through the Ministry of Water and Sanitation and its sector institutions while water provision is the mandate of the County Government. The water sector in Kenya continues to experience a huge financial gap. According to the water regulator, (WASREB), to achieve the SDG 100% water coverage by 2030, and to fill the current financial gap, the National Water Master Plan (NWMP) projects an investment of Ksh. 1.8 trillion, out of which 1.3 trillion will be required for water supply and the 500 billion will be required for sanitation. The Kenyan government projects to avail Ksh 592.4 billion for the duration of the National Water Master Plan^[5]. This basically leaves the sector with a financial gap of over Ksh. 1 trillion. The Master plan further suggests that

since the government budget available for the water supply subsector only covers 44% of the required investment cost, more private sector financing and Official Development Assistance funds being actively introduced in the sector could substantially reduce the financial gap.

Official Development Assistance (ODA) refers to government aid aimed to enhance the economic development and wellbeing of developing nations^[6]. Such aid may be channelled through multilateral agencies such as the World Bank or Government bilateral cooperation. Developing countries are required to devote 0.7% of their gross national income to Official Development Assistance. The Organization of Economic Cooperation and Development maintains a list of developing countries entitled to be recipients of Official Development Assistance. The World Bank estimates that Development Partners contribute more than 50% to the Water Sector Budget by the year 2017. Good governance, pro-poor policy, capable and legitimate institutions with well-trained professionals, financing systems that are not susceptible to corruption, efficient and effective public financial management are important factors in providing access to water and sanitation for all^[7]. It is on this basis that this study aimed to establish whether the Official Development Assistance funds had any effect on the performance of water sector utilities in Kenya. In accessing the performance of the water sector utilities the study checked on the Key Performance Indicators as outlined by the water regulator, Water Services Regulatory Board (WASREB).

Though access to clean and safe water in adequate quantity has been described as a basic human right^[3], only 60% of the population has access to safe water. Availability of fresh water in the world is diminishing owing to climate change and other human-related activities, and Kenya has been classified as a water-scarce country. Conflicts for the scarce water resource have emerged in various parts of the country and this has been attributed to a lack of legal framework for shared waters. Encroachment and destruction of key water catchment areas have further resulted in reduced water levels threatening the livelihoods of riparian's depending on these watercourses. The only accurate data available on water coverage are for the urban areas due to the lack of a cost-effective Information Technology system that is capable of capturing data across the country. The data for rural areas are therefore based on an estimate, which poses a huge risk in investment decision-making. For universal access to water to be achieved by the year 2030, more connections are required annually. Achieving Vision 2030 requires an investment of 100 billion, yet only 42 billion is disbursed to the sector for Water Supply and Sewerage Services development

budget. Though the development of water infrastructure is the sole responsibility of the government, only 24% of the budgetary allocation is provided by the Government, while the remaining 76% is expected to be provided by donors. This poses a huge risk to the sustainability of the Water Infrastructure Projects since the donor funding is not assured, thus the need to innovate other funding sources. Since the Development Partners provide a significant proportion of the development budget related to the Water Supply Infrastructure, none of the studies has attempted to examine why only 60% of the population has access to safe water. In view of the background information above, this study aimed to determine the effect of donor funding on the performance of water utilities in Kenya. In view of this, the aim of this paper is to determine the effect of donor funding on the performance of water utilities in Kenya. The remaining part of the paper is divided into literature review, methodology, analysis and discussion of findings and conclusion and recommendation.

2. Literature Review

2.1 Theoretical Review

Dependency Theory

Paul Baran's dependency theory^[8], posits that development is only feasible if a country adopts a strategy of de-linking and import substitution. The main characteristics of this theory entail, that international systems consist of dominant and dependent states; secondly, external forces influence the economic activity of dependent states, and; lastly, strong historical relationships between the two states reinforce the patterns of inequality. The theory asserts that aid leads to underdevelopment; increases inequality and conflict and; puts in place an authoritarian government. This theory views the world as either the core or the periphery. The core is the wealthy who are industrialised and educated while the peripheries possess mines, productive agricultural lands though they are the poor, illiterate, and powerless^[9]. Dependency theorists classify the world into four different groups: Core of Core (CC); Periphery of Core (PC), and this is characterized by less global power and wealth than CC countries; Core of Periphery (CP), and these countries are wealthy though they are still developing and; Periphery of Periphery (PP), which entail the Least Developed Countries (LDC)^[9]. Dependency theory is based on the fact that resources move from poor countries to rich countries. The poor countries export raw materials to rich countries, who in turn process the raw materials through a value addition chain. The poor countries in turn import these finished products at a more expensive price, causing inequality between the poor and

rich states. Underdevelopment can only be overcome if countries delink from the core dominance.

Ekeh and Emeh^[10], through a paper on 'Dependency theory and Africa's underdevelopment: a paradigm shift from Pseudo-Intellectualism: The Nigerian Perspective', developed four main recommendations. First, the solution lies with Africans, therefore the political leaders and the private investors should stop complaining and instead brainstorm on the solutions. Secondly, the leaders of African countries should invest in their home countries and not in foreign bank accounts in countries that are considered to be tax havens, for example, Swiss. Thirdly, good governance needs to be practiced by every citizen of the various African states. The positive net effect of this is that it will put to an end ethnicity and the continent's greatest vice, corruption. Lastly, civil education needs to be promoted so that it can result in an intellectual revolution. This will bring to an end the political tension that arises during the election period, and thus the continent will once again become conducive for businesses.

Many scholars have always argued that the reason why Africa has remained to be poor is because of its over-reliance on aid. This has inhibited innovation and learning. Most of its resources have also continued to be exploited. This has led the African continent to continue being net exporters of raw materials. Industries have collapsed and this has led to further loss of jobs, increasing the poverty index of the continent. Lack of regulation has also led the continent to receive sub-standard products which are a health hazard to its citizens. If only the Paris Declaration on Aid effectiveness (OECD, 2005) could be followed, then the developing countries could have owned the projects under the support of donor agencies. Jackson, Nkwocha, and Boroh^[11] through their paper on 'Dependency and third world underdevelopment: Examining Production-Consumption Disarticulation in Nigeria', came up with five main recommendations.

First, for Africa to come out of the dependency syndrome, internal trade within the African Union states needs to be encouraged. The African Union states ratified the Africa Continental Free Trade Agreement (ACFTA) in 2018, though countries with big economies like Nigeria did not ratify the ACFTA^[12]. Secondly, African countries need to diversify their revenue sources and not just rely on one source. Thirdly, industrialisation is required in Africa for it to detach itself from too much dependency on foreign aid. Kenya 2030 Vision footprint will in the short term, 2018-2022, focus on Manufacturing, Food security, Improved health care, and Housing, otherwise called the Big Four Agenda. Fourth, there should be an interlinkage of the various economic portfolios. For example, in

Kenya, for the Big Four Agenda to be achieved, water is a cross-cutting issue that needs to be taken into consideration, since all these four Agendas will rely too much on water, and might, as a result, cause the country to experience water stress like the one experienced in South Africa in 2018. Lastly, for the continent to de-link itself from dependence on aid, rural development is key. The rural poor have always been ignored and as a result, this has led to rural-urban migration, leading to vices such as poor sanitation and increased crime rates. Quality education is hard to find in rural areas and drinking water quality is not befitting for any human standard. The system that has been developed to collect data to be used by the Water Services Regulatory Board is still not able to collect the rural data and thus this is always based on an approximation.

Ahiakpor studied the success and failure of the dependency theory in Ghana ^[13]. It found out that by concentrating too much on the past, the theory does not help so much in understanding the present. The government failed to anticipate the consequences of its initial actions because history is a poor predictor of the future. The fragility of democratic institutions complicates the problem of Least Developed Countries (LDCs) ability to evaluate the embedded hypothesis of the theory. Critics of the theory argue that the theory failed to argue the case of development experienced in East Asia. The theory also assumed that all the countries are the same and failed to appreciate the distinctiveness of the various developing countries. The theory only seemed to be applicable in the manufacturing sector and not in any other sector. This theory will assist us in examining the effect of grants on the performance of water utilities since approximately 70% of the water sector funding comes from development partners. Despite such a significant amount of funding coming from donors, the population with access to safe water has continued to remain low at 60%. The theory will therefore assist in establishing whether the poor connectivity has been caused by reliance on the core dominance or foreign aid.

2.2 Empirical Review

This section will review empirical studies that have been carried out on the relationship between donor funding and water utility performance. It reviews studies done on the impact of donor funding to the water utilities; the effect of technical assistance provided by donors to the utilities; the impact of newly introduced information systems by donors to the utilities; and the effect of governance on the performance of water utilities.

Donor financing and performance of water utilities

Few academic papers have been written on the effect

of donor funding on the performance of water utilities. Reviewing this literature shows that while a significant amount of literature examines various aspects of donor funding, it tends to be fragmented. At present, no one has examined the effect of donor funding on the performance of water utilities in Kenya despite more than 70% of the sector budget coming from donors. This study seeks to address these gaps.

A publication by Ahsan and Gunawan analysed the cost and schedule performance of International Development Projects ^[14]. It aimed to find out the reasons why International Development projects to record a poor performance by analysing the cost and schedule performance. The sample population included 100 projects financed by the Asian Development Bank. The variables under study included project duration, schedule variation, and overall project performance. The study found out that only 13% of the projects are completed within schedule and budgeted cost. 73% of the projects start late and operate with less budgeted costs. The causes why International Development (ID) projects are always extended include long procurement procedures. Since ID projects rely too much on the services of a consultant, any delay in procuring the services of a consultant is likely to lead to poor performance of the implementing agency. The Government bureaucratic problems were found out to result in slow decision making. Most projects were found not to have utilized the planned budget and this was attributed to depreciation and devaluation of local currency and international competitive bidding. In Kenya, all the bilateral projects are required to present their project proposals with the Treasury. Before this happens there are always Government to Government negotiations to fulfill the Paris Declaration Agreement on Aid Effectiveness ^[15], whereby the recipient of the donor funding should own the project. Mostly, these negotiations take relatively a very long time that inhibits the success of a given project. The donors are also under pressure to spend the money so that they can report back to their respective governments and thus sometimes more emphasis is laid towards spending the funds as compared to the actual delivery of quality output. The findings of this literature will offer great input to this study in laying an understanding of the factors that impact the effectiveness of donor funding. It also leads to the hypothesis (HO₁), there is no significant relationship between donor funding and the performance of Water Utilities in Kenya.

Beamon and Balcik undertook a study on performance measurement in humanitarian relief chains ^[16]. The objective of the study was to compare performance measurement in the humanitarian relief chain against the commercial supply chain and develop a performance

metric for the humanitarian chain. The performance measurement analysis details were obtained through interviews. The finding of the study was in comparing the performance measurements between profit and non-profit organizations. It did this by checking on the revenue sources, goals, stakeholders, and performance measurement. The revenue sources of profit organizations were from the sale of the line products or services, while the non-profit organizations generated revenue from donor funding. The goal of the commercial entity was profit maximization while that of no-profit entity was to achieve a social purpose and mission. Commercial entities comprise homogenous stakeholders, for example, the directors of the entity while the non-profit entities comprise heterogeneous stakeholders including the government, donors, and the citizens to whom services are rendered to. The performance measurement for commercial entities is profit-based while it is difficult to establish a common performance measurement standard for non-profit entities. The challenges experienced in developing a performance measurement standard for commercial entities include the intangibility of the services offered, immeasurability of the missions, and unknown outcomes, and the variety of interest and standards. Performance measurement for relief entities is important in securing donor funding and improving the funding purpose. The Water Sector Regulatory Board developed key performance indicators to be used in assessing the performance of Water Service Providers. These included percentage of people with access to piped water, drinking water quality, Hours of uninterrupted water supply, Non-Revenue Water percentage, metering ratio, staff productivity per one thousand connections, Personnel expenditure as a percentage of operation and maintenance costs, Revenue Collection Efficiency, Operation, and Maintenance cost coverage ratio and finally percentage sewerage coverage. The donors should thus align their support activities towards these measurement indicators. The findings of this literature will assist the study in identifying the performance measurement standard of donor-funded projects. This leads to the hypothesis (HO₂); donor-funded water utility projects do not significantly align to the various performance measurement indicators.

Galvin and Habib studied the politics of decentralisation and donor funding in South Africa's Rural Water Sector^[17]. It examined the impact of decentralisation policies supported by donors in regard to its implementation. Primary data were obtained by interviewing 47 Government, Donor, and NGO Officials. The study found out that in practice donors promote a state-centric decentralisation while they claim to promote a community-centric decentralisation. This reinforces the institutional bias of

the Government. The study found out that donor funding is used to support initiatives of the South African Government. The donors who provide funding and technical assistance to the South African Government, therefore, reinforce institutional balance by indirectly promoting the state-centric decentralisation. Some stakeholders were of the opinion that despite donors spending millions of rands, there was no significant impact on the outcome. The study further noted that the capacity of the government employees was enhanced through the training offered. The effects of a state-centric decentralisation system should be of great concern to the development partners since it does not promote community participation thus hampering efficient delivery of services. The findings of this paper will assist us in establishing the best practices in which donor funding can be expended.

3. Methodology

The study applied a longitudinal descriptive research design. This is because the sample used was fixed and large. It also enabled the study to determine the degree to which the variables were related. The research focused on the 88 WSPs^[18] regulated by the WASREB. Since the population under study comprises 88 WSPs, the research will not sample the population. It, therefore, applied census, since the population is small. Secondary data were collected from the WASREB Impact publications for the period 2016 to 2017. The research got additional data from the OECD website, MTEF of the Government of Kenya, WSTF^[19], WASPA publications^[20], and Audit reports from the Office of the Auditor-General. The panel data comprised 176 observations since 88 WSPs were analysed over a period of 2 years. The study adopted the use of panel data analysis. This is because the interest of the study was to analyse the effect of the variables over a specified period. SPSS software was used for the analysis. In examining the effect of donor funding on the performance of water utilities, the research adopted the simple panel data regression econometric model as applied by Waweru and Fatoki^[21].

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \varepsilon_{it}$$

Where,

Y = the dependent variable (Water Utilities Performance)

I = Number of observations (88 WSPs)

T = Time period for the study (2 years)

β_0 = Regression coefficient

X_1 = Donor funding

Water utilities performance was measured by assessing the coverage ratio, Non-Revenue Water (NRW) and revenue collection efficiency. On its part, donor funding was measured by the amount of money received in Kenya

shillings.

4. Results and Analysis

4.1 Descriptive Statistics

Descriptive statistics give an initial indication of variables that can be used in regression analysis giving several summarized statistics on a variable, e.g. mean, standard deviation, and also often the lowest and highest observation.

Table 1. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
2016 Coverage ratio	76	3.00	96.00	52.34	25.56
2017 Coverage ratio	85	2.00	99.00	53.22	25.24
2016 NRW	69	18.00	83.00	46.33	13.70
2017 NRW	71	18.00	74.00	45.48	12.64
2016 Rev. Collect Efficiency	76	38.00	114.00	90.26	13.46
2017 Rev. Collect Efficiency	80	55.00	126.00	94.35	12.76
Donor Funding	16	483,613.00	289,406,420.00	78,264,589.29	87,431,265.46

The descriptive statistics in Table 1 show the total number of data analysed (n) which represents the WSPs regulated by the WASREB in Kenya. According to Gujarati (2003), the standard deviation represents a measure of the dispersion from the mean which indicates the smaller the standard deviation the more accurate future predictions maybe because there is less variability. In Table 1, the results indicate that Water utility performance, Information systems, Technical Assistance, Donor Funding do deviate to some extent from the mean although the variables have smaller standard deviations thus more accurate the future predictions. The mean coverage ratio in 2016 and 2017 was 52.34 and 53.22 with a standard deviation of 25.56 and 25.24 respectively, meaning that the data is clustered around the mean. The mean for NRW in 2016 and 2017 was 46.33 and 45.48 with a standard deviation of 13.70 and 12.64 respectively. Revenue collection efficiency has a mean of 90.26 in 2016 and 94.35 in 2017 and a standard deviation of 13.46 in 2016 and 12.76 in 2017. Donor funding has a mean of 78,264,589.29. Technical assistance has a mean of 9,940, and 7841.16.

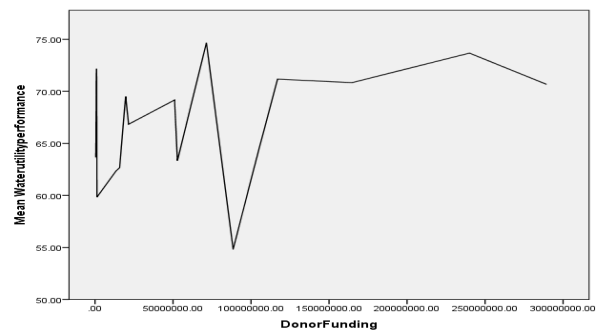


Figure 1. Trend Analysis for Donor Funding

4.2 Donor Funding

Donor funding has a positive effect on the performance of Water Service Providers in Kenya. A unit increase in donor funding issued directly to the WSPs will lead to a 2.116 increase in the performance of the Water Service Providers. The measures of performance considered under this study were the population of people with access to piped water, the revenue collection efficiency, and the percentage of Non-Revenue Water. All these measures of performance data were retrieved from the impact reports produced by the Water Sector Regulatory Board. The donor funding disbursed in cash to the Water Service Providers through the Output-Based Funding (OBF) Programme of the Water Sector Trust Fund has been found to have a greater impact on the performance of WSPs. OBF refers to where the donors give the money to the WSTF, which issues the cash to the WSPs through various calls. The WSTF enters into an arrangement with the commercial banks, who lend the funds to the WSPs and the donors act as bank guarantors just in case the WSPs don't honour their obligation of paying the loans. The WSPs will in turn be given a subsidy of up to 60% by the WSTF. This subsidy is the donor funding issued to the WSTF. The study findings indicate that OBA increases ownership and accountability. With good policies in place, the WSPs are able to make decisions and investments that improve the coverage ratio, reduce Non-Revenue Water, and improve revenue collection efficiency. Galvin and Habib^[17] studied the politics of decentralisation and donor funding in South Africa's Rural Water Sector. It found out that the state-centric decentralisation system failed to promote community participation thus hampering efficient delivery of services. This study finding however introduces a new dimension to the findings by Galvin and Habib^[17], whereby it is not the role of the donors to ensure community participation but instead the partner Government should be the one taking the lead role in ensuring proper public participation as enshrined in our constitution^[6].

4.3 Correlation

The analysis was carried out using the Standard Package of Statistical Science (SPSS) to determine the correlation Pearson Product Moment Correlation was used. The summary of the correlations is shown in the table below:

Table 2. Test of Correlations

		WUP	DF
WUP	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	86	
DF	Pearson Correlation	.410	1
	Sig. (2-tailed)	.115	
	N	16	16

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

The data presented in the table above on the effect of donor funding (DF) on Water Utilities performance (WUP) in Kenya were computed into single variables per factor by obtaining the averages of each factor. Pearson's correlations analysis was then conducted at 95% confidence interval and 5% confidence level 2-tailed. The table indicates that DF did not have a significant effect on WUP as shown by insignificant p-value ($p > 0.05$) at a 95% confidence level. In this regard, all the two null hypotheses namely H_{01} : there is no significant relationship between donor funding and the performance of Water Utilities in Kenya and (H_{02} : donor-funded water utility projects do not significantly align to the various performance measurement indicators were accepted.

4.4 Diagnostic Tests

Prior to carrying out regression analysis, diagnostic tests were carried out. These included linearity and multicollinearity tests.

4.4.1 Linearity Test

Linearity means the correlation variables, which is represented by a straight line. Linearity test aims to determine the relationship between independent variables and the dependent variables is linear or not. If the value sig. deviation from linearity > 0.05 then the relationship be-

tween the independent variable and the dependent variable are linearly dependent. If the Value sig. deviation from linearity < 0.05 then the relationship between independent variables with the dependent is not linear.

Table 3 results indicate that value of sig deviation from the linearity of donor funding was > 0.05 and it can therefore be concluded that there is a linear relationship between the donor funding and the performance of Water Utilities in Kenya.

Table 3. Test of Linearity

			Sum of Squares	df	Mean Square	F	Sig.
Water utility performance * Donor Funding	Between Groups	(Combined)	145.256	6	24.209	.189	.979
		Linearity	14.466	1	14.466	.113	.738
		Deviation from Linearity	130.790	5	26.158	.204	.960
	Within Groups		10142.962	79	128.392		
	Total		10288.218	85			

4.4.2 Multicollinearity

Multicollinearity is a test that evaluates whether the independent variables are highly correlated. The primary concern is that as the degree of Multicollinearity increases, the regression model estimates of the coefficients become unstable and the standard errors for the coefficients can get wildly inflated. The variance inflation factor (VIF) was used to evaluate the level of correlation between variables and to estimate how much the variance of a coefficient was inflated because of linear dependence with other predictors. As a rule of thumb if any of the VIF are greater than 10 (greater than 5 when conservative) then there is a probability of a problem with Multicollinearity and is harmful to the study^[23]. Tolerance, defined as $1/VIF$, is used by many researchers to check on the degree of collinearity. A tolerance value lower than 0.1 is comparable to a VIF of 10. It means that the variable could be considered as a linear combination of other independent variables^[23]. The results for tests of Multicollinearity were as presented in Table 4.

Based on the coefficients output, collinearity statistics obtained VIF value of donor funding = 1.27. This means that the VIF value obtained is greater than 1 and less than 10. It can be concluded that there is no multicollinearity.

Table 4. Test of Multicollinearity

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	70.354	9.533		7.380	.000		
	Donor Funding	1.747E-008	.000	.274	.878	.403	.785	1.274

a. Dependent Variable: Water utility performance

Table 5. Regression Results Without the Moderating Variable

Model	R	R Square	Adjusted R Square		Std. Error of the Estimate		
1	.536 ^a	.287	.073		5.67007		
a. Predictors: (Constant), Donor Funding							
b. Dependent Variable: Water utility performance							
ANOVA ^a							
Model		Sum of Squares		df	Mean Square	F	Sig.
1	Regression	129.346		3	43.115	1.341	.316 ^b
	Residual	321.497		10	32.150		
	Total	450.843		13			
a. Dependent Variable: Water utility performance							
b. Predictors: (Constant), Donor Funding							
Coefficients ^a							
Model		Unstandardized Coefficients		Standardized Coefficients		t	Sig.
		B	Std. Error	Beta			
1	(Constant)	73.316	7.835			9.358	.000
	Donor Funding	2.116E-008	.000	.331		1.158	.274
a. Dependent Variable: Water utility performance							

Table 6. Regression Results with the Moderating Variable

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate			
1	.560 ^a	.313	.008	5.86451			
a. Predictor: (Constant) Donor Funding							
ANOVA ^a							
Model		Sum of Squares	df	Mean Square	F	Sig.	
1	Regression	141.311	4	35.328	1.027	.444 ^b	
	Residual	309.532	9	34.392			
	Total	450.843	13				
a. Dependent Variable: Water utility performance							
b. Predictor: (Constant), Donor Funding							
Coefficients ^a							
Model		Unstandardized Coefficients		Standardized Coefficients		t	Sig.
		B	Std. Error	Beta			
1	(Constant)	70.354	9.533			7.380	.000
	Donor Funding	1.747E-008	.000	.274		.878	.403
a. Dependent Variable: Water utility performance							

4.5 Regression

This section presents the results after performing a multiple regression analysis. Regression analysis is a set of statistical processes for estimating the relationships among variables.

The results presented in Table 5 above indicate that the effect of donor funding on the performance of Water Utilities in Kenya was not significant (R Square = 0.287, F= 1.341, $p > 0.05$). The test results indicated that 28.7% of the variation in performance of Water Utilities in Kenya

could be explained by variation in donor funding which was not significant ($p > 0.05$). The coefficients resulting from the regression model in Table 5 show that holding Donor Funding constant as zero, Water utility performance in Kenya will be 73.316. A unit increase in donor funding will lead to a 2.116E-008 units increase in Water utility performance in Kenya. These findings further buttress the findings from correlation analysis where the two null hypotheses were rejected.

The results presented in Table 6 above indicate that the effect of donor funding together with the moderating var-

iable of governance on the performance of Water Utilities in Kenya was also not significant (R Square = 0.313, F= 1.027, $p > 0.05$). The test results indicated that 31.3% of variation in performance of Water Utilities in Kenya could be explained by variation in donor funding, which was not significant ($p > 0.05$). The coefficients results from the regression model in table 6 further shows that Donor Funding constant as zero, Water utility performance in Kenya will be 70.354.

5. Conclusions and Recommendations

The study found out that donor funding issued directly to WSPs has a positive effect on the performance of the WSPs. This study confirms the agreement of the Paris Declaration on Aid Effectiveness whereby it was stated that for aid to be effective, the receiver of the funds should own the project. If the WSPs are given the liberty to implement the projects on their own without the interference of the external parties and given that they uphold high standards of integrity, then this will lead to improved performance of the WSPs. The donors should therefore align their support along with that of the WSPs and not the other way round. The means of disbursing the funds should also change whereby WSPs should be given the money for project implementation. The Output-Based Approach should be promoted as a means by which the donors can support the WSPs.

The study recommends that Output-Based Aid should be adopted as a means of disbursing donor funding to the WSPs. This is because WSPs remain accountable for meeting the objective of the funding before getting a subsidy from the donors. This ensures ownership of the implemented projects by the WSPs.

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ARTICLE

How does Street Vending Economy Help Rural to Urban Migrants Integrate into Cities?

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ABSTRACT

Street vending is a form of informal economy. The main participants of street vending economy consist of exploited workers, rural-urban migrants who are in low level of socioeconomic households, common workers, and some individual households. Most of the studies and articles have explored how to regulate the street vending economy and how to facilitate the relationship between vendors and city authorities, but the important constitute of street vending economies, rural migrants, has received little attention from scholars and there is little research about it. What role does street vending economy play in the lives of this segment of this population which itself faces a number of challenges in migrating and integrating into the city? We have found out that street vending functions as a platform which helps these people to better integrate into the cities. Through desktop research and case studies, this paper explores how street vending economy helps rural to urban migrants integrate into the city from four perspectives: identity integration, integrating in economic level, integrating in social level, and females' empowerment.

1. Introduction

Street vendors are defined as a historically existing business model in which vendors are easily mobile and sell cheap handicrafts, goods, or food; Liu lingling regards street vendors as unstable practitioner who use the public space of the city to engage in small commodities or small-scale transactions in order to obtain economic income to meet the basic needs of survival ^[1]. Street vendors can be divided into the following three categories. Local urban residents who are unemployed or homeless; local farmers mainly sell fruits and vegetables grown by themselves; non-local vendors from rural areas ^[2]. Because of the accelerating urbanization process, the demand for

migrant labor rose further after the early 2000s, especially after China's accession to the World Trade Organization, making a great number of people from rural areas emigrate to the cities for job opportunities. According to the National Bureau of Statistics, the number of migrants in China had reached 221 million by 2010, of which 174 million (78.7%) were from the countryside ^[3]. However, the majority of the rural population are not well educated, and the job skills they master are not advanced. Obviously, they are at marginal status in the job market. If they cannot find a way to make a living in a short time, they will have no choice but to leave the big cities and go back to the villages or towns where they originally lived.

Through studying different articles and case analysis,

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we found out that prosperous street vending economies does not only provide a platform for people who are in low socioeconomic status to maintain life, but help rural to urban migrants to integrate into urban life. This paper fills the gap by examining how street vending economy helps rural to urban migrants to integrate into urban life through four aspects.

2. Identity Integration

The importance of China's Household Registration System cannot be underestimated in every respect of people's lives, as it has a close relationship with birth status, educational opportunity, housing, and work. Hukou system divides the population into agricultural and non-agricultural households according to geography and family members. Urban hukou and rural hukou can have completely different treatment and the right to engage in activities. Rural migrant, with rural hukou, face a continued lack of access to the social-security benefits, public housing, and urban public education available to those officially classified as 'urban residents' under the Hukou system^[4-6]. Obviously, one of the main rural-urban migrants' goals is to obtain an urban hukou hence getting permanent residency in the cities, integrating into urban life "physically" and in identity. To be eligible for a non-agricultural hukou, a person must meet the conditions specified in the policy control criteria. The conditions include recruitment by state-owned enterprises (zhaogong), admission to higher education institutions (zhaosheng), promotion to senior executive positions (zhaogari), and migration for personal reasons^[7].

However, very few of the migrants are well-educated, and many of them can only do farm work and lack the professional skills that cities want to attract. Moreover, the requirements for applying for urban hukou vary from city to city, but most of them are very demanding. For example, the government of Guangdong Province implemented a program known as the "credit accumulation system" in 2010, requiring migrants to earn 60 points to qualify for hukou in Dongguan, Shenzhen, Huizhou and Zhongshan. Education and skills, years of work, social insurance payments, and even good deeds such as blood donations are all taken into account^[8]. In addition, some cities require migrants to purchase housing to be qualified to obtain an urban hukou, and others may require migrants to reside permanently for five years and pay taxes in order to obtain an urban hukou. Thus, it can be seen that these eligibility criteria are very difficult for migrants to meet, and very few people meet the above criteria, which means that they have little opportunity to settle permanently in urban cities. A study draws on a large sample of migrants from 12 cities in four major urbanizing areas in China

found out that self-employed migrants are more intent than wage-earning migrants on permanent urban settlement. Engaging in street vending is their master key to sustain life and keep preparing for obtaining urban hukou, because street vending activities provide them with job opportunities to bypass potential exclusion from the formal labor market^[9]. It does not require specific training or special skills, and it is easy to get started and operate, which also helps them to get financial resources in a short period of time. It serves as a platform for them to accumulate capital and experience, so that they can find a more decent job afterwards, seeking to purchase an apartment and paying taxes, making them able to fulfill the requirements of urban hukou. In a case study conducted by Chen and Liu, vendor [X1], migrated from a town to Beijing, said, "I have never worked in a supermarket before. In my mind, being an employee in a supermarket is a really great job." However, when she started at the supermarket, she felt very frustrated "My boss always criticizes me, as I cannot recognize the English alphabet and always make mistakes when labeling the food. I also have to recite antifire regulations all the time, as my boss will check every day. Working in a supermarket is also very tiring as employees frequently have to carry heavy boxes. My arms are so sore at night that I cannot fall asleep." Since she works part-time, she only earns 1800 RMB per month, which is far less than her previous street vending business at Nanhmarket. She said if she kept engaging in street vending, the money she earns may be enough for her son to graduate from college, supporting him to find a job and settle in Beijing^[10]. Hence, street vending is not necessarily the most useful way, but it does help migrants "physically" get a step closer to an urban hukou.

3. Integrating into Cities in Economic Level

Street vending economy helps rural-urban migrants to integrate into the cities at economic level, which means making them financially independent enough to survive in the cities, and even making their income close to the income of urban people and their consumption level. In recent years, although the government has made "agriculture, rural areas and farmers" a top priority, and the welfare and subsidies of peasants have been greatly increased, agriculture is still a low-margin business. As a result, many of the younger generation are heading to urban areas to seek higher incomes^[11]. Moreover, with the development of urbanization, rural residents are encouraged to settle down in cities, and the continuous demand for labor also attracts them. Hence, the essential push factor for people who emigrate to the cities is poverty of their hometown and the most significant pull factor for them is

the higher income and broader market in the cities. However, most of the rural to urban migrants are the weak, especially those with low education and low working skills like the above mentioned^[12]. Therefore, it is not realistic for them to be accepted by the units (*danwei*) and obtain stable jobs in the face of competitors such as college graduates with high education or technical school graduates with advanced technology. The high prices and consumption level in cities make them unable to stop looking for jobs. Otherwise they have to go back to their original rural areas. For most street vendors, the cost of buying a house is a bit beyond their budget. So renting a house is the choice of almost all street vendors^[13]. It can be seen that they are suffering huge economic pressure.

Street vending's markets have relatively low barriers to entry and provide a welcoming platform to start a small business and manage a stall^[10]. Due to the low rental fee and cheap products, migrants do not need to invest a lot and do not need to spend obtaining a business license to set up stalls. According to a report by the National Bureau of Statistics and the Digital Finance Center of Peking University, the vast majority of the vendors earned more than 4,000 yuan, excluding those who were unwilling to disclose their income. For example, a *malatang* (small hotpot) vendor could earn 15,000 yuan a month^[11]. The booming vendor economy also shows that this business is profitable and promising. According to the 2020 China Street Vending Economy Industry Research Report, from 2013 to 2018, self-employed occupied 70 percent of the new employment in the country, which is an important part of the job supply. By May 21, Chengdu's 36,000 stalls had created more than 100,000 jobs since March, when the city introduced a policy allowing traders to temporarily occupy the streets. It is estimated that if other cities across the country carry out the policy in an orderly manner, 500,000 booths will be opened, and one to 1.5 million new jobs will be created^[14]. In Chen and Liu's study, one vegetable vendor from a village in Henan province[T1] decided to pursue a more stable and predictable job after working at a private construction company for several years since coming to Beijing in 1992. He explained, "When there was a project, the company would ask me to keep working. I was so busy that I could not even rest for one day. But when there was no project, I had to stay at home waiting for a long period of time, with no earnings." Inspired by a vegetable vendor who vended in his courtyard every day, he decided to become a vendor to obtain stable earnings: "Being a vendor requires hard work, but I persisted, since the threshold is low, the risk is low, and it is also quite flexible. Now, I don't need to worry about how I should earn money if I don't have

a job some days and I don't need to worry about that I may have to leave Beijing and go back to my hometown. Things are getting better."^[10]. It can be seen that street vending economy provides strong economic support for the migrants, making them able to fully pay their daily expenses. Thus, when they have enough funds to live in the cities instead of leaving because of low financial status, it is easier to integrate into urban life.

4. Integrating into Cities in Social Level

Street vending helps migrants to integrate into city life by building social ties. In China, this can also be called *Guanxi*, which has been used to describe the meaning and importance of interpersonal relationships. Its essence is a set of interpersonal ties that facilitate exchange of favors among people on a dyadic basis. Since *Guanxi* involves familiarity or intimacy, trust and reciprocal obligation, in practice, it generally occurs among immediate family members, relatives and friends^[15]. I will then elucidate two cases.

First, it is easy to establish native-place fellows (*Laoxiang*), the most supportive and reliable social relationships considered by rural people in the process of engaging in street vending, which helps them gain warmth, understanding, financial assistance and emotional support. It had been demonstrated that these migrant networks were social resources of great importance for migrants who were seeking jobs, conducting business, exchanging rental information, and acquiring loans with low interest rates in cities^[4,16]. In a report studying the social relations of night market vendors in Yinchuan City, the author conducted fieldwork, questionnaires, observations, interviews towards the lives of many migrants who work as street vendors. ZL is a vendor from Hubei who sold "spicy huhu" in Yinchuan. She was always very busy and had no time to make friends, so in her spare time, she often chatted with the nearby vendors and hence got to know many *Laoxiang*, and soon became friends with them. The son of one of the *Laoxiang* could not continue to work as a construction worker because of his poor health, and he wanted to learn the ingredients of spicy huhu from ZL to make money in other places. ZL did not agree at first, but she considered that she should teach him the technique because they were from the same place. As a result, she charged a small tuition fee and taught him the recipe and production method. Afterwards, ZL and this vendor's family became closer, helping each other more often and introducing customers to each other, which made both of their business become better^[2]. Thus, it can be seen that it is difficult for migrants to establish social ties in big cities because of cultural differences, uneven education levels, busy work

schedules, and even discrimination, but street vending is a great way to help them to construct basic *Laoxiang* relationship, bringing huge convenience and benefit.

On the other hand, developing *Guanxi* with local residents also matters ^[17]. In a study interviewing street vending migrants in Beijing, many of them said street vending offers a platform for information exchange that expands their social networks. One cloth retailer told Chen and Liu about her son. After entering middle school, her son became addicted to internet and dropped out of school. This made her very anxious, but she could do nothing as she did not have any child-rearing and educational experience. Also, she did not have relatives in Beijing who could help and gave her some suggestions. However, one of her longtime customers, after hearing about her frustration, introduced her son to a vocational high school to learn skills and kick the bad habit. "Now my son is doing an internship in a repair and service shop!" she said. Thus, *Guanxi* in street vending can yield positive outcomes. Furthermore, aside from tangible support, local customers also provide migrants with emotional support. One tailor [Q1] was welcomed by local residents because of her strong skills and work virtue. Since her husband was at home in Sichuan Province taking care of his parents, and her two children were studying at universities, she stayed in Beijing by herself and she was the only income earner in the family. Having learned about her situation, many customers tried to help her in various ways. She said, "All customers were my friends, and they always took care of me. They often invited me to go to the supermarket with them and hang out together. When I did not feel well, they bought medicine for me. During periods of spring festivals, some of the customers gave me 200 or 300 RMB as a gift." ^[10] Because of the mobility and flexibility of the street vending, it is effective for vendors to make friends with different people and create interactions with them, thus building relationships with *Laoxiang* and residents who may help them to integrate into urban life to a certain extent.

5. Improvement of Females' Social Status, Economic Status and Discourse

Although in contemporary urban cities, females can fully rely on themselves to achieve economic independence and work outside instead of staying at home, in rural areas, social norms still require females to be responsible only for doing household work and raising children. Their status and discourse are not as equal as urban females. Data indicated that over half of both rural to urban street vendors were female, and nearly 90% were married ^[18]. When they are engaged in the street vending economy, fe-

males would gradually get rid of the division of labor they used to believe and get used to. Street vending economy not only proffers them a platform to learn skills and earn income, but also imperceptibly makes them aware of that females can also be the breadwinner of the family, not just playing the role of doing housework and bearing children. This can be explained by socialization and observational learning. Socialization is the process by which society's values and norms, including those pertaining to gender, are taught and learned. It is a two-fold process through which a person internalizes the culture and develops a sense of self; both are learned in interaction with other people, through words and gestures. Agents of socialization such as family, school, peer, media provide information, feedback, and social supports for role learning. Observational learning, a mechanism of socialization, is a component of social learning theory, involves learning by watching the action and behaviors of others. If those actions and behaviors are considered desirable by the observer, then the observer may imitate observed behavioral patterns for.

When these females set up stalls to sell products, they will observe that many other females are also doing the same things. It is not strange that they bargain and purchase goods by themselves ^[19]. During the interaction process with urban customers and other vendors, they will also realize that their role is not limited to staying at home and raising children, but also be going out to make money, working by themselves and supporting their families. Over time, when they get used to such consciousness and behavior pattern, their inherent and banal division of labor consciousness shaped by the countryside will gradually fade and accept the new consciousness of urban people. Moreover, many of them can earn money as tuition through street vending to learn professional skills that do not require a high academic background, such as makeup and haircut, trying to hunt other formal jobs. Consequently, the economic and social status and discourse of rural females would gradually improve, getting ready to integrate into urban life.

6. Discussion and Suggestion

After reading various literature and studies, we also found some noticeable phenomena. Some migrants who are engaged in street vending economy gradually do not care whether they integrate into the city or not after working for a while. For them, they are satisfied as long as they can earn enough money to sustain themselves and have a stable habitat without being evicted by the city administration. It doesn't matter whether they have friends in the city or not, as well as getting an urban huk-

ou or not. Also, some migrants never really think of any way to get an urban hukou, and building social networks doesn't make much sense to them either. They know that this restriction and distance between themselves and city residents cannot be changed and it is hard to meet, so they are ready to go back to their hometown at any time. Most of these migrants are single, have no family, and living a boring life. It can be understood that they are struggling to "survive" instead of living. When rural migrants are engaged in the street vending economy, they encounter more difficulties and obstacles, but in turn, it is a lucrative platform to help them to integrate into the cities compared to the locals. We believe that the government should adjust its management towards those urban migrants engaged in street vending economy to be more flexible and develop more countermeasures to support and help them. Guangzhou's Designated Vending Zone is restrictive and undesired was implemented in Guangdong province, but this policy failed to satisfy most street vendors^[20]. Due to the limitation of fixed stalls, the advantages of the original mobile customers are reduced. Therefore, some scholars believe that the government should implement some "soft" policies, such as compensatory welfare for land-lost farmers^[21]. Or formalize the informal economy^[22]. But no matter what government policy, the ultimate goal of the government is to cooperate with the street vending economy, not conflict.

7. Conclusions

The role of street vending not only provides a means for laid-off workers and unemployed groups to maintain their livelihood and financial income, but also provides opportunities for rural-urban migrants to integrate into the cities and move upward. As a "qiaomenzhuan", the urban hukou is the first step for migrants to integrate into the city physically. Street vending economy helps migrants who are not accepted by state-owned enterprises, who do not have professional skills, and who are uneducated, to have a temporary platform where they can earn income, gain experience, and prepare for a formal job and an urban hukou. They can maintain their living expenses and get close to urban consumption level through engaging in street vending economy. Moreover, it also helps migrants to build a network with their *Laoxiang* and local residents. As a result, they are more likely to have information exchange, benefits change, emotional support from each other, hence integrating into the cities emotionally and psychologically. Last but not least, street vending to some extent improves females' social status, economic status and discourse.

It is undeniable that the majority of migrants who are

engaged in the street vending economy are still at the bottom of our society. And the definition of so-called urban integration is different for them. Some think that as long as they have permanent residency, they are city residents; some think that as long as they have enough financial resources, they can integrate into wherever they go; and some think that building up connections and bonding means truly integrating into a city. Nonetheless, as long as the street vending economy can play its role in helping migrants to integrate into the cities in whatever way, it is worth being encouraged.

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ARTICLE

Velocity of Money in Ethiopia**Kedir Bekeru Genemo***

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ABSTRACT

Velocity of money is an important instrument used to measure the monetary target and quality of monetary policy. Referencing the trends in the money velocity, mainly in the short term, will have a paramount effect in determining the trends in real money growth. This study investigates the main causes of money velocity in Ethiopia using time series data for the period 1974/75 to 2015/16. A regression with Bayesian estimation and non-parametric Locally Weighted Scatterplot Smoothing (LOWESS) methods were used to analyze the data. Variables such as credit, real interest rate, real exchange rate and real per capita income were included as potential determinants of money velocity. The findings of using non-parametric LOWESS methods show an upward trends in the velocity of money since 2002 and downward trends before 2002, indicating the existence's of prudent monetary policy in Ethiopia after 2002. The result also shows a positive effect of real exchange rate and credit, whereas income per capita and real interest rates have a negative effect on velocity of money in Ethiopia. Hence, this paper recommends that, the policy to encourage sustainable economic growth and increase in interest rate would be beneficial to reduce velocity of money.

1. Introduction and Background of Study

In the studies of the relationship among money, output and price, the money velocity is assumed to be stable in the short-run. However, if the change in velocity of money could be significant in the short-run, the money growth indicator may add significant noise to monetary analysis. Consideration of velocity of money in setting monetary policy is important when financial markets are underdeveloped, choices of monetary instruments are limited, interest rates are ineffective, and monetary operations largely depend on targeting money aggregates^[1]. Against this preview, in Ethiopia, a working assumption is that velocity is declining by 2 percent each year^[4]. This could

lead to the setting of aggregate money growth targets that are higher than the desired growth rates of nominal output.

Several researches have linked the determinants of demand for money to search the predictability of velocity of money. It has shown that income and inflation were significantly determine demand for money^[10], while the other also shows that it is more of inflation that determine demand than income and setting the monetary target needs to account for volatility as well^[11]. This might be due to the fact that the increase in money velocity and the fluctuating market risk is increasing the importance for accounting for velocity of money to calculate the monetary target^[4]. Substantial evidence shows that factors determin-

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ing money demand such as output and change in general price are also important in determining money velocity and, however, it also highlights that money velocity draw mixed picture about its prediction benefit in calculating the monetary target in the policy of targeting money as an intermediate policy to stabilize macro economy.

Most of the literature has focused on the determinant of money velocity, and again their evidences are encouraging^[6,9,12,13]. Moreover, given the locally specific nature of monetary velocity, evidence is difficult to compare across cases and there is no agreement regarding the determinants of velocity of money. The issues of estimation methods, the variety of measuring velocity of money, the use of unstandardized observation in the methods were some of the factors contributed the disagreements on the determinants of monetary velocity.

This paper is designed to contribute to the literature on the determinants of velocity of money in Ethiopia. The factors that determine the velocity of money were closely examined. Some of potential estimation problems were addressed using Bayesian estimation and non-parametric Locally Weighted Scatterplot Smoothing (LOWESS). The analysis is drawn on the time series data collected from National Bank of Ethiopia (NBE) and the soundness of the factors presented by this paper relayed significantly on the analysis of priori information in determining posterior information.

This paper is organized in to four sections. The first section is introducing the paper, the second section is explaining about the methods of estimation; the third section is producing the analysis and makes discussion, and fourth section is about conclusion.

2. Material and Methods

2.1 Data Type and Sources

This study has used time series data collected from National Bank of Ethiopia and spanned from 1974/75 to 2015/16. The main variables are velocity of money, real per capita income, real interest rate, credit to output ratio and real effective exchange rate. To estimate the model and examine the statistical significance of the explanatory variables on velocity of money, multiple regressions with Bayesian estimation was employed.

2.2 Model Specification

The theoretical modern quantity theory specifies that the velocity function depends on the measure of output and change in general price. The rapid growth of institutions with technologically advanced payment and settle-

ments system, especially entrenched banking system, also affects the way people conduct their economic transactions^[5]. Hence, financial indicators should therefore enter the velocity function along with measures of output and change in general price. In this paper, inflation (change in general price) is captured by real interest rate. In the light of the theoretical and empirical discussion, the researcher proposes the following model for estimation of velocity equation.

$$V = PY/M = Y / (M/P) = Y / Md(RI, PC, CY, RE) \quad (1)$$

Where

V.... velocity of money

PC... Real per capita income

CY... Credit to GDP ratio indicator for Financial Developments

RI.....real Interest Rate

RE..... real effective exchange rate

While many agreed that income is one of the most important variables affecting movements in velocity, they do not all share the same view on the nature of the relationship between them. PC represents real income per capita. The way per capita income affects velocity depends upon income elasticity of demand for money. If it exceeds one, there will be a negative impact on per capita income on money velocity and vice versa^[6]. The sign of association between V and PC depends on the phase of economic development, particularly the financial development^[2]. At the earlier phase of economic development, the velocity may decrease with higher growth of output but at a later stage (phase), it may become positively correlated with output growth. The reason is that, at the initial stage of economic development there is increasing monetization, improvement of banking system and fast expansion of monetary transactions that leads to higher demand for money creating money velocity to fall down. At the advanced stage of development branded by transaction efficiency, financial modernization and technological development that guarantee the accessibility and use of money substitutes and provide a variety of money substitutes reduce the demand for money, which makes V boost up. Therefore, PC expected negative or positive sign.

Changes in the financial environment, both in developed and developing economies can also be expected to exert an influence on velocity. The behavior of economic units can be affected by changes in financial regulations, a wider range of financial institutions and assets, the spread of bank offices, the introduction of deposit insurance and credit cards, new techniques of cash management, etc. The psychological impact of these factors may be difficult to Operationalizing in a single variable. A common approach is to use the Credit to GDP ratio as an index of financial

development or financial sophistication. This variable should have a positive or negative effect the velocity of money^[8].

Movements in the exchange rate can also affect velocity. This can be indirect through its impact on inflation. In a situation where confidence in the domestic and/or external value of the local currency is waning residents may seek to substitute foreign currency for local money. Real effective exchange rate and velocity of money expected to have positive relationship through inflation. Again, the real interest rate entails to some sort essence of inflation expectation and nominal interest rate. Moreover, increase in real interest rate may be due to increase in nominal interest rate or decrease in inflation and of is closely related to the velocity of money. When interest rate measure the opportunity cost of holding money it is expected to be positive since substitution can occur between money and alternative financial assets, an increase in the rate of interest contributes to a higher cost of holding money, and therefore, velocity increases^[2]. Alternatively, if a rise in real interest rate measure decrease in price levels it is expected to have negative effect. Therefore, RI expected to have a negative or positive association with velocity.

Bearing these views the paper going to estimate the following model:

$$V_t = \beta_0 + \beta_1 PC_t + \beta_2 RI_t + \beta_3 CY_t + \beta_4 RE_t + \varepsilon_t \quad (2)$$

$\beta_0, \beta_1, \beta_2, \beta_4$ are constant coefficient and E_t is random disturbance term and other variable are as explained before.

2.3 Estimation Methods

2.3.1 Unit Root Test

Time series data on most economic variables are not stationary at level. A regression of non-stationary variables give spurious or inconsistent regression, which gives very high R2 due to time trend, that may lead to invalid statistical inferences^[3]. In exploring effect of explanatory variable on income velocity of money, the first step is examining the statistical properties of time series data. Particularly, to find the order of integration of order d, written I(d) if it needs differencing d times to achieve stationary. Augmented Dickey-Fuller (ADF) test is performed to check the order of integration i.e. whether the variable are stationary at level or change.

2.3.2 Bayesian Estimation

Bayesian multiple regression models include specifications of the prior distributions for parameters. Prior specification may be conjugate or diffuse. If prior distributions

are formulated with very small variances so that the prior knowledge strongly influences posterior distribution of the parameters in the model, then they are called informative priors. On the other hand if the priors are formulated using large variances they may have very little effect on the posterior distributions thus they are called diffuse priors^[9]. In any way a very important issue is selection of priori information for which in this paper ordinary least square estimate is used. A population model for multiple regression models that relates the response variable Y to P-1 predictor variables is written as

$$V_t = X\beta + \varepsilon \quad (3)$$

Where V is response variable .i.e. income velocity of money.

X is the known covariate, β are the unknown parameter and E random error with variance δ^2 .

Since we do not know the values for $\theta(\delta^2, \beta)$ we will need to estimate them based on our data using Bayesian estimation, assuming that unknown parameter are random unlike frequenters approach. When both δ^2 and β are unknown we take the joint posterior distribution, after that we integrate to each parameter (i.e. find the marginal distribution of each parameter). However, this may be difficult in practice as the posterior density may be difficult to derive and integrate.

In fact, for many interesting models, it is unfortunately not possible to evaluate the moments and quintiles of the posterior $p(\theta/v)$ analytically. In general, we are only able to numerically evaluate the prior distribution, $p(\theta)$ and the likelihood function $p(v/\theta)$. Nowadays, the integrals involved in Bayesian analysis are usually evaluated using numerical simulation methods known as Markov-chain Monte Carlo simulation. The simulation process needs burn in (i.e., run for long enough that the posterior distribution reaches a steady state that is independent of the starting values of parameters) and thinning. The mean of this probability density function is the point estimate of parameter β ^[9].

3. Results and Discussion

3.1 Descriptive Analysis

With aiming to analyze time series data mainly to identify, to describe the fundamental structure and to determine a suitable model to fit the data, the trends using Locally Weighted Scatterplot Smoothing (LOWESS) have been shown. The Figure 1 below shows the trend of the income velocity of money, real interest rate, per capita income, real exchange rate, and currency to GDP ratio in

Ethiopia to see some insight portrayed from the graph. Again summary of statistic on these variables were explained in Table 1. It is observed that, the minimum money velocity is 2.412 and maximum is 7.189, but on average, it is around 4. Again 50 percent of income velocity of money lies above 3.519 and 25 percent of income velocity lies above 4.027.

Table 1. summary statistics for each variable under study

summary	year	V	PC	RI	RE	CY
Min.	1975	2.412	294.2	0.512	93.58	21.54
1st Qu.	1985	2.996	387.5	0.07802	114.08	41.77
Median	1996	3.519	802.1	0.02458	163.29	48.78
Mean	1996	3.843	2450.2	0.03867	156.98	52.78
3rd Qu.	2006	4.027	1663	0.04207	184.5	59.18
Max.	2016	7.189	16572	0.19079	284.5	92.39

Source: R- output on data from National Bank of Ethiopia

The LOWESS method was aimed to bring robust locally weighted observation and scatter plot smoothing for both equal-spaced and non-equal-spaced data. It is a data analysis method for making a “smooth” set of values from a time series observation, which has been tainted with noise. This method is an improvement over least squares smoothing which assumes when the data are equally spaced. In LOWESS smoothing method, the size of the smoothing window can vary from zero to one. The default window size is 0.1 which indicates that smoothing window has a total of width 10 percent over the time. By default, the LOWESS smooth command executes a weighted linear least squares fit of the points in the current data window^[3].

Its simplistic form is:

$$\min_{\beta_0, \beta_1} \sum_{j \in N} W_j (Y_j - (\beta_0 + \beta_1 X_j))^2$$

Where Y is response variables or variable of importance and X is time period and W_j is weight.

Form the Figure 1 the fit of locally weighted regression smoothing observed. The smoothing span used is 20%, 30%, and 50% for each line. At 50% spanning (the red line) the income velocity of money decreases from 1975-1993 persistently then constant from 1994-2003 on slightly decreasing, and then increased from 2004-present on decreasing rate as well. The actual decreasing of income velocity of money before 1993 and increasing after 2004 seems entails that large money injection before 1993 and low money injection after 2004 respectively when it compared to the income product that money used to carry out. The LOWESS line also showed that there is no outlier affected the line fit for income velocity of money, but the line is a bit similar to up word parabola in which the mini-

mum is around 3.0.

Again, it has observed that per capita income, currency to GDP ratio and consumer price index slightly increased over time, while real Effective exchange rate declined over time. However, any of the covariate under study showed quadratic or any other form of the data. Hence one can have confidence to analysis with linear model because all the covariate shown exclusively with LOESS smoothing does not shown us any non-linearity in the data, in addition to quadratic or any other parabolic effect of variable form. Further investigation of the effects and relationships of those variables have on income velocity of money can be seen in Bayesian model without any assumption about the quadratic or parabolic effect of covariate. Now the question is what contributes to the decreasing or increasing of income velocity of money in Ethiopia, which can be answered by the econometric analysis in following content.

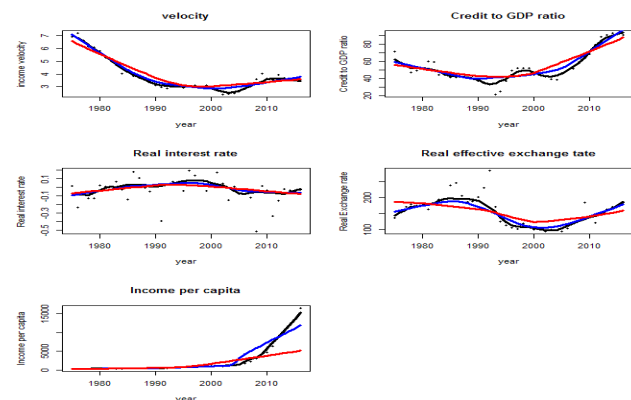


Figure 1. trends and LOWESS estimation of some selected variables in Ethiopia

Source: computation with R- on data from National Bank of Ethiopia

3.2 Econometric Estimation Result

3.2.1 Unit Root Test Result

Table 2 presents the results of unit root test using ADF test at level and at first difference. The results clearly show that the null hypothesis of “there is a unit root” in the level cannot be rejected at different lag. However, the first differencing of observation resulted in the series to be stationary. Finally we able to conclude that all of the variables are non-stationary with and without including test equation specifications through ADF test, and found stationary after first differencing or they are integrated of order one (i.e. $I(1)$).

Table 2. unit root test using ADF

Variables	ADF test statistic	
	At level	At first difference
V	-1.4994	-5.3970***
CY	-1.5993	-4.4345***
PC	2.2164	-2.1988***
RI	-1.6742	-5.8719***
RE	-0.8184	-4.7222***

Note: *, **, *** indicates rejection of the null hypothesis of a non-stationary at 1% and 5%, and 10% levels of significance (critical test: -4.440739 at 1%, -3.632896 at 5% , -3.254671 at 10%.

3.2.2 Estimation of Model

As it explained in detail under methods, using priori distribution of OLS and the likelihood function of parameter given the data, the posterior distribution estimated. After which sample simulation were used by Gibbs sampling method from MCMC pack package. The summary of result displayed in the Table 3.

From Figure 2 it depicted the stability of coefficient so that, the paper can positively interpret the result because of the plot showed the estimated coefficient on average clearly indicate symmetrically under normal curve. From the estimated model, the currency to GDP ratio which is a proxy for financial developments (financial environment), real per capita income, real exchange rate and real interest rate are the main determinants of income velocity of money because they are statistically significant.

Changes in the financial environment in Ethiopian economy posed positive effect on income velocity of money which might be due to the improvements in the access to cash, such as ATM cards or demand deposits that earn interest, such as interest-paying checking accounts, reduced the demand for money and increased bank branch. Since these payment substitutes a means of payment without the need to hold the money itself and it leads to increase in money velocity. A percent change in financial environment leads to about 0.077 increases in Velocity of money. This result is supported empirically^[8] and theoretically^[7].

Moreover, income per capita found to have a negative effect on income velocity of money. It is argued that at the initial stage of economic development there is increasing monetization, improvement in banking system and fast expansion of monetary transactions which contributes to the higher demand for money is pressuring money velocity to fall down^[6]. A percent change in income per capita leads to about 0.0003 decreases in Velocity. Again, real interest rate is found to have negative and statistically significant effect, realizing a decrease in real interest rate due to increase in price affect velocity of money in Ethiopia which is in line with the literature^[2]. It's found that, there is a positive relationship between real effective exchange rate and velocity of money. A percent increase in real effective exchange rate leads to about 0.008 percent increases in velocity. It means that the appreciation of the real effective exchange rate causes the income velocity to increase as the

Table 3. Bayesian Estimate of the Model

Coefficient	Mean	SD	Naïve SE	Time series SE	Confidence interval				
					2.5%	25.0%	50.0%	75.0%	97.5%
intercept	-0.7932	0.6833	0.0068	0.0068	0.0520	0.0693	0.0779	-0.3444	0.57124
CY	0.0778	0.0128	0.0001	0.0001	0.0520	0.0693	0.0779	0.0863	0.102113
PC	-0.0003	0.0001	0.0000	0.0000	-0.0005	-0.0004	-0.0003	-0.0003	-0.00022
RI	-0.3255	0.7556	0.0076	0.0076	-1.7872	-0.8424	-0.3323	0.1821	1.183025
RE	0.0088	0.0028	0.0000	0.0000	0.0033	0.0069	0.0088	0.0106	0.014231
sigma2	0.8490	0.1911	0.0019	0.0021	0.5520	0.7121	0.8219	0.9548	1.293146

Source: R- output on data from National Bank of Ethiopia

Table 4. Summary of output

coefficient	Mean	SD	2.5%	97.5%
intercept	-0.7932	0.6833	0.0520	0.5712403**
CY	0.0778	0.0128	0.0520	0.1021134**
PC	-0.0003	0.0001	-0.0005	-0.0002246**
RI	-0.3255	0.7556	-1.7872	1.183025
RE	0.0088	0.0028	0.0033	0.0142309**
sigma2	0.8490	0.1911	0.5520	1.2931457**

** shows significance level at 5 percent

Source: Author compiled from Bayesian output

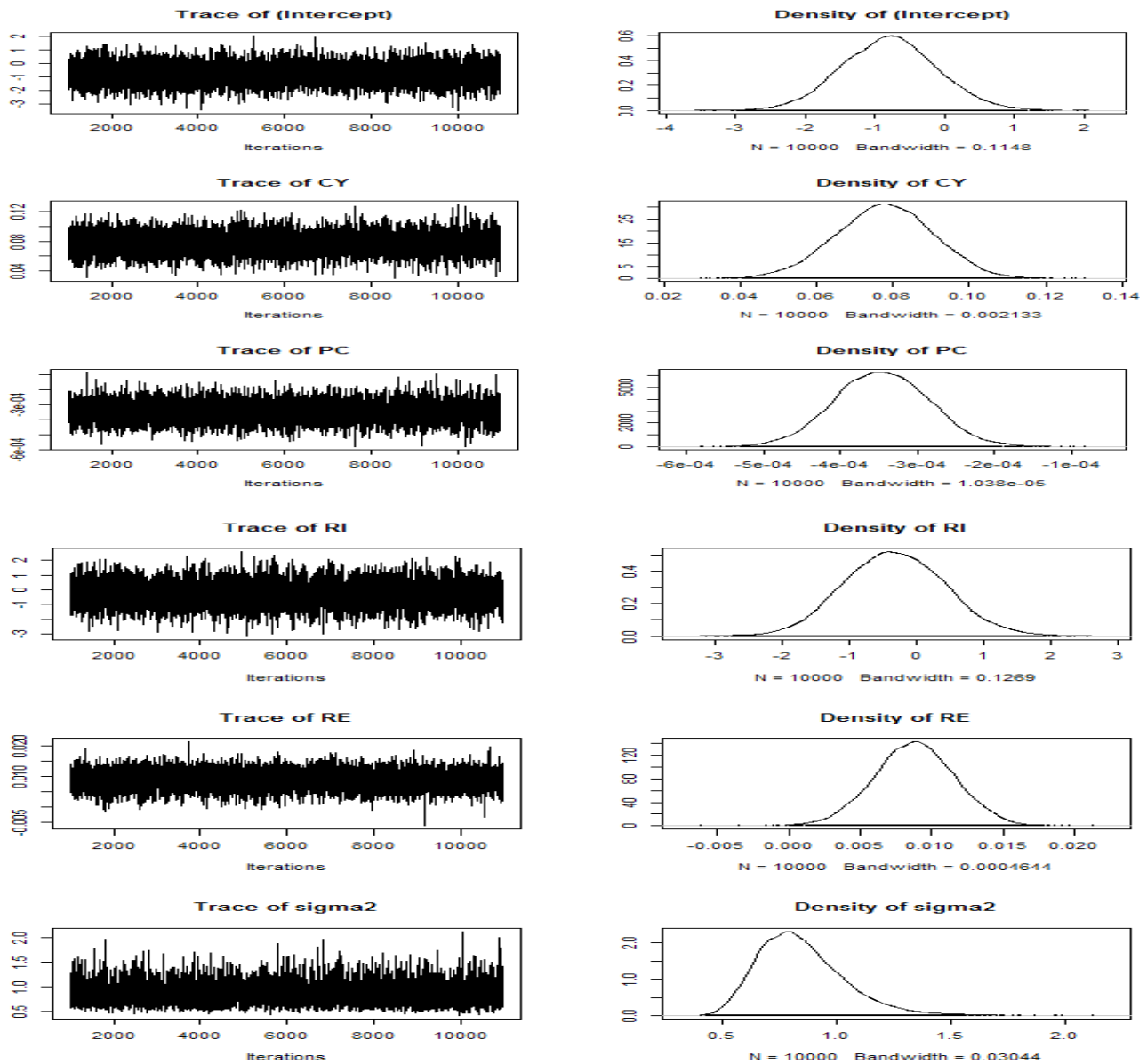


Figure 2. plot of the posterior distribution of parameter under estimation

Source: R- output on data from National Bank of Ethiopia

domestic portfolio holders readjust their portfolio in favor of foreign assets. Some literature found the reverse^[2].

Figure 2 plot shows the traces of the parameters on the left, each with different chain, all chain to converge to similar values (i.e. no divergence in the values on the right side of the plot). On the right side of the plot are the posterior distributions of the parameters. This is the key information this paper found from Bayesian regression analysis. Based on this figure we can confidently improve symmetry of the regression parameter under the normal curve. Hence, there is no skewness of distribution of observation in each variable and the credible intervals in which the coefficient exists under the model were ex-

plained well.

4. Conclusions

This study investigates the main causes of money velocity in Ethiopia using time series data for the period 1974/75 to 2015/16 by using Bayesian estimation and non-parametric locally weighted least square smoothing method. The resulting models were diagnosed for outlier and symmetry for Bayesian model. The results show that velocity of money was associated with changes in the financial environment, per capita income, real exchange rate and real interest rate in the economy. In fact, finan-

cial environment depends on increase in bank branch, interest-paying checking accounts, which has reduced the demand for money, contributing to velocity of money in Ethiopia. The increased income per capita resulted in increasing in public consumption has also contributed to decreasing rate of velocity of money. It is argued that Per capita income is associated negatively with velocity of money when income elasticity of money is less than one ^[2]. The real interest rate affects velocity of money negatively while real effective exchange rate affects velocity of money positively. Again the paper found that, after 2003 from non-parametric locally weighted least square estimation smoothing method, the velocity of money increased at decreasing rate providing information that money supplied to the economy was much less than product produced and transacted in the economy. This shows tight or prudent monetary policy in Ethiopia. In general, this result suggested that, the policy to encourage sustainable economic growth and increase in interest rate would be beneficial to reduce velocity of money.

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ARTICLE

Sustainability in Higher Education Institutions (HEI): Merging the Study Systematic Review, Analysis Content and Bibliometrics

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ABSTRACT

This study aims to explore how the topic of sustainability in Higher Education Institutions (HEI) has been addressed in the scientific literature. It presents a systematic literature review of peer-reviewed journal articles published between 1975 and 2019. After that, bibliometric and content analyses were performed in order to identify the behavior and evolution of the literature and identify the frequency with which they appear in the text, making it possible to raise replicable and valid inferences to the data. The results of this study indicate that the theme is emerging since the year 2010 and with a strong focus on qualitative studies, focused on critical theory. The results indicate that although studies involve the tripod environment, economy, and society, there is still a gap in studies that deal with specific issues to solve practical problems and that analyze the impacts from a more holistic perspective. The combination of methods made it possible to identify and interpret the articles in the selected sample, but based on results reported by other authors, with little room for quality control and integrity.

1. Introduction

The sustainability debate is not new and has gained ground and strength in recent years, from the demands of contemporary society, attentive to new patterns of production and consumption. Guided the expectations and desires of this contemporary society, for some time the subject has, repeatedly, been the focus of major global meetings.

Among the targeted global initiatives to the subject, there is the United Nations Conference on Environment, known as ECO-92, which created the Agenda 21, with the goal of greater provide support discussions and actions on sustainability through planning guidelines and building

sustainable societies.

In Brazil, sustainability has also been an important topic of political, institutional and scientific order. The first publications on sustainability in journals are in the late 1980s and early 1990s, during which were published major books and international reports^[1,2], among Brazilian authors stand out Maimon^[3-5], Donaire^[6] and Barbieri^[7].

It is observed then that deal with sustainability, is not restricted to private organizations, but notes that it is civil society, private organizations and public authorities complement the implementation and promotion of sustainability^[8]. The government agent plays an important role, either in the preparation, implementation or dissemination

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of actions that allow the effective sustainable development. It is the governmental entity, providing means for achieving such sustainability. Therefore, the appropriateness of the public bodies and entities structures is fundamental for the construction of a new institutional culture that includes sustainability as a core principle.

The choice of study in Higher Education Institutions (HEI) is due to the fact of its importance as an example to society through the development of studies and projects that prioritize actions and sustainable practices. Through policies and management practices, the IES have responsibility and should promote sustainable development in the communities in which they operate, influencing the present and the future of every reality^[9].

Several studies have been conducted on sustainability in IES. Noeke^[10] researched the environmental management system of a university in Germany. Herremans and Allwright^[11] studied sustainability initiatives in American universities. Carpenter and Meehan^[12] investigated the environmental management in universities in Australia and New Zealand. Sammalisto and Arvidsson^[13] analyzed the implementation of environmental management in Swedish universities. Already Arvidsson^[9] investigated the sustainability reports of the Swedish universities, which have a legal obligation to submit such reports.

In this context, this study aims to explore how the theme of sustainability in HEI has been addressed in the scientific literature. Due to the scope extended and diversified its potential application, this research aims to identify articles published with relevance and scope in both themes and analyze the main types, methodologies, scales, dimensions and approaches, as well as trends and gaps.

2. Materials and Methods

The combination of systematic literature review and analysis and bibliometric content gives this study qualitative and quantitative characteristic. The systematic review provides the investigation of similarities and differences^[14]. In turn, the bibliometric analysis is the literature of the behavior of identification and its evolution. Already the content analysis uses mathematical and statistical methods in order to interpret the results^[15].

A systematic review from the collection, identification and selection of relevant studies was performed. Thus, the evidence has been mapped; grouped and summarized data and results and identified gaps in the research.

The bibliometric analysis is the literature of the behavior of identification and their evolution in a context and time determined^[15]. In all the literature, there are significant inconsistencies in how the terms are defined. For example, an author considers a criterion, one can treat as

an indicator.

In this study the sustainability information applied in IES were registered in IBM SPSS in order to expose the bibliometric indicators of the selected articles in the literature systematic review and present the results of the analysis in tables and figures.

Content analysis includes descriptive statistics of articles, periodicals, authors and quotes, as well as the analysis of the temporal evolution^[14]. After the fonts have been selected for inclusion in the study by the systematic literature review and bibliometric analysis. Each source has been read in full for the content analysis. The content was classified according to five characteristics: type, methodology, scale, size and approach.

Finally, data were extrapolated and interpreted after cross-examination of the characteristics of the dimensions of sustainability.

3. Results and Discussion

Initially will be presented the results of a systematic literature review in order to obtain an overview of the publications. Following, we will discuss the results of bibliometric analysis and content of the articles, in order to detail the characteristics of this group of publications.

3.1 Systematic Review of Literature

The starting point has been established by the following question: which path characteristics of HEI research on the scientific production in the area of sustainability? To address this issue, a systematic review followed the process illustrated in Figure 1.

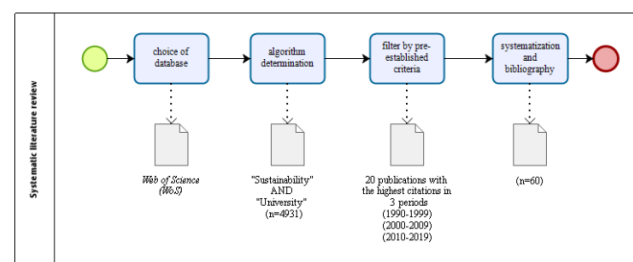


Figure 1. Implementing process of systematic review of the literature

The documents for this review were identified from the database Web of Science (WoS). This database provides comprehensive coverage of subjects considered relevant, as well as access to bibliographic data for further elaboration of tables and graphs.

The search terms were identified and refined even further selection criteria by reviewing a sample of random publications of the search results. A comprehensive survey was completed in November 2019 using the ultimate

combination of search terms, "Sustainability" AND "University".

Regarding the time period it was decided to no restriction in order to ensure a greater range of bibliometric analysis. Therefore, the study was conducted between 1975 and 2019.

The initial search in the database resulted in a total of 4,931 publications, geographically distributed as shown in Figure 2.

Figure 2 shows that the theme recurs in the international literature, countries like the United States of America (649 items) and the UK (388 articles) are the highest number of publications, followed by Australia (257 articles) and Spain (148 articles). Shortly thereafter are Canada (126 products), Germany (114 products), Malaysia (100 products), Brazil (98 items), and China (90 items). Following is South Africa (81 items), the Netherlands (78), Portugal (77 articles), Sweden (71 articles), Italy (65 articles) and Mexico (40 articles). The sum of items of other countries represent 18.08% of the total.

In a temporal analysis of the articles could be identified that 4,931 articles identified in the initial portfolio represents 28 years of research with an emphasis on sustainability in the IES on the basis WoS, and have average annual publication of 63 articles.

Figure 3 illustrates the distribution of publications (column) and citations (stacked area) each year. Observed the growing number of publications and citations received. Please note that the number of citations corresponds to the

indications received under the Main WoS collection.

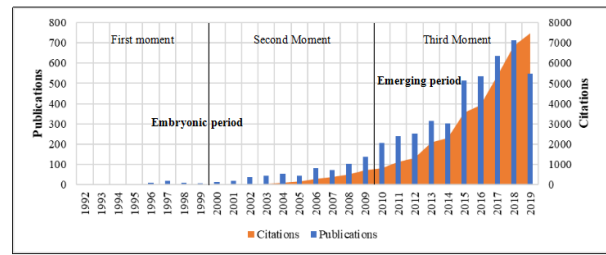


Figure 3. Evolution of publications and citations was between 1990 and 2019 (blunt criterion)

In terms of publications and citations were identified statically three stages of study: from 1990 to 1999 as the first, from 2000 to 2009 as the second time, and from 2010 to 2019 as the third time (Table 1).

Table 1. Descriptive statistics: percentiles

		Year	Publications	quotes
percentiles	33.33333333	1999	16	27
	66.66666667	2009	183	782

In addition, it was detected the first and second times, such as embryonic, as they represent only 16 publications and 27 quotations. The third time was identified as an emerging period, since it represents 183 publications and 782 citations.

The first embryonic marks the beginning of publications on the theme. At first, between 1990 and 1999 were recorded articles 62 and 75 quotes, which together represent 1.26% and 0.20% of publications and citations,

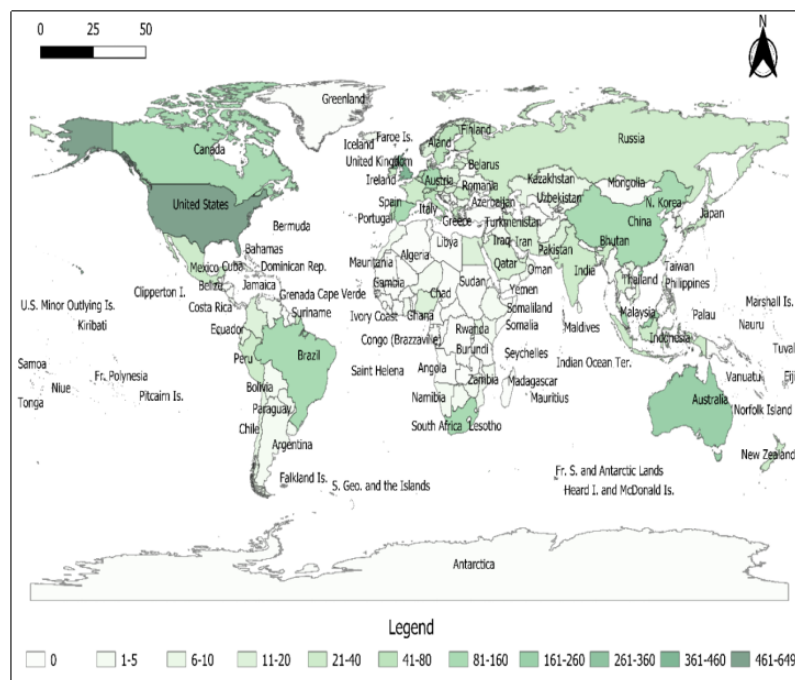


Figure 2. Geographical distribution of the published documents

respectively. The dissemination of publications, the ratio between the average citations and the average is 1.21 publications, as can be seen in the early years of the series.

In the second phase it is observed a small increase in the number of articles and quotations, especially from the 2000s, which concentrates 12.31% of all published articles. The number of citations is significant representing 6.22% of the total received mentions. The increase in the number of citations is observed from the increase of the ratio between the average and the average of citations to publications reaches 3.81, which represents a 3.15 fold increase in the order from the previous decade.

The third time is considered an emerging period due to the growth rate of publications: 87.69% and the quote: 93.78% from 2010. In this respect, the period 2010 to 2019 concentrates 86.43% of the articles published and 93.58% of incoming quotes. It is observed that, during this period, the ratio between quote and publications increased to 8.19, showing an increase of spread within the WoS, publications analyzed and hence the expansion of themes in the area.

From the survey of 4,931 items, which form the initial portfolio, the most cited articles were identified under the WoS. Figure 4 shows the items 1166 received at least seven quotes, representing 23.99% of the total document.

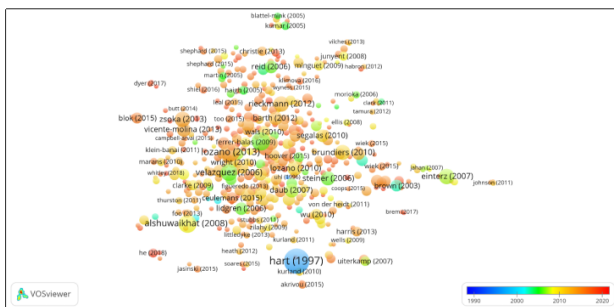


Figure 4. Sample Mapping articles with cutting criterion 7 citations for publications

The colors of the circles indicate the year of publication, as the caption displayed in the lower right corner. But the size reflects the number of citations received. The choice of criteria seven underlies It quotes the observation that the 90 shows the annual average of 7 quotes. Thus, it sought to incorporate the figure this period, despite representing only 0.21% of total citations, is relevant because it is the period when the research began.

Among the articles published in 1990, identified by blue color (Figure 4), stands out as the most cited work of Hart ^[16] entitled Beyond greening: Strategies for the sustainable world. The article published in the Harvard Business Review received 593 citations and has annual average of citations equal to 21.18, while the research

Uhl, Kulakowski, Gerwing, Brown and Cochrane ^[17] received only 8 quotes.

The period between 2000 and 2009, shown in Figure 4 with colors ranging from pale blue to yellow, focuses items with intermediate quotes. The article published by Lozano ^[18], entitled incorporation and institutionalization of SD into universities: breaking through barriers to change has 264 citations and average annual equal citations 9.43. Further, there is the study published in 2008 by Alshuwaihat and Abubakar ^[19] with 247 citations and average annual equal citations 8.82. In sequence is the Daub ^[20], which has 130 citations and average annual equal citations 4.64.

But the most recent period spanning between 2010 and 2019, shown in Figure 4 with colors ranging from light to red orange, concentrates the most quoted items analyzed together. The article Lozano ^[21] titled Declarations for sustainability in higher education: Becoming better leaders, through addressing the university system, has 281 citations and average of 10.04 citations, and is the most cited of all the analyzed publications. Soon after, another appears Lozano ^[22], which has 161 citations and annual average of 5.75 citations.

The analysis revealed that the periodic 4,931 selected articles were published in 1633 in the journal indexed WoS, as shown in Figure 5.

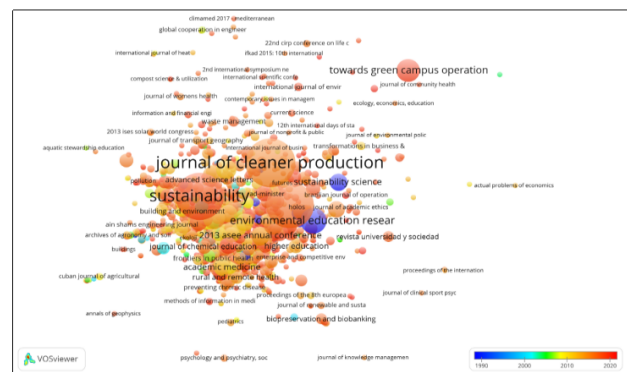


Figure 5. Mapping of journals where the articles were published initial sample

The colors of the circles indicate the average year of publication, as legend displayed in the lower right corner of the figure. But the size reflects the number of published articles.

In the initial period (1990), two journals stand out regarding the number of items, although they have not previously dominated the period studied. The Environmental Education Research presented articles 50 (1.03%) is released in the UK, and is indexed in WoS since 2000. The second most productive journal, in the 1990s, it is the Sustainability Science articles 19 showed that (0, 39%), is

published in Germany, and is indexed in WoS since 2007.

In the 2000s, the most prominent journal in terms of number of publications, is the Water Science and Technology with 9 articles (0.19%). The journal, which is published in Germany, and indexed since 2013.

More recently, between 2010 and 2019, include: Journal of Cleaner Production indexed since 1993, has 263 articles (5.41%); Sustainability the Periodic indexed since 2009, with 242 articles (4.98%); and International Journal of Sustainability in Higher Education, indexed since 2000, and rely on articles 234 (4.81%).

Figure 6 shows the affiliation of the authors institutions, totaling 391 organizations, including universities and research organizations.

It is observed in Figure 6, the predominance with 1,212 citations, publications of authors linked to the Arizona State University (United States). Between 2000 and 2010, the highlights are the authors of the MIT University (United States) with 338 citations and State of Saint Paul (Brazil) with 309 citations. As of 2010, there is the University of Michigan (United States) with 325 citations.

After mapping the original sample ($n = 4.931$), the items have been grouped into three periods (Table 2), according to three previously identified times: 1990 to 1999, 2000 to 2009 and 2010 to 2019.

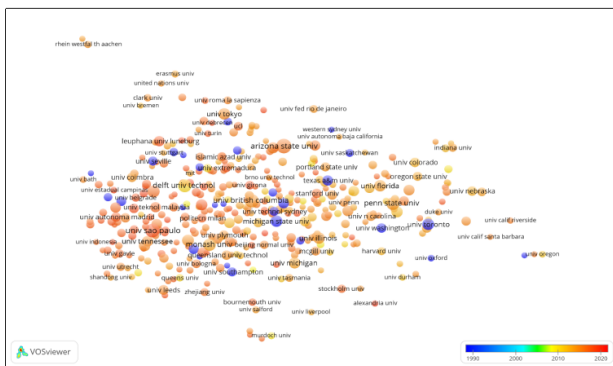


Figure 6. Membership institutions of the authors of articles

In the evaluation phase, the criterion used in the selection of publications is based on the average of quotations,

and selected the twenty publications with annual average citations ($n = 20$) of each period. A citation analysis of the premise that the authors cite more works that are important in the development of their research.

The oldest publication is dated 1992 and the latest in 2015. To facilitate the analyzes were assigned codes (ID) to each of the selected items, which are presented in the first column.

One of the criteria adopted for selection of studies is access to the full text. Another criterion used was the service to the theme sustainability in HEI, considering the objective of this study. The results of this step are shown in Table 3.

Table 3. Description of the categories adopted for selection of studies

Period	Total analyzed publications	Complete text	Sustainability in IES
1990-1999	20	18	3
2000-2009	20	20	5
2010-2019	20	20	12
totals	60	58	20

Articles were excluded if they had not in full text the term “Sustainability” AND “University” OR “Higher Education”, considering the title, abstract or keywords.

Of the 60 articles selected initially, 40 were excluded for not meeting the established criteria. Among the items removed two did not have the full text. publications were also found that addressed sustainability, but they were not related to the HEI context. As a result, we selected 20 articles for a systematic review of the literature.

3.2 Analysis Bibliometric

In this study, shown in Figure 7, the analysis bibliometric exposes bibliometric indicators of selected articles in a systematic literature review: title, author (s), periodic, year, and average citation reference. Moreover, it presents the results of analysis by the table and figures.

Table 2. Total of publications and citations for the period analyzed

Period	Total period of publications	Total period of quote (A)	Total citations (N = 20) (B)	Quotes (B / A)	Average annual period quotes	Average annual quotes (N = 20)
1990-1999	62	1410	1322	93.76%	1.87	2.82
2000-2009	607	11,224	3857	34.36%	1.78	13.15
2010-2019	4,262	24,768	3038	12.27%	1.17	20.05

Table 4. Selected Items for bibliometric analysis

ID	Title	Author (s)	Filiation	Journal	Year	Citation	Average
<i>1st Period (1990-1999)</i>							
11	Beyond greening: Strategies for the sustainable world	Hart, SL	U.S	Harvard Business Review	1997	601	26.13
17	Sustainable development and technology assessment	Jischa, MF	Germany	Chemical Engineering & Technology	1998	10	0.45
18	Issues of sustainability and pollution prevention in environmental engineering education	Gutierrez-Martin, F; Dahab MF	Spain	Water Science and Technology	1998	8	0.36
<i>2nd Period (2000-2009)</i>							
28	Incorporation and institutionalization of SD into universities: breaking through barriers to change	Lozano, R	UK	Journal of Cleaner Production	2006	267	19.07
30	Sustainable university: what can be the matter?	Velazquez, L; Munguia, N; Platt, A; Taddei, J	Mexico	Journal of Cleaner Production	2006	212	15.14
31	Higher education for sustainability by means of transdisciplinary case studies: an innovative approach for solving complex, real-world problems	Steiner L; Posch, A	Austria	Journal of Cleaner Production	2006	137	9.79
34	The systemic approach to incorporate sustainability into university courses and curricula	Lidgren, A; Rodhe H; Huisinigh, D	Sweden	Journal of Cleaner Production	2006	102	7.29
40	An integrated approach to sustainability Achieving campus: assessment of the current campus environmental management practices	Alshuwaikhat HM.; Abubakar I	Saudi Arabia	Journal of Cleaner Production	2008	262	21.83
<i>3rd Period (2010-2019)</i>							
41	Real-world learning opportunities in sustainability: from classroom into the real world	Brundiars, K; Wiek, A; Redman, CL	U.S	International Journal of Higher Education in Sustainability	2010	167	16.7
42	Diffusion of sustainable development in universities' curricula: an empirical example from Cardiff University	Lozano, R	UK	Journal of Cleaner Production	2010	161	16.1
47	The state of sustainability reporting in universities	Lozano, R	UK	International Journal of Higher Education in Sustainability	2011	118	13.11
48	Future-oriented higher education: Which key competencies shouldnt be fostered through university teaching and learning?	Rieckmann, M	Germany	Futures	2012	185	23.13
49	Academic staff development as a catalyst for curriculum change towards education for sustainable development: an output perspective	Barth, F; Rieckmann, M	Australia	Journal of Cleaner Production	2012	116	14.5

50	Environmental Management Systems (EMS) implementation processes and practices in European higher education institutions - Top-down approaches versus participatory	Disterheft, A; Ferreira da Silva Caeiro, SS; Ramos, MR; Miranda Azeiteiro, A	Portugal	Journal of Cleaner Production	2012	102	12.75
51	Declarations for sustainability in higher education: Becoming better leaders, through addressing the university system	Lozano, R; Lukman, R; Lozano, FJ.; Huisingh, D; Lambrechts, W	Slovenia	Journal of Cleaner Production	2013	284	40.57
53	Greening due to environmental education? Environmental knowledge, attitudes, behavior and consumer pro-environmental activities of everyday Hungarian high school and university students	Zsoka, A; Szerenyi ZM; Szechy, A; Kocsis, T	Hungary	Journal of Cleaner Production	2013	169	24.14
54	Environmental knowledge and other variables Affecting pro-environmental behavior: comparison of university students from emerging and advanced countries	Azucena Vicente-Molina M; Fernandez-Sainz, A; Izagirre-Olaizola, J	Spain	Journal of Cleaner Production	2013	133	19
55	An in-depth review of the literature and roles evolving contributions of universities to Education for Sustainable Development	Karatzoglou, B	Greece	Journal of Cleaner Production	2013	131	18.71
58	Advancing Higher Education for Sustainable Development: International critical reflections and insights	Lozano, R; Lozano, FJ; Mulder, K; Huisingh, D; Waas, T	Netherlands	Journal of Cleaner Production	2013	104	14.86
60	The review of commitment and implementation of sustainable development in higher education: results from a survey worldwide	Lozano, R; Ceulemans, K; Alonso-Almeida M; Huisingh, D; Lozano, FJ; Waas, T; Lambrechts, W; Lukman, R; Hüge, J	Netherlands	Journal of Cleaner Production	2015	164	32.8

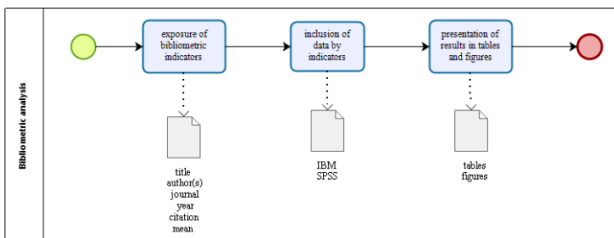


Figure 7. Implementing process of bibliometric analysis

The 20 items selected as a sample for analysis bibliometric are shown in Table 4.

When we analyzed the authors of the publications, one realizes that only Lozano R. published articles 6 of 20 of the sample. Thus, it is evident an open field for other research and researchers the sustainability issue in HEI.

The geographical origin of affiliation of the authors who have published articles, as Figure 8 shows a distribution around the world, however, with the largest representation in Europe (15): Austria (1), Germany (2), Greece (1), Hungary (1), Netherlands (2), Portugal (1), Spain (2), Slovenia (1), Sweden (1), United Kingdom (3); followed by North America (3): United States (2), Mexico (1); Asia (1): Saudi Arabia (1) and Oceania (1): Australia (1). Note that no work originated in Latin America and Africa.

As shown in Figure 9, the sample articles come from a variety of different periodic 6, with the greatest presence of the Journal of Cleaner Production 70% of posts (14, 20). Something interesting is that this journal focuses on transdisciplinary research involving Cleaner Production, Environmental and Sustainability.

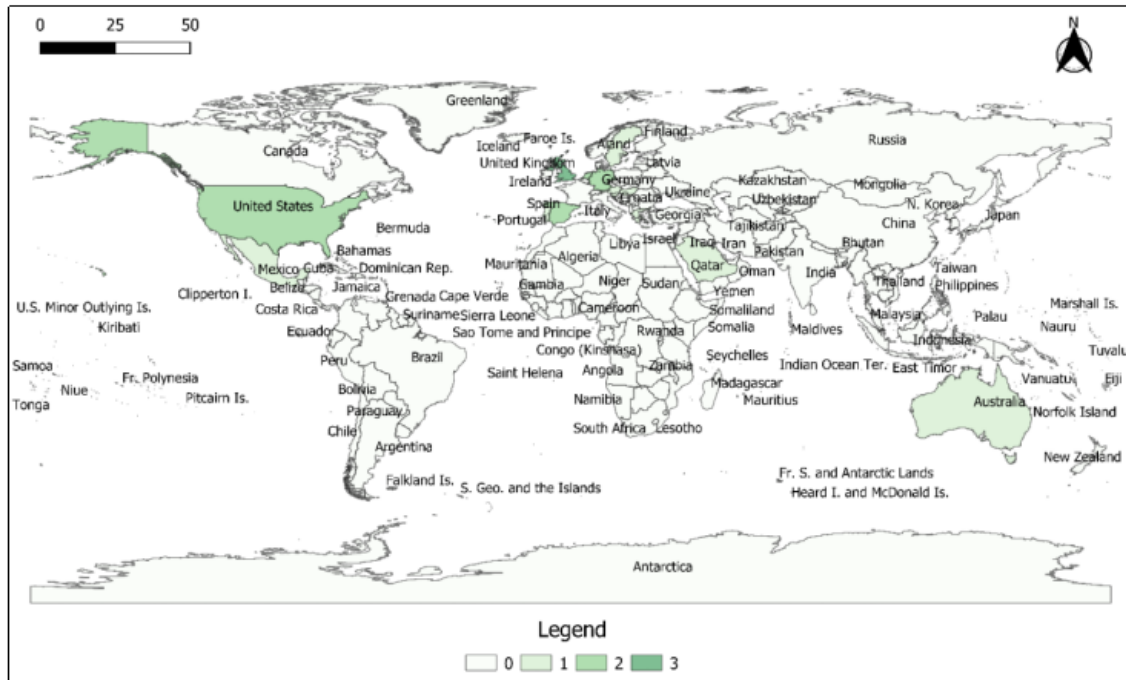


Figure 8. Distribution of articles selected by geographic origin

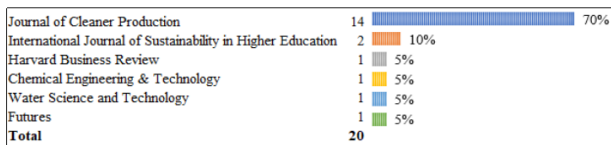


Figure 9. Distribution of publications in relation to periodic

The temporal distribution of items (Figure 10) indicates recent occurring theme in the literature, since only three articles published received higher quotes by 2005. In 2006, there was a first peak of publications, signaling the emergence of developing studies on the subject and, the year 2013 stands out with 25% of articles published in more citations. Worth noting also the fact that since 2015 was the last year with articles that received the highest quotes.

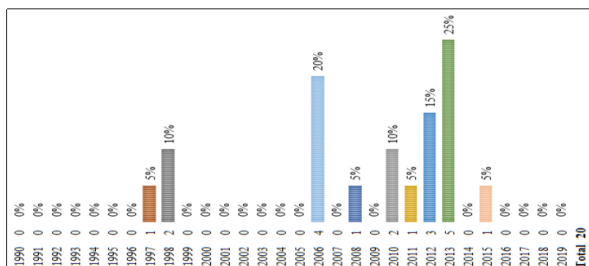


Figure 10. Monthly distribution of publications

Figure 11 illustrates the distribution of quotes (column) and average quotes (line) of each item classified by the ID number. It is observed that the article identified by the

ID 11 alone received the highest number of citations. This indicates that such an article has been considered as a reference of the studied subject.

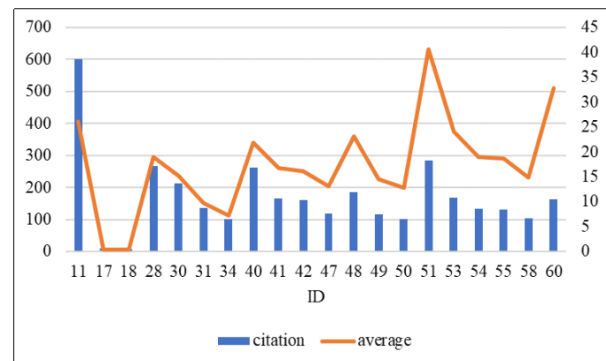


Figure 11. Distribution of citations and medium

3.3 Content Analysis

The content analysis was performed in three stages: pre-analysis, exploration of material and processing results (Figure 12).

After completion of reading, the selected studies were classified according to five characteristics: type (qualitative, quantitative and qualitative / quantitative) methodology (case study, theoretical / conceptual and modeling), scale (local and global), dimension (environmental / economic / social, environmental / economic, environmental / social and environmental) and approach (critical theory and problem solving).

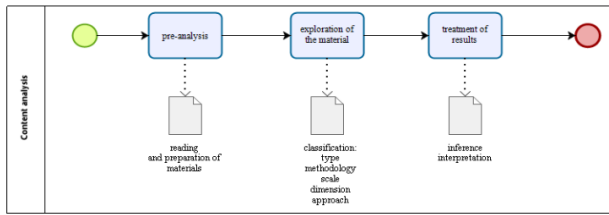


Figure 12. Procedures for the implementation of content analysis

In order to facilitate analysis, data were synthesized according to the analyzed frequency characteristics (Figure 13).

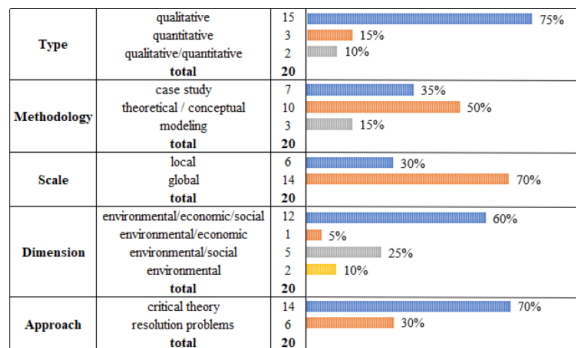


Figure 13. Characteristics of selected articles

It can be seen that most of the studies are of qualitative (75%), use is made of theoretical / conceptual methodology (50%), include global (70%) have environmental dimension / economic / social (60%) and address critical theory (70%). After this operation, the data were processed and the inferred results and interpreted in relation to the three dimensions of sustainability: environmental, economic and social.

Making a cross-analysis of the dimensions of sustainability versus types of research used in the sample publications it has been, that the 15 qualitative studies presented 53.3% have an environmental connotation / economic /

social (Table 5).

Another analysis of the dimensions of sustainability versus methodologies used in sample surveys has been that of the 10 studies theoretical / conceptual presented 80% have an environmental connotation / economic / social (Table 6).

Already analyzing the dimensions of sustainability versus breadth of scale has been that of 14 studies on a global scale presented 64.3% have an environmental connotation / economic / social (Table 7).

When evaluating the dimensions of sustainability versus approach has been that of the 14 studies in critical theory approach presented 57.1% have an environmental connotation / economic / social (Table 8).

Performing an analysis of the periodic publications of the sample draws attention the Journal of Cleaner Production, which in addition to having most of the articles shows that 64.3% of them have a connotation / environmental / economic / social (Table 9).

Finally, cross-temporal analysis of the sample (Table 10) was performed.

This analysis identified the year 2013 as having 5 of the 20 articles of the sample. In addition, 100% of them have an environmental connotation / economic / social.

4. Conclusions

The literature of systematic review and bibliometric and content analysis showed that the topic of sustainability in HEI is an emerging period since 2010.

It can be concluded that most research initiatives are being made by means of theoretical methods / conceptual, analysing the environment tripod, economy and society, but mostly qualitative way, leaving to explore problem solving in order to increase its generalization. It is evident, too, the need for studies on the integration of two themes:

Table 5. Types of research versus dimensions of sustainability

TYPE	DIMENSION									
	environmental/ economic/ social		environmental/ economic		environmental/ social		environmental		total	
	n	%	n	%	n	%	n	%	n	%
qualitative	8	53.3%	1	6.7%	4	26.7%	2	13.3%	15	100.0%
quantitative	3	100.0%	0	0.0%	0	0.0%	0	0.0%	3	100.0%
qualitative / quantitative	1	50.0%	0	0.0%	1	50.0%	0	0.0%	2	100.0%

Table 6. Methodologies used versus dimensions of sustainability

METHODOLOGY	DIMENSION									
	environmental/ economic/ social		environmental/ economic		environmental/ social		environmental		total	
	n	%	n	%	n	%	n	%	n	%
case study	2	28.6%	1	14.3%	3	42.9%	1	14.3%	7	100.0%
theoretical / conceptual	8	80.0%	0	0.0%	1	10.0%	1	10.0%	10	100.0%
modeling	2	66.7%	0	0.0%	1	33.3%	0	0.0%	3	100.0%

Table 7. Scales covered versus dimensions of sustainability

SCALE	DIMENSION									
	environmental/ economic/ social		environmental/ economic		environmental/ social		environmental		total	
	n	%	n	%	n	%	n	%	n	%
local	3	50.0%	0	0.0%	2	33.3%	1	16.7%	6	100.0%
global	9	64.3%	1	7.1%	3	21.4%	1	7.1%	14	100.0%

Table 8. Approach versus dimensions of sustainability

APPROACH	DIMENSION									
	environmental/ economic/ social		environmental/ economic		environmental/ social		environmental		total	
	n	%	n	%	n	%	n	%	n	%
critical theory	8	57.1%	1	7.1%	3	21.4%	2	14.3%	14	100.0%
resolution problems	4	66.7%	0	0.0%	2	33.3%	0	0.0%	6	100.0%

Table 9. Journal versus dimensions of sustainability

PERIODIC	DIMENSION									
	environmental/ economic/ social		environmental/ economic		environmental/ social		environmental		total	
	n	%	n	%	n	%	n	%	n	%
Harvard Business Review	0	0.0%	1	100.0%	0	0.0%	0	0.0%	1	100.0%
Journal of Cleaner Production	9	64.3%	0	0.0%	4	28.6%	1	7.1%	14	100.0%
Chemical Engineering & Technology	1	100.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%
Water Science and Technology	0	0.0%	0	0.0%	0	0.0%	1	100.0%	1	100.0%
Futures	1	100.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%
International Journal of Higher Education in Sustainability	1	50.0%	0	0.0%	1	50.0%	0	0.0%	2	100.0%

Table 10. Year versus dimensions of sustainability

YEAR	DIMENSION									
	environmental/ economic/ social		environmental/ economic		environmental/ social		environmental		total	
	n	%	n	%	n	%	n	%	n	%
1997	0	0.0%	1	100.0%	0	0.0%	0	0.0%	1	100.0%
1998	1	50.0%	0	0.0%	0	0.0%	1	50.0%	2	100.0%
2006	2	50.0%	0	0.0%	2	50.0%	0	0.0%	4	100.0%
2008	1	100.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%
2010	2	100.0%	0	0.0%	0	0.0%	0	0.0%	2	100.0%
2011	0	0.0%	0	0.0%	1	100.0%	0	0.0%	1	100.0%
2012	1	33.3%	0	0.0%	2	66.7%	0	0.0%	3	100.0%
2013	5	100.0%	0	0.0%	0	0.0%	0	0.0%	5	100.0%
2015	0	0.0%	0	0.0%	0	0.0%	1	100.0%	1	100.0%

sustainability and HEI, given the fact that research in this area is a global trend at present, due to the absence of reference articles in recent years. Still, this research presents a broad reading of the literature and finds trends consistently reported by others.

It recognizes as a limitation. This study has only exploratory and involves subjectivity in the interpretation of articles of the selected sample. Thus, new future research on the subject of this research should be conducted in order to clarify and closer and closer to the themes explored.

Despite efforts to systematically collect a solid set of studies, there are limitations to this research. First, the study was limited to journal articles found by the selected database. Second, the content analysis is based on the results reported by other authors, and there is little room to control the quality and integrity of the results of others as well as the selective biases of the authors.

However, the number of confirmed discussions to consider the dimensions of sustainability fully and effectively in the HEI, with models and methods applicable in different natures, is a major legal challenge to advance the frontiers of knowledge, may be a relevant topic for future research.

Author Contributions

Both authors conceived the idea. Erika Bedin collected and analyzed the data and prepared the first version. Luiz Faria supervised the planning and execution of the activities. Both discussed the results and contributed to the final version of the manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest.

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