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African Development: Beyond Income Convergence

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Abstract

In examining some big questions on African development, we provide evidence that dynamics of some development indicators could support both endogenous and neoclassical growth theories in the convergence debate. This paper investigates convergence in real per capita GDP and inequality adjusted human development in African countries, disaggregated into 11 homogenous panels based on regions(Sub-Saharan and North Africa), income-levels(low, middle, lower-middle and upper-middle), legal-origins(English common-law and French civil-law) and religious dominations(Christianity and Islam). Findings reveal, while human development supports the exogenous growth model and rejects the endogenous theory, its income component suggests the contrary. As a policy implication, looking beyond income convergence can provide a concrete agenda for development involving all aspects of economic, institutional and social life. Also, the income component of the human development index moves slower than others in the convergence process and thus requires a more focused policy intervention.

JEL Classification: Human development; Growth; Convergence; Panel; Africa

Keywords: O11; O20; O47; O55; P52

1. Introduction

Is human development among African countries converging or diverging? Do income levels matter in poor countries catching-up with their rich counterparts? Does religious-origin have some bearing on convergence(divergence) in African development? Does legal-origin influence the quality of human development convergence? Do regional dynamics matter in the convergence process? Common to all these questions are the issues of the speed of and time for convergence(divergence). These concerns cut deep into the formulation of theories and policies of economic growth in the African continent. By 2008, according to Konya & Guisan(2008;9) only three papers in the literature had focused on the study of convergence by measuring standards of living with the human development index instead of per capita GDP or labour productivity. What many studies show is that economic and human developments are complex processes with historical, political, economic, geographic and institutional determinants that do not conform to some simple linear model(Mayer-Foulkes,2010). This fact guides the current paper in disaggregating African countries into 11 homogenous panels based on regions(Sub-Saharan and North Africa), income-levels(low, middle, lower-middle and upper-middle), legal-origins(English common-law and French civil-law) and religious dominations(Christianity and Islam). The richness of our dataset in investigating this previously missing human development dimension in the convergence literature adds impetus to the study.

Convergence in economic growth and per capita income among nations has been a central theme in neoclassical growth theory and a great bulk of economic literature for decades. Traditionally, the analysis of convergence involved the investigation of whether poor countries are set on a convergence path; that is, if their real per capita incomes will eventually catch up with those of rich countries. However in recent decades, increased emphasis has been laid on

development strategies based on regional economic integration which has required effectiveness and stability, strengthening of macroeconomic policy credibility; leading to the formulation of specific goals of macroeconomic convergence among regional economic groupings(Tirelli,2010; Kumo,2011).

Empirical evidence shows that during the past three decades there has been strong differences among countries in real capita income and economic growth, especially between African economies and emerging Asian countries(Kumo,2011). Introducing a previously missing human development component into the convergence debate with an in depth analysis from multidimensional spectrums could result in important policy implications. This paper therefore assesses three aspects of intra-regional convergence in eleven different panels from the African continent. These include: firstly, the assessment of convergence(divergence) among economies; secondly, the speed of convergence and thirdly, the time needed to achieved full(100%) convergence. An added appeal of this work is the use of a new approach to convergence investigation recently applied by Narayan et al.(2011). Grasping the rate of and time for full convergence could have particularly significant policies implications for the African continent given the current debate on economic integration. The rest of the paper is organized in the following manner. Section 2 reviews existing literature. Data and methodology are presented and outlined respectively in Section 3. Empirical analysis, discussion of results, policy implications and future directions are covered in Section 4. We conclude with Section 5.

2. Literature review

2.1 Theoretical framework

The initial theories of growth that sprouted with the Neoclassical revolution and the demise of Keynesianism defined the concept of convergence. As Development Economics was thrown out, together with its appreciation of vicious and virtuous circles, nascent theories of economic growth grounded simply on extending the concepts of market equilibrium to the intertemporal dynamic context forecasted absolute convergence(Mayer-Foulkes, 2010). It ensued that economic convergence across countries would result from the implementation of free markets. Therefore findings on convergence were considered to support free market policies. Results from initial empirical studies on income convergence(Barro, 1991) revealed absolute divergence instead, as was later confirmed for the long-run by Pritchett(1997).

The neoclassical(exogenous) growth model predicts that real per capita income converges to each country's steady state or common steady state, irrespective of its initial level(Kumo, 2011). Conversely, the endogenous growth theory by emphasizing differences among countries in their initial endowments and the possibility of multiple equilibria shows that there is no tendency for income levels to converge in the long-term.

2.2 Previous studies on convergence in human development

More than two decades have passed since the 1990 Human Development Report that introduced economic development as human development. Twenty years of change have followed, marked by globalization and events that have improved our understanding of the convergence dimension in human development(Mayer-Foulkes, 2010).

In 2008, Konya & Guisan(2008;9) acknowledged the existence of only three papers in the literature that were dedicated to the study of convergence by measuring living standards. These

were Mazumdar(2002), Sutcliffe(2004) and Noorbakhsh(2006). Since the work of Konya & Guisan(2008), to the best of our knowledge only two works have been added to this bulk of existing human development convergence literature: Mayer-Foulkes(2010) and Clark(2011). However, in retrospect we notice that Konya & Guisan(2008) do not give credit to Hobijn & Franses(2001) and Neumayer (2003) who have also focused on human development convergence. We shall examine all these works in the review below.

Mazumdar(2002) investigate if the Human Development Index(HDI) converged across countries over the period 1960-1995 for a full sample of 91 countries, as well as for three groups of countries classified in their levels of human development. Findings of this work indicated divergence for all four considered cases, suggesting that the economies of the world were becoming more dissimilar over the period 1960-1995 with respect to the HDI. Konya & Guisan(2008) have criticized the basis for data comparability in the work. According to them, Mazumdar(2002) obtained the HDI values for 1960 and 1995 from the 1998 issue of the Human Development Report(HDR). The 1998 HDR however does not report any HDI data for 1960. Konya & Guisan(2008) further emphasis it is well stated on the UNDP website that “ comparable data are not available for many countries for all components of the HDI before 1975, so 1975 is the first year for which the HDI was calculated”(page. 27).

Sutcliffe(2004) focused on the link between globalization and world inequality and only assessed the issue of convergence in human development by studying the HDI trends of 99 countries in 1975, 1980,.....,1995 and 2001. Still borrowing from Konya & Guisan(2008), Sutcliffe(2004) rebuffed the whole idea of HDI convergence for two reasons. (1) He posited that developed countries have their HDIs close to unity because in these countries life expectancy has been close to its biological limit, adult literacy and educational(primary) enrolment have been

practically hundred percent, and the impact of the only variable without natural upper limit(per capita income) on measuring the variation between the rich and the poor is strongly restricted by taking the logarithm of per capita income. According to Konya & Guisan(2008), this is not a reasonable criticism because in the HDI, life expectancy and education are measured in relative terms compared to the variation between potentially ever changing maximum and minimum values. As concerns per capita income, the logarithm transformation certainly brings the values closer to each other and this is true for the extreme values too. (2) Sutcliffe(2004) is of the opinion that the HDI convergence has been grasped suddenly by the IMF(for instance) to mitigate the acknowledged downside of the long-term economic history of the world economy. We concur with Konya & Guisan(2008) in asserting that this second point might be true, but it does not eradicate the fact that even with the exception of income, health and education(other components in the HDI) are crucial determinants of the quality of life.

Noorbakhsh's(2006) used slightly updated data on the HDI from 1975 to 2002 with five year intervals. However his methodology has been criticized from a broad range of dimensions(Konya & Guisan,2008; pp.28-29). A common criticism to Mazumdar (2002), Sutcliffe (2004) and Noorbakhsh (2006), is that they tested for convergence without correcting for heteroscedasticity. Owing to the wide range of countries in their samples, it's most likely that their estimates could be misleading.

Neumayer (2003) and Hobijn & Franses(2001) investigate convergence in living standards. While the later conclude on the existence of divergence in living standards, the former argues that convergence in living standards should not be looked-at only in some achievement index. Neumayer(2003) finds strong evidence of convergence in some aspects of living standards like life-expectancy, infant survival, educational enrolment, literacy as well as telephone and television

availability. Neumayer(2003) argues that in suggesting divergence rather than convergence in living standards, Hobijn & Franses(2001) unduly deny one of the great success stories of development in the last century. Clark(2011) study the last half of the twentieth century by examining the extent to which welfare outcomes have actually converged and the degree by which economic development is responsible for the observed trends. Drawing from estimates of 195 nations during the period 1955 to 2005, he finds that life expectancy averages converged during this time but the infant mortality rate continuously diverged. Among poor countries, economic development improves life expectancy more than it reduces infant mortality while the situation is reversed among wealthier nations. In this perspective, development has contributed to both convergence in life expectancy and divergence in infant mortality. There is also evidence that the positive effect of GDP per capita on life expectancy attenuates at higher levels of development whereas the negative effect of GDP per capita growth on infant mortality grows stronger.

2.3 Motivations for convergence in African development

Weak development convergence hinders deeper economic integration in African sub-regions. Thus human development convergence is not an end in itself; instead it is a strategy to economic integration. In the same line of march, convergence to similar per capita income and human development levels could facilitate trade links and technological spillovers, equalize macroeconomic and institutional policies. On the other hand, macroeconomic strategies should be designed conditional on the actual degree of convergence in the economic structure(Tirelli, 2010). Analysis of human development convergence therefore serves as a signal in the degree of success of integration promotion strategy(Kumo, 2011).

In contrast to Tirelli(2010) and Kumo(2011), we postulate that studies on integration should not limit the concept of convergence to the neoclassical versus endogenous growth

controversy in the development of African countries. As highlighted by Konya & Guisan (2008), for underdeveloped countries, beyond macro economic convergence, factor endowments, policies and institutions, other important dimensions of human-life like, health, education, working conditions, leisure time, environment, management to escape the grip of famine, social justice...etc have become increasingly important. Lofty ambitions of catching-up with the First World cannot only be limited to analysis between developed and developing countries. A within-assessment of African convergence could be modeled to take stock of the state and direction of living standards. This dimension of convergence has escaped the focus of development literature and certainly deserves attention. Neoclassical growth theory has modeled income-convergence in such a neat way. Given the absence of strong theoretical foundation for human development convergence, we agree with Costantini & Lupi(2005) that applied econometrics has other tasks than merely validating or refuting economic theories.

2.4 How does the current paper integrate various strands in the literature?

Firstly, we have concurred with Konya & Guisan(2008) in the postulation that a common criticism to Mazumdar (2002), Sutcliffe (2004) and Noorbakhsh (2006), is that they tested for convergence without correcting for heteroscedasticity and owing to the wide range of countries in their samples, it's most likely that their estimates could be misleading. This concern is taken into account in our paper by the Two-Step dynamic GMM estimation technique. It should be recalled that the first-step is based on homoscedasticity of residuals.

Secondly, the Sutcliffe(2004) criticism of the HDI convergence as a means by the IMF to blur the long standing differences between rich and poor countries is only partially valid. We have sided with Konya & Guisan(2008) in asserting that this second point might be true, but it does not eradicate the fact that even with the exception of income, health and education are crucial

determinants of the quality of life. To account for this dimension of the debate, we shall distinguish the income component of the HDI in a distinct analysis. Therefore our variables of interest shall be GDP per capita and human development. More so, this decomposition is in line with the basis for the Hobijn & Franses(2001) and Neumayer(2003) debate.

Thirdly, the 2010 Human Development Report has integrated some of the criticisms by Sutcliffe(2004) into the new HDI computation: inequality adjusted HDI. Therefore our work steers clear of past literature by using an index that integrates criticisms from said literature.

Fourthly, the absence of any study that has focused exclusively on Africa is deserving of examination. In the present context of the regional integration debate in the continent, it is worthwhile investigating the human development appeals of such policies. Beyond this, the richness of our dataset(based on 11 homogenous panels) adds motivation to context of this paper.

3. Data and methodology

3.1 Data

We examine a sample of 38 African countries with data from African Development Indicators(ADI) of the World Bank. Due to constraints in data availability, dataset spans from 1981 to 2009. Details on summary statistics(Appendix 1), correlation analysis(Appendix 2), variable definitions(Appendix 3) and presentation of countries(Appendix 4) are revealed in the appendices.

Many studies show that economic and human developments are complex processes with historical, political, economic, institutional and geographical determinants that do not conform to some simple linear model(Mayer-Foulkes,2010). To this end, we concur with Narayan et al.(2011) in highlighting that one is unlikely to find convergence of stock markets within a very heterogeneous set of countries. We therefore disaggregate countries into homogenous panels based on income-levels(low-income, middle-income, lower middle-income and upper middle-income),

regions(SSA and North Africa), legal-origins(English common-law and French civil-law) and religious-dominations(Christianity and Islam). The choice of these panels is merely an extension of Narayan et al.(2011). In the literature on convergence in per capita incomes, countries identical in structural characteristics such as preferences in technologies, rate of population growth, government policies and price stability have the tendency to converge to one another if their initial conditions are dissimilar(Prichett, 1997). In this paper we proxy for preferences in technology, population growth, government policy and price stability with openness(trade), population growth rate, public investment and inflation respectively(Bruno et al.,2011; Narayan et al., 2011).

3.2 Model and estimation approach

Borrowing from Fung(2009) the two equations below are the standard approaches in the literature for testing conditional convergence if $W_{i,t}$ is taken as strictly exogenous.

$$\ln(Y_{i,t}) - \ln(Y_{i,t-\tau}) = \beta \ln(Y_{i,t-\tau}) + \delta W_{i,t-\tau} + \eta_i + \xi_t + \varepsilon_{i,t} \quad (1)$$

$$\ln(Y_{i,t}) = \sigma \ln(Y_{i,t-\tau}) + \delta W_{i,t-\tau} + \eta_i + \xi_t + \varepsilon_{i,t} \quad (2)$$

Where $\sigma = 1 + \beta$, $Y_{i,t}$ is the measure of per capita income or human development in country i at period t . $W_{i,t}$ is a vector of determinants of per capita human development, η_i is a country specific effect, ξ_t is a time specific constant and $\varepsilon_{i,t}$ an error term. Consistent with the neo-classical growth model, a statistically significant negative coefficient on β in Eq. (1) suggests that countries relatively close to their steady state of per capita growth will experience a slowdown in growth of per capita human development, known as conditional convergence(Narayan et al.,2011; 2). Also, in line with Fung(2009; 3), if $0 < |\sigma| < 1$ in Eq.(2), then $Y_{i,t}$ is dynamically stable around the path

with a trend growth rate the same as that of W_t , and with a height relative to the level of W_t . The variables contained in $W_{i,t-\tau}$ and the individual effect η_i are proxies for the long-term level the market is converging to. Thus, the country specific effect η_i appreciates the existence of other determinants of a country's steady state not captured by $W_{i,t-\tau}$.

Conditions for convergence elucidated above are valid if $W_{i,t}$ is strictly exogenous. Unfortunately, this is not the case in the real world because, while inflation, trade, public investment and population growth(components of $W_{i,t}$) influence per capita development, the reverse effect cannot be ruled-out. Thus we are confronted with the issue of endogeneity where inflation, openness(trade), public investment and population growth are correlated with the error term($\varepsilon_{i,t}$). Also country and time specific effects could be correlated with other variables in the model, which is often the case when lagged dependent variables apply to the equations. A way of dealing with the problem of the correlation between the individual specific-effect and the lagged dependent variables consists in eliminating the individual effect by first differencing. Thus Eq. (2) becomes:

$$\ln(Y_{i,t}) - \ln(Y_{i,t-\tau}) = \sigma \ln(Y_{i,t-\tau} - Y_{i,t-2\tau}) + \delta (W_{i,t-\tau} - W_{i,t-2\tau}) + (\varepsilon_{i,t} - \varepsilon_{i,t-\tau}) \quad (3)$$

However, Ordinary Least Square(OLS) estimators are still biased because there still remains a correlation between the lagged endogenous independent variable and the disturbance term. Arellano & Bond(1991) proposed an application of the Generalized Method of Moments(GMM) exploiting all the orthogonality conditions between the dependent lagged variables and the error term. This GMM approach has been widely used in the convergence literature; and recently applied by Narayan et al.(2011). While Narayan et al.(2011) use Eq.(1)

without the presence of fixed effects, this paper applies Eq.(3) instead: in line with Fung(2009). We apply the *second-step* GMM because it corrects the residuals for heteroscedasticity: contrary to Mazumdar (2002), Sutcliffe (2004) and Noorbakhsh (2006) in the human development-convergence literature. The *first-step* supposes that the residuals are homoscedastic. The assumption of no auto-correlation in residuals is paramount as past lagged variables are to be used as instruments for the endogenous variables. However the estimation depends on the assumption that the lagged values of the dependent variable and other independent variables are valid instruments in the regression. We expect the first-order auto-correlation of the differenced residuals to be significant while their second-order auto-correlation in levels should not. The validity of the instruments is also tested with the Sargan over-identifying restrictions test(OIR).

As emphasized by Islam (1995;14), yearly time spans are too short to be appropriate for studying convergence, as short run disturbances may loom large in such brief time spans. Thus considering the data span of 28 years, we borrow from Narayan et al.(2011) in using a 4 year non-overlapping interval such that we have seven time intervals: 1982-1985; 1986-1989 and so on. This implies in our regression, τ is set to 4.

We also compute the implied rate of convergence by calculating $(\sigma/4)$ which is same as the Narayan et al.(2011) computation of $(1+\beta)/4$. Thus we divide the estimated coefficient of the lagged-log endogenous difference variable by 4 because we have used a four year interval to mitigate short term disturbances. When the absolute value of the estimated lagged coefficient is greater than zero but less than one ($0 < |\sigma| < 1$), we conclude the existence of convergence. The broader interpretation suggests, past differences have a less proportionate impact on future differences, implying the variation on the left hand side of Eq.(3) is decreasing overtime as the country is converging to a steady state.

4. Empirical analysis

This section investigates three main issues: (1) assessment of the presence of convergence; (2) determination of the speed of convergence and; (3) computation of the time needed for a full(100%)convergence. Table 1 presents a summary of overall findings(which look at the first two issues), while Table 2 and Table 3 respectively present results for unconditional and conditional convergence.

Unconditional(absolute) convergence is estimated when only the lagged difference of the endogenous variable is used as the exogenous variable while conditional convergence is in respect of Eq. (3). Therefore unconditional convergence is estimated without $W_{i,t}$:vector of determinants(openness, inflation public investment and population growth) of per capita growth(human development). To assess the validity of the model and indeed the convergence hypothesis, we carry-out two tests, notably the Sargan test, which examines the over-identification restrictions, and the Arellano and Bond test for autocorrelation which assesses the null hypothesis of no autocorrelation. The Sargan test assesses whether the instruments are uncorrelated with the error term in the estimated equation. The null hypothesis is the view that the instruments as a group are strictly exogenous(absence of endogeneity), which is essential for the validity of the GMM estimates. We also report the Wald statistics for the combined significance of estimated coefficients. The autocorrelation, Wald and Sargan tests statistics with associated p-values for each of the panels are reported in the tables. The Sargan test statistics often appear with a p-value greater than 0.10, hence its alternative hypothesis is rejected for the most part. We only report the second-order autocorrelation: $AR(2)$ test because it is more relevant than $AR(1)$ as it detects autocorrelation in levels. For most estimated models we fail to reject the null hypothesis of no autocorrelation.

There is therefore robust evidence that most of the models are free from autocorrelation at least at the 5% significance level.

4.1 Synthesis of results

Table 1 below presents, a summary of the results. This synthesis of results is based on details presented in Tables 2-3. AC, CC, SAC, SCC; denote Absolute Convergence, Conditional Convergence, Speed of Absolute Convergence and Speed of Conditional Convergence respectively. In contrast to GDP per capita growth, we notice substantial evidence of convergence in Human Development.

Table 1: Summary of results on convergence

		GDP per capita growth				Human Development			
		AC	CC	SAC	SCC	AC	CC	SAC	SCC
Legal origins	English Common Law	No	No	---	---	Yes(5%)	Yes(5%)	7.45%	13.92%
	French Civil Law	No	Yes(10%)	---	5.75%	No	Yes(1%)	---	19.77%
Religions	Christianity	No	No	---	---	Yes(1%)	Yes(1%)	11.75%	16.17%
	Islam	No	No	---	---	No	Yes(10%)	---	23.70%
Regions	North Africa	No	No	---	---	Yes(1%)	No	22.15%	---
	Sub Saharan Africa	No	No	---	---	Yes(1%)	Yes(1%)	20.22%	17.12%
	Low Income	Yes(5%)	No	7.0%	---	Yes(1%)	Yes(1%)	22.40%	20.42%
Income Levels	Middle Income	No	No	---	---	Yes(1%)	Yes(1%)	20.60%	12.50%
	Lower Middle Income	No	No	---	---	Yes(1%)	No	22.50%	---
	Upper Middle Income	No	No	---	---	Yes(1%)	Yes(10%)	17.50%	8.82%
	Africa	No	No	---	---	Yes(1%)	Yes(1%)	20.75%	15.00%

AC: Absolute Convergence. CC: Conditional Convergence. SAC : Speed of Absolute Convergence. SCC: Speed of Conditional Convergence.

4.2 Results of absolute convergence(AC)

In Table 2 below, we report results of absolute convergence. Firstly, we notice that for all models the instruments are valid as the alternative hypotheses of the AR(2) and Sargan OIR tests are rejected. In all cases where the lagged endogenous estimated coefficient is significant, the Wald statistics is also significant: which is not unexpected as only one explaining variable is used for the absolute convergence regressions. We find evidence of AC only in low income countries with a convergence rate of 7% per annum(p.a) and the time required for a 100% convergence of 57.14 years(yrs). Of all panels in the case of human development, only French civil-law and Islam-oriented countries fail the AC test. For the remaining panels, the following are their convergence

rates and time required for 100% convergence: English common-law(7.45% p.a for 53.69yrs); Christian(11.75% p.a for 30.04yrs); North Africa(22.15% p.a for 18.05yrs); SSA(20.22% p.a for 19.78yrs); Low income (22.40% p.a for 17.85yrs); Middle income(20.60% p.a for 19.41yrs); Lower middle income(22.50% p.a for 17.77yrs); Upper middle income(17.50% p.a for 22.85 yrs) and Africa(20.75% p.a for 19.27yrs).

Table 2: Absolute convergence in development

	GDP per Capita Growth										
	English	French	Christ	Islam	N.Africa	SSAfrica	Low.I	Middle I	LMI	UMI	Africa
Initial	-0.005 (0.984)	-0.190 (0.249)	0.010 (0.860)	-0.177 (0.633)	-0.537 (0.293)	-0.086 (0.708)	-0.28** (0.011)	-0.103 (0.866)	-0.008 (0.991)	0.224 (0.696)	-0.088 (0.686)
2 nd Auto	-0.099 (0.920)	-1.560 (0.118)	-1.002 (0.315)	-1.078 (0.280)	-1.103 (0.269)	-1.221 (0.222)	-1.544 (0.122)	-0.535 (0.592)	-0.220 (0.825)	-0.922 (0.356)	-1.450 (0.146)
OIR	11.729 (0.925)	13.950 (0.833)	15.524 (0.745)	9.039 (0.982)	1.944 (0.999)	20.392 (0.433)	14.201 (0.820)	10.418 (0.959)	6.116 (0.998)	3.795 (0.924)	19.517 (0.488)
Wald	0.000 (0.984)	1.324 (0.249)	0.030 (0.860)	0.227 (0.633)	1.101 (0.293)	0.139 (0.708)	6.363** (0.011)	0.028 (0.866)	0.0001 (0.991)	0.152 (0.696)	0.162 (0.686)
Countries	13	15	18	10	4	24	15	13	9	4	28
Obser	42	41	49	34	16	67	38	45	33	12	83

	Human Development										
	English	French	Christ	Islam	N.Africa	SSAfrica	Low.I	Middle I	LMI	UMI	Africa
Initial	0.298** (0.015)	1.079** (0.000)	0.470*** (0.010)	1.049*** (0.000)	0.886*** (0.000)	0.809*** (0.000)	0.896*** (0.000)	0.824*** (0.000)	0.90*** (0.000)	0.70*** (0.000)	0.83*** (0.000)
2 nd Auto	-0.898 (0.368)	-0.224 (0.822)	-0.932 (0.351)	1.008 (0.313)	-1.343 (0.179)	-1.095 (0.273)	-1.103 (0.269)	-1.857* (0.063)	-1.697* (0.089)	-1.002 (0.316)	-1.120 (0.262)
OIR	13.518 (0.854)	22.395 (0.319)	22.142 (0.332)	12.514 (0.897)	4.764 (0.999)	28.272 (0.103)	21.726 (0.355)	14.677 (0.794)	8.973 (0.983)	4.947 (0.997)	29.26* (0.082)
Wald	5.858** (0.015)	386.03*** (0.000)	6.642** (0.010)	429.9*** (0.000)	321.9*** (0.000)	24.78*** (0.000)	41.73*** (0.000)	131.1*** (0.000)	109.9*** (0.000)	11.8*** (0.000)	34.4*** (0.000)
Countries	14	23	24	13	5	32	22	15	10	5	37
Obser	82	138	142	78	30	190	132	88	60	28	220

***, **, *: significance levels of 1%, 5% and 10% respectively. English: Common-Law. French: Civil-Law. Christ: Christians. N.Africa: North Africa. SSA: Sub-Saharan Africa. Low I: Low Income. Middle I: Middle Income. LMI: Lower Middle Income. UMI: Upper Middle Income. 2nd Auto: Second Order Autocorrelation test. OIR: Overidentifying Restrictions test. Obser: Observations. Wald: Statistics for joint significance of estimated coefficients.

4.3 Results of conditional convergence(CC)

Findings for conditional convergence are reported in Table 3.

Table 3: Conditional convergence in development

	GDP per Capita Growth										
	English	French	Christ	Islam	N.Africa	SSAfrica	Low.I	Middle I	LMI	UMI	Africa
Initial	-0.076 (0.876)	-0.230* (0.071)	-0.025 (0.959)	-0.078 (0.810)	-1.200* (0.097)	-0.064 (0.773)	-0.257 (0.162)	-0.113 (0.794)	0.067 (0.946)	1.115 (0.490)	-0.189 (0.181)
Intercept	-0.082 (0.729)	0.105 (0.573)	-0.252 (0.451)	0.240 (0.370)	0.618 (0.250)	-0.026 (0.892)	0.093 (0.748)	-0.051 (0.889)	0.617 (0.534)	-0.018 (0.983)	-0.028 (0.885)
Trade	0.015 (0.215)	0.018** (0.010)	0.025 (0.306)	0.011 (0.527)	0.0008 (0.973)	0.017 (0.253)	0.010 (0.358)	0.019 (0.504)	0.021 (0.251)	-0.002 (0.905)	0.012 (0.213)
Inflation	-0.009 (0.220)	-0.004 (0.815)	-0.013 (0.226)	0.010 (0.521)	0.027 (0.605)	-0.003 (0.453)	-0.010 (0.429)	-0.010 (0.475)	-0.005 (0.703)	---	-0.004 (0.510)
PubIvt	-0.028 (0.793)	0.083 (0.216)	-0.046 (0.691)	0.123 (0.333)	---	0.025** (0.036)	-0.020 (0.788)	0.058 (0.556)	-0.015 (0.875)	---	-0.0005 (0.994)
Popg	0.121 (0.783)	-0.149 (0.734)	-0.105 (0.714)	-0.178 (0.809)	---	0.075 (0.789)	-0.145 (0.534)	0.350 (0.603)	1.683 (0.410)	---	0.135 (0.523)
2 nd Auto	-0.489 (0.624)	-1.388 (0.165)	-0.605 (0.545)	-1.037 (0.299)	-0.903 (0.366)	-1.101 (0.270)	-1.170 (0.241)	-1.079 (0.280)	-0.176 (0.859)	-1.113 (0.265)	-1.721* (0.085)
OIR	5.311 (0.999)	5.504 (0.999)	13.213 (0.868)	6.004 (0.996)	0.000 (1.000)	16.279 (0.699)	9.180 (0.980)	8.422 (0.988)	2.271 (1.000)	2.091 (0.989)	24.43 (0.223)
Wald	4.887 (0.429)	12.170** (0.032)	10.889* (0.053)	3.806 (0.577)	4.659 (0.198)	10.778* (0.055)	13.79** (0.017)	6.393 (0.269)	5.285 (0.382)	0.666 (0.716)	7.782 (0.168)
Countries	12	14	17	9	4	22	14	12	8	4	26
Obser	39	35	48	26	16	59	35	39	27	12	74

	Human Development										
	English	French	Christ	Islam	N.Africa	SSAfrica	Low.I	Middle I	LMI	UMI	Africa
Initial	0.557** (0.040)	0.791*** (0.000)	0.647*** (0.000)	0.948* (0.057)	0.284 (0.431)	0.685*** (0.000)	0.817*** (0.000)	0.50*** (0.000)	0.786 (0.156)	0.353* (0.092)	0.60*** (0.000)
Intercept	0.003 (0.603)	0.013* (0.064)	0.007*** (0.007)	0.009 (0.697)	0.026 (0.116)	0.012*** (0.003)	0.011** (0.025)	0.016*** (0.000)	0.009 (0.554)	0.015** (0.041)	0.01*** (0.001)
Trade	-0.000 (0.850)	0.0008 (0.100)	0.0002 (0.541)	0.000 (0.918)	-0.0002 (0.364)	0.0002 (0.586)	0.0002 (0.706)	-0.000 (0.944)	-0.0002 (0.595)	0.0002* (0.090)	0.0003 (0.443)
Inflation	-0.0003 (0.476)	-0.000 (0.002)	-0.00*** (0.000)	0.0003 (0.121)	-0.0001 (0.845)	-0.00*** (0.000)	-0.00*** (0.000)	0.0002** (0.023)	0.0003 (0.415)	---	-0.00*** (0.000)
PubIvt	-0.0001 (0.970)	0.003* (0.072)	0.002 (0.208)	0.003 (0.262)	---	0.0006 (0.495)	0.001 (0.664)	0.001** (0.035)	0.003** (0.031)	---	0.001 (0.293)
Popg	0.004 (0.855)	0.025*** (0.000)	0.021*** (0.000)	0.031 (0.311)	---	0.021*** (0.000)	0.024*** (0.000)	0.013 (0.171)	0.021 (0.202)	---	0.021*** (0.000)
2 nd Auto	-1.182 (0.236)	0.208 (0.834)	-1.412 (0.157)	0.676 (0.498)	-0.687 (0.491)	-0.788 (0.430)	-0.900 (0.367)	-1.332 (0.182)	-1.350 (0.177)	-1.054 (0.291)	-0.955 (0.339)
OIR	10.216 (0.964)	20.108 (0.451)	19.572 (0.484)	9.403 (0.977)	0.909 (1.000)	23.615 (0.259)	17.793 (0.601)	7.373 (0.995)	3.765 (1.000)	1.720 (1.000)	23.631 (0.258)
Wald	8.128 (0.149)	137.4*** (0.000)	93.37*** (0.000)	29.98*** (0.000)	3.521 (0.317)	65.19*** (0.000)	78.10*** (0.000)	23.66*** (0.000)	---	3.609 (0.164)	85.49*** (0.000)
Countries	12	22	23	11	5	30	21	13	9	5	34
Obser	64	111	122	53	27	155	104	71	49	25	175

***,**, *: significance levels of 1%, 5% and 10% respectively. English: Common-Law. French: Civil-Law. Christ: Christians. N.Africa: North Africa. SSA: Sub-Saharan Africa. Low I: Low Income. Middle I: Middle Income. LMI: Lower Middle Income. UMI: Upper Middle Income. 2nd Auto: Second Order Autocorrelation test. OIR: Overidentifying Restrictions test. Obser: Observations. PubIvt: Public Investment. Popg: Population growth. Wald: Statistics for joint significance of estimated coefficients.

We first notice that(with the exception of the African panel in the GDP per capita regressions) in all models the instruments are valid as the alternative hypotheses of the AR(2) and Sargan-OIR tests are rejected. Also in almost all cases where the lagged endogenous estimated coefficient is significant, the Wald statistics is also significant: exceptions to this are North

African(English common-law and Upper Middle Income) countries in GDP per capita(human development) regressions. In the case of GDP per capita we find CC only in French civil law countries with a convergence rate of 5.75% p.a and the time required for a 100% convergence of 69.56 years. Conversely, but for the cases of North Africa and Lower Middle Income countries, we find overwhelming evidence of CC in human development: the following are their convergence rates and time required for 100% convergence: English common-law(13.92% p.a for 28.73yrs); French civil-law(19.77% p.a for 20.23yrs), Christian(16.17% p.a for 24.73 yrs); Islam(23.70% p.a for 16.87yrs); SSA(17.12% p.a for 23.36yrs); Low income (20.42% p.a for 19.58yrs); Middle income(12.50% p.a for 32yrs); Upper middle income(8.82% p.a for 45.35yrs) and Africa(15.00% p.a for 26.66yrs).

4. 4 Discussion, policy implications and future directions

Before delving into discussions of the findings, it is imperative to reconcile our results with economic growth theories. The findings have broadly rejected the neoclassical(exogenous) growth model prediction that real per capita income converges to each country's steady state or common steady state regardless of its initial level. Thus confirming the endogenous theory which emphasizes that differences among countries in their initial endowments and the possibility of multiple equilibria shows that there is no tendency for income levels to converge in the long run. Conversely, results for human development are in line with the neoclassical growth hypothesis and run counter to the endogenous theory. Therefore from a theoretical standpoint, it could be concluded that while GDP per capita(human development) findings, reject(confirm) the exogenous growth model theory, human development(GDP per capita) results reject(confirm) the endogenous theory. Put in plainer terms, findings reveal while human development supports the exogenous growth model and rejects the endogenous theory, its income component suggests the contrary

4.4.1 Absolute Convergence(AC)

Absolute convergence is the result from factors such as monetary unions and the adoption of a single currency , among others(Nayaran et al., 2011). In the context of our paper it stretches beyond monetary policies to include homogenous characteristics of human development like religions, income-levels, regions, institutional qualities, legal origins...etc. Therefore AC implies that countries share the same fundamental characteristics with respect to development, such that the only difference between countries is in the initial level of development. The absence of AC in per capita income suggests that, holding other things constant(such as political instability, market isolation and macroeconomic conditions) financial liberalization has not: reduced barriers to trade, increased investment, mitigated capital controls and stifled the control on exchange rate transactions. Openness(globalization) in trade and capital has not had some positive redistributive impact on income between rich and poor African countries. Simply put, structural adjustment programs implemented by African countries may not have had the desired absolute effect on equalizing per capita income growth. If we were to assume that cross border capital flows have increased with financial liberalization, then the cross-country income equalizing impact has been negative. Recent inequality-growth literature point to the negative income redistributive impact of foreign direct investment in the African continent(Asongu,2011ab). This interpretation should be treated with caution because a great chunk of foreign private capital flows often emanate from developed countries and not from other African countries within the same panel. All these factors have resulted in the absence of absolute convergence in per capita income.

Conversely, AC in human development has converged because of increase in life expectancy, literacy and gross enrolment ratios due to development policies by the United Nations Development Program, World Bank, World Health Organization, World Trade Organization , Food

and Agricultural Organization...etc. Therefore it maybe said that irrespective of cross-country differences in structural and institutional characteristics, the impact of policies by multilateral donor organizations is equalizing in human development. Put in contextual terms, fundamental characteristics from multilateral donor agencies are the same within countries of the same panel. In spite of dissimilar initial conditions of human development across countries, global human development initiatives are being applied in all countries without distinction: leading to poor countries catching-up with their rich neighbors.

4.4.2 Conditional Convergence(CC)

Borrowing from Barro(1991), in the economic growth literature conditional convergence depicts convergence whereby one's own long-term steady state(equilibrium) is contingent on the different structural characteristics or fundamentals of each economy or market(Nayaran et al.,2011). When countries with the same fundamental characteristics(in the same homogenous panel) differ in terms of factors relating to the performance of their economies, there is likely to be conditional convergence. This convergence is contingent on the variables we select and empirically test; implying findings depend on macro economic variables used. With constraints in data availability and degrees of freedom required for the OIR test, we conditioned the analysis on four macroeconomic variables(openness, inflation, population growth and public investment): consistent with the convergence literature(Prichett, 1997; Bruno et al., 2011; Narayan et al., 2011). Thus based on our conditioning information set it could be established that, differences in factors related to social and health performance across countries are blurring; thus leading to conditional convergence in human development. It follows that countries with lower living standards in terms of life expectancy, literacy and gross enrolment ratios are catching-up with their higher-level counterparts. Conversely, we fail to find any backing in per capita income CC. This absence could

result from persisting cross-country differences in long run economic performance patterns. Population growth, inflation, globalization(openness) and public investment on which the analysis is conditioned are crucial determinants of GDP per capita growth. Beyond structural disparities, cross-country differences in government quality determinants like control of corruption, government effectiveness, regulation quality, rule of law and political instability also constitute important institutional patterns that could explain this absence in convergence.

4.4.3 Retrospect to testable hypotheses

In the introduction of this paper, we highlighted certain concerns common to all panels that cut deep into the formulation of theories and policies of economic growth in the African continent. For clarity in interpretation of results we reformulate the issues.

a) *Is human development among African countries converging or diverging?* Based on distinct homogenous settings, while human development in per capita income terms is not significantly converging, non-income aspects of human development like health care, education, life expectancy and gross enrolment ratios are converging.

b) *Do income levels matter in poor countries catching-up with their rich counterparts?* In terms of both AC and CC, income levels matter in convergence, with low income panels experiencing a higher rate of convergence than their middle income counter parts. This fact still holds when convergence dynamics of upper and lower middle income countries are compared.

c) *Do religious-domination, legal origin and regional-belonging have some bearing on human development convergence(divergence) in Africa?* Islam(French civil-law) dominated countries have a higher rate of convergence in human development than their Christian(English common-law)

counterparts. In absolute human development terms, convergence is higher in North Africa than in Sub-Saharan Africa.

4.4.4 Contribution to addressing exiting puzzle in the literature

Our findings have partially confirmed the Sutcliffe(2004) hypothesis on the validity of the HDI convergence(as preached by the IMF). Konya & Guