The Effect of Financial Inclusion in Sub-Saharan Africa on Human Development

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Abstract

The question of how best to improve human development in Sub-Saharan Africa is one of the most important topics in modern economics. Evaluating the impact of financial inclusion on human development in Sub-Saharan Africa may help to influence government and international policy regarding human development in the region positively. This paper ran a multiple linear regression of human development as measured by the Human Development Index (HDI) on a measure of financial inclusion and numerous other macroeconomic control variables. From this regression it was determined that for a 1% increase in financial inclusion, HDI was expected to rise by around .0012 points. This result was statistically significant ($p<.01$). Despite some misspecification within the regression model, the results of this study indicate that the promotion of financial inclusion is an extremely important component of effective human development policy in Sub-Saharan Africa. To facilitate increases in financial inclusion and thus human development, governments in the region should pursue policy solutions like microfinance promotion, banking drives, and mobile money research spending.

Introduction

While many Sub-Saharan African nations had experienced unprecedented economic growth in the recent years before the pandemic with healthy macroeconomic growth rates in areas like GDP, Sub-Saharan Africa remains a region in need of innovative and sustainable solutions to not only economic development but also human development (World Bank Africa Overview). According to 2018 figures from the UN, some 38% of individuals in the region live on less than $1.90 a day, and although this rate has decreased over the last few decades, the

number of people living in poverty in the region has increased significantly over this same time period reaching 413 million by 2015 (UN Stats SDG Indicators). Further, according to the metric of Human Development Index (an index measured between 0 and 1 that captures 3 core quality of life indicators, namely education, health, and standard of living), in 2020 the ten countries with the lowest score all hailed from the region (Conceição). These statistics convey the dire need for innovative solutions to development in the region. Solution approaches have been formulated for years, each focusing on different facets of the economy and of human life.

One interesting angle of approach to improving HDI is to emphasize financial inclusion. The concept of financial inclusion refers broadly to the level of access a given country's population has to financial resources and financial knowledge. Increased financial inclusion is thought to improve HDI by allowing individuals to better leverage financial resources to materially improve their standard of living. Specific facets of a financial inclusion based approach to human development include microfinance for small businesses, banking expansion at scale, and the promotion of development-focused financial technology (fin-tech) that relies on the increasingly widespread nature of mobile phone technology (World Bank Financial Inclusion Overview #2). However, there still is some uncertainty to this approach to development economics and its potency when compared to other more established approaches that focus on things like healthcare, sanitation, or education.

Herein lies the value of this paper, which should hopefully assess the hypothesis at the country level that there are significant positive human development effects of financial inclusion. Policy recommendations are appropriate in this case as there are many significant aspects of the research contained in this paper that warrant government intervention. The primary and slightly obvious reason for intervention is that human development is a metric that good governments

should inherently care about, and much of the core functions of government are concerned with quality of life improvements captured by the measure. Pursuing an optimal human development strategy is thus a reason for government intervention.

This paper will set out to assess the above hypothesis in a systematic manner. The empirical research question this paper will seek to answer is whether financial inclusion is an important causal factor in improving human development in the poorer countries in Sub-Saharan Africa. To definitively answer this question, this paper will build a multiple linear regression model to explain the variance of Human Development Index (*HDI*) at the country level of 34 Sub-Saharan African nations, utilizing an explanatory variable of percent financial inclusion (*account%*). The returned coefficients from this regression of *HDI* on *account%* will be analyzed for statistical significance, and conclusions will be drawn accordingly. *Account%* is perhaps not the only important coefficient though. Other statistically significant control variable coefficients will also be interpreted and assessed in order to provide information on the relative level of importance of financial inclusion and to guide further policy proposals for improving human development in Sub-Saharan Africa.

Literature Review

The current state of literature regarding financial inclusion's impact on human development is in an interesting place. Firstly, almost all literature on this topic finds at least some positive relationship between human development and financial inclusion. One exemplary paper on the topic, that produced findings typical of most papers, was written by Kodan et al. Regression analysis in this paper determined that indicators of financial inclusion had dramatic impacts on human development. The analysis in the paper focused primarily on the relationship between state-level financial inclusion and human development in Indian states in order to draw

policy conclusions for global economic development. The paper concluded that a 1% increase in financial inclusion led to a .139% increase in Human Development index within Indian states (Kodan et al.).

However, not all literature has found a clear causal relationship between the two variables. In a country-wide analysis of Saudi Arabia, Salem Hathroubi concluded that although HDI and financial inclusion are strongly positively correlated, it could not be determined whether financial inclusion exhibited Granger causality towards HDI in Saudi Arabia (Hathroubi). This hints that each country's peculiarities may impact the effectiveness of financial inclusion for development.

Another thing to note about most papers in the literature is that they seem to primarily focus on evidence from one or two countries at a time, or focus on a couple specific regions, namely South Asia and the Middle East.

Nevertheless, there is also some literature that does use a large cross-country dataset of diverse countries including Sub-Saharan Africa. One paper by Soumyendra Kishore Datta and Krishna Singh titled “Variation and determinants of financial inclusion and their association with human development: A cross-country analysis” contains a wealth of information on the variation in financial inclusion across different countries. This was the focus of the paper, but it also includes a small section discussing the impact of financial inclusion on human development. The paper did not establish a causal relationship but instead simply explored the correlations between both variables, finding that co-movement was higher the higher the income of the country was (Datta and Singh). Yet, correlations are useless for determining causal relationships.

There is still at least one notable paper of the cross-country variety that did in fact look at the causal relationship between financial inclusion and HDI. This paper is “Financial Inclusion

and Human Development: A Cross-country Evidence." In a cross-country analysis of 68 countries, it found strong evidence for the positive effects of financial inclusion and recommended policies aimed at reducing barriers to financial service access. It is important to note that this data is now relatively old, was collected in 2012, and includes many countries not in Sub-Saharan Africa (Nanda and Kaur).

Thus, since each region requires at least a slightly different approach to development economics, since there is a lack of Sub-Saharan Africa specific literature, and since there is new financial inclusion data available from 2017, there is a gap in the literature that the following paper can help to patch.

Empirical Model

In order to determine the causal effect of financial inclusion on HDI, a multiple linear regression model has been constructed. The specific model is defined as follows and involves variables constructed from country-level data for 34 Sub-Saharan African countries:

$$HDI = \beta_0 + \beta_1 account\% + \beta_2 GDPPC + \beta_3 enrollment\% + \beta_4 peace + \beta_5 healthcare + \beta_6 sanitation + u$$

The dependent variable *HDI* refers to the country-level Human Development Index of each nation. *Account%* refers to the country-level measure of "the percent of population over 15 who have reported to use a bank account or account of another type of financial institution...or report personally using a mobile money service in the past 12 months"(Demirgüç-Kunt et al.). *GDPPC* refers to the nominal per capita GDP of each country measured in U.S. dollars. *Enrollment%* refers to the percentage of school-aged individuals enrolled in school as a proportion of the total school-aged population. *Peace* refers to each country's Global Peace Index score, with lower numbers associated with greater levels of peace. *Healthcare* refers to current healthcare spending

at the country level as a percentage of GDP. *Sanitation* refers to the percent of each country's population with access to at least basic sanitation services.

Data

The study contained within this paper utilizes publicly available data from 2017 with a couple notable exceptions. Further, all data was collected at the country-level for 34 Sub-Saharan African nations. Table 1 below provides the specific countries used for analysis. All data was complete for all countries. There were no missing values in the analysis or the regression.

Table 1. Countries of Analysis:

Benin	DR Congo	Kenya	Mauritania	Rwanda	Uganda
Burkina Faso	Congo Republic	Liberia	Mauritius	Senegal	South Africa
Botswana	Ethiopia	Lesotho	Malawi	Sierra Leone	Zambia
Central African Republic	Gabon	Madagascar	Namibia	Chad	Zimbabwe
Cote d'Ivoire	Ghana	Mali	Niger	Togo	
Cameroon	Guinea	Mozambique	Nigeria	Tanzania	

Data for *account%* was collected from the World Bank's Global Findex Database 2017. *Account%* specifically references the statistic found in the Global Findex Database that is described in its documentation as "The percent of population over 15 who have reported to use a bank account or account of another type of financial institution...or report personally using a mobile money service in the past 12 months" (Demirgüç-Kunt et al.). For further information on this data source please visit: https://globalfindex.worldbank.org/#data_sec_focus

Data for *HDI* was collected from the United Nations Development Programme's 2018 statistical update report that was created using 2017 data. This measure is calculated from three indicator categories: health, education, and standard of living. Health is determined by life expectancy. Education is determined by the estimated years of schooling for a given child and the mean years of schooling for adults. Standard of living is measured by Gross National Income per capita. The official measure is an index that results from a geometric mean of these inputs. The index ranges from 0 to 1 with 0 representing the lowest possible level of human development and 1 the highest. For more information on this data source please visit: http://hdr.undp.org/en/content/human-development-indices-indicators-2018-statistical-update.

Data for *GDPPC* was collected from Worldometer's 2017 data on GDP per capita. The specific statistic is nominal GDP per capita in U.S. dollars. For more information on this data source please visit: https://www.worldometers.info/gdp/gdp-per-capita/

Data for *enrollment%* was collected from the World Bank's database of human development indicators through the UNESCO Institute for Statistics. The specific statistic is "School enrollment, primary (% gross)." This is a measure of the individuals enrolled in primary school as a percentage of the total population of individuals of age appropriate for primary school. This measure is a weighted average and is generated from self-reported school surveys. For further information on this data source please visit: https://data.worldbank.org/indicator/SE.PRM.ENRR

Data for *sanitation* came from the World Bank's database of human development indicators for 2017 through the WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply, Sanitation and Hygiene. The specific statistic is "People using at least basic sanitation services (% of population)." Access to basic sanitation services is defined as access to unshared

improved sanitation facilities. Improved sanitation facilities include "flush/pour flush to piped sewer systems, septic tanks or pit latrines; ventilated improved pit latrines, composting toilets or pit latrines with slabs." This is a weighted average. For more information on this data source please visit: https://data.worldbank.org/indicator/SH.STA.BASS.ZS

Data for *healthcare* came from the World Bank's database of human development indicators through the World Health Organization Global Health Expenditure database. The specific statistic is "Current health expenditure (% of GDP)." For this particular data source, some country values did not exist for 2017, so this paper used the closest available year's value. This was infrequent and each time the closest available year was very close to 2017, usually no more than one or two years away. For more information on this data source please visit: https://data.worldbank.org/indicator/SH.XPD.CHEX.GD.ZS

Descriptive Statistics

Table 2 below provides the descriptive statistics for the cross-country data used in the analysis.

Table 2. Descriptive Statistics:

Variable	Obs	Mean	Std. dev.	Min	Max
hdi	34	.5329412	.0959071	.386	.797
accountage15	34	42.5	18.95969	14	90
gdpnominal~a	34	1930.941	2469.533	357	10491
schoolenro~s	34	106.3828	18.81015	74.7362	145.4889
peaceindex~e	34	2.172382	.3689759	1.564	3.228
currenthea~p	34	5.791176	2.713867	2.6	16.6
sanitation~e	34	32.83735	20.8311	7.32	95.5

HDI in the countries of interest had an average value of .533. The index ranged from a maximum value of .797 in Mauritius to a minimum value of .386 in Niger. *Account%* varied wildly in the data from a maximum value of 90 in Mauritius to a minimum value of 14 in the Central African Republic. The measure had a mean value of 42.5 in the data.

Empirical Regression Results

Through the process of OLS multiple linear regression analysis, Table 3 below was created. From the evidence provided in Table 3, the level of financial inclusion in surveyed countries was shown to have a statistically significant (p<.01) effect on increasing the HDI of said country. According to *account%'s* positive coefficient value, a 1% increase in financial inclusion led to an increase in HDI of around .0011967 points.

Table 3. Empirical Regression Results:

Source	SS	df	MS		
Model	.273951955	6	.045658659	Number of obs	= 34
Residual	.029587927	27	.001095849	F(6, 27)	= 41.67
				Prob > F	= 0.0000
Total	.303539882	33	.009198178	R-squared	= 0.9025
				Adj R-squared	= 0.8809
				Root MSE	= .0331

hdi	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
accountage15	.0011967	.0004276	2.80	0.009	.0003193	.0020741
gdpnominalpe~a	.000021	4.13e-06	5.10	0.000	.0000126	.0000295
schoolenroll~s	.0009075	.0003258	2.79	0.010	.0002389	.0015761
peaceindexsc~e	-.0355084	.0186313	-1.91	0.067	-.0737367	.0027199
currenthealt~p	-.0076094	.0022818	-3.33	0.002	-.0122912	-.0029277
sanitationsc~e	.0006391	.0004351	1.47	0.153	-.0002538	.0015319
_cons	.4451264	.0662024	6.72	0.000	.3092904	.5809624

The explanatory variable of interest was not the only statistically significant determinant of *HDI* though. *GDPPC* had a statistically significant positive effect (p<0.01) as well. For a $1 increase in *GDP, HDI* was expected to increase .000021 points. *Enrollment%* also had a statistically significant (p<0.01) positive effect on *HDI*. For a 1% increase in *enrollment%*, *HDI* was expected to rise .0009075 points. In addition, *peace* was a less statistically significant (p<.10) determinant of *HDI.* For a 1 point increase in the peace index, *HDI* fell .0355 points. Finally, and somewhat vexingly, *healthcare* had a statistically significant (p<0.01) negative effect

on *HDI.* For a 1% increase in healthcare spending as a part of GDP, *HDI* was expected to decrease by .0076094 points.

The overall significance of the model was quite high, with an R-squared value of 0.9025, an adjusted R-squared of 0.8809, and an extremely high F-statistic of 41.67. These statistics engender confidence in the overall fit of the model and its predictions of *HDI.*

Diagnostic Testing

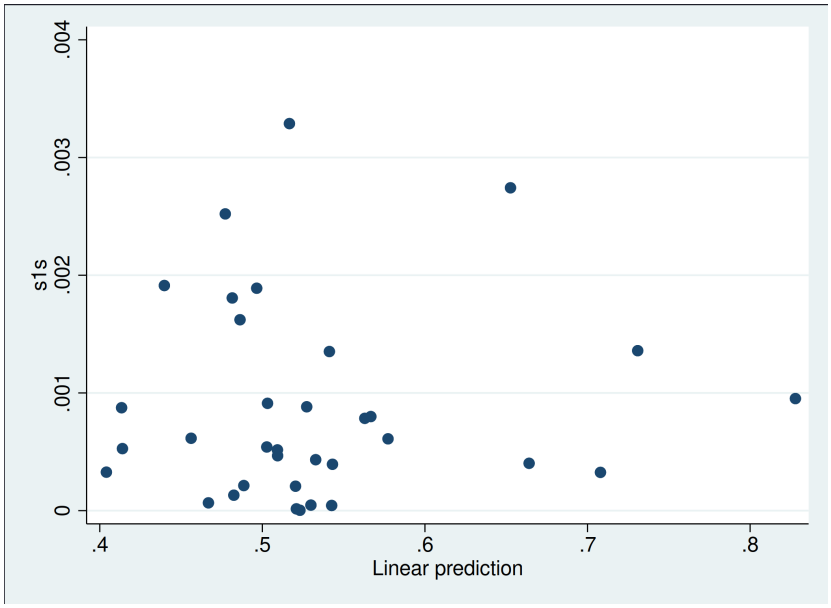
The empirical results' economic significance and accuracy depend on several assumptions holding true. Namely, the regression should have normal residuals and a normal dependent variable while lacking multicollinearity, omitted variable bias, and heteroskedasticity.

Heteroskedasticity

Testing for the presence of heteroskedasticity is important, because if it is present it would render all statistical tests used in this paper invalid even though this would not bias the actual regression coefficients.

Two tests for heteroskedasticity were used. The first was graphical and plotted squared residuals versus linear predictions. Graph 1 below is the result of this test.

Graph 1. Graphical Heteroskedasticity Test:



As shown above in Graph 1, no evidence of heteroskedasticity was found. Residuals varied throughout the graph and showed minimal to no movement with the linear predictions.

The next test was the Breusch-Pagan test for heteroskedasticity. It is performed using the command **.hettest** within Stata. Insignificant p-values of this test indicate that one cannot reject the null hypothesis of homoscedasticity. Table 4 below shows the results of the Breusch-Pagan test for this paper's regression model.

Table 4. Breusch-Pagan Test:

```
. hettest

Breusch–Pagan/Cook–Weisberg test for heteroskedasticity
Assumption: Normal error terms
Variable: Fitted values of hdi

H0: Constant variance

    chi2(1) =   0.03
Prob > chi2 = 0.8527
```

As shown in Table 4 above, the Breusch-Pagan test yielded a highly insignificant p-value of 0.8527. Therefore, no evidence of heteroskedasticity was found.

Multicollinearity

It is important to test for multicollinearity because its presence in a regression indicates that regression coefficients will be imprecise. Imprecise regression coefficients make drawing conclusions about economic significance from a regression with multicollinearity quite difficult. To test for the presence of multicollinearity, I used VIF or the variance inflation factor. A VIF greater than 10 indicates worrisome levels of multicollinearity. Table 5 below shows the VIF results of this paper's regression model.

Table 5. VIF:

```
. vif

    Variable |       VIF       1/VIF
-------------+----------------------
gdpnominal~a |      3.13    0.319754
sanitation~e |      2.47    0.404185
accountage15 |      1.98    0.505200
peaceindex~e |      1.42    0.702674
currenthea~p |      1.15    0.866007
schoolenro~s |      1.13    0.883948
-------------+----------------------
    Mean VIF |      1.88
```

As evidenced in Table 5 above, no variable had a VIF over 10, indicating that multicollinearity is not a problem for this regression model.

Normality

An essential assumption implicit to the conclusions of this paper is that the regression exhibits normality in residuals and in the dependent variable. Normality is essential because it is necessary for valid hypothesis testing. To test for normality the Skewness-Kurtosis test is used. P-values generated by the test that are higher than .05 indicate that the null hypothesis of normality should not be rejected. Within Stata this test was run for both the dependent variable *HDI* and the residuals of the model denoted by s1. Table 6 and 7 below show the test results for each respectively.

Table 6. Sktest *HDI:*

```
. sktest hdi

Skewness and kurtosis tests for normality
                                                    ------ Joint test ------
    Variable |       Obs   Pr(skewness)   Pr(kurtosis)   Adj chi2(2)  Prob>chi2
-------------+--------------------------------------------------------------
         hdi |        34         0.0342         0.2502          5.54     0.0628
```

Table 7. Sktest of residuals:

```
. sktest s1

Skewness and kurtosis tests for normality
                                                    ------ Joint test ------
    Variable |       Obs   Pr(skewness)   Pr(kurtosis)   Adj chi2(2)  Prob>chi2
-------------+--------------------------------------------------------------
          s1 |        34         0.7699         0.0316          4.71     0.0947
```

In table 6 and 7 above both joint p-values are greater than .05 (.0628 and .0947). Thus, the regression exhibits requisite levels of normality.

Ramsey Test

The Ramsey Test assesses the quality of the specification of the regression model. It tests if a non-linear combination of variables would produce a better explanation of the dependent

variable. Insignificant p-values indicate an acceptable specification of the model. Table 8 below shows the Ramsey test for this paper's regression.

Table 8. Ramsey Test:

```
. ovtest

Ramsey RESET test for omitted variables
Omitted: Powers of fitted values of hdi

H0: Model has no omitted variables

F(3, 24) =   7.78
Prob > F = 0.0008

.
```

As table 8 above shows, the Ramsey Test produced a highly significant p-value. This indicates an imperfectly specified model. To correct this, alternative models that utilized hdi^2, hdi^3, ln(hdi), and ln(ln(hdi)) as respective dependent variables were constructed. In all cases, the Ramsey test or another diagnostic test failed for each model. This failure of the Ramsey Test is noted as a limitation of this paper's conclusions.

Conclusions and Policy Implications

Through empirical evidence, the level of financial inclusion in the surveyed Sub-Saharan African countries as represented by *account%* was shown to have a statistically and economically significant impact on human development at the country level. This finding is in accordance with the existing literature regarding the impacts of financial inclusion on human development in other regions and under alternative empirical specifications. Further, unlike papers such as those from Salem Hathroubi and Datta and Singh, causality was able to be deduced in the affirmative.

The findings in Kodan et al. of a 1% increase in financial inclusion leading to a .139% increase in *HDI* in Indian states was especially consistent with this paper's analysis of Sub-Saharan Africa.

In addition, with the relative recency of the data in this paper compared to Nanda and Kaur's 2012 study, their recommendations for increased spending on financial inclusion seem to still be quite reasonable.

Thus, it is fair to conclude that in terms of development policy for the relevant countries of this study, increasing financial inclusion should be regarded as a primary concern of both country-level and global-level leaders. This policy can take many forms but exemplary methods might include microfinance promotion, banking drives, and mobile money research spending.

However, despite the significance of *account%, GDPPC* was the single most economically significant determinant of *HDI* in the model that was statistically significant. The estimated coefficient on *GDPPC* was lower than that of *account%*, but this would be like comparing apples to oranges. A $1 increase in per capita GDP is a much smaller threshold of change than a 1% increase in financial inclusion. This makes sense in terms of how percentage changes usually compare to level changes of the same numeric value. Yet, this conclusion might not yield very many actionable policy recommendations. It is one thing to recommend promotion of microfinance and a very different, much more nebulous, thing to recommend strategies to improve per capita GDP. The best methods to achieve such a result are simply quite controversial within economics. Policy recommendations can vary wildly from increased educational spending to even population control.

Empirical evidence also suggested that emphasis on school enrollment can be an essential component of a country's human development strategy. Policy recommendations could include

lowering school fees, increasing the amount of school lunch programs, or pursuing any other policy aimed at attracting new students that are not currently enrolled in primary school.

As expected, *peace* had a statistically significant negative coefficient. This makes sense, as the higher the peace index score the lower the level of peace. As with income, the policy recommendations here may not be extremely useful, but it is fair to implore governments that are concerned about human development to avoid conflict whenever possible.

Finally, the empirical evidence contained in this paper suggested that healthcare spending is relatively less important than other areas of human development strategy. The negative coefficient on *healthcare* was perhaps due to poorer countries usually having smaller GDPs yet no lower financial burdens of healthcare. Nevertheless, I think it is fair to recommend that countries should focus on financial inclusion and education before addressing healthcare when they seek to improve human development.

Limitations

The regression analysis presented within this paper is far from perfect. Firstly, since a few of the variables included in the regression are directly related to certain metrics used to calculate HDI, the analysis of this paper hinges considerably on the reliability of HDI as a measurement of human development. If HDI was not a good measure of human development, then clearly this analysis should be discarded. Second, as aforementioned, some of the *enrollment%* data was not from 2017 and instead came from the same data source's closest available year to 2017 which was usually no more than one or two years away. Third, the regression model presented in this paper failed the Ramsey Test and was unable to correct for it. This indicates that there is room for improvement in the specification of the model and its parameters. Perhaps more variables need to be added, or perhaps a better model would utilize an as-of-yet-unknown non-linear

relationship between parameters. In either case, further studies with alternative models and alternative data sources would go a long way toward solidifying academic consensus on this topic. Finally, data collection errors can always be present, especially with self-reported statistics which *account%* and *enrollment%* both happen to be.

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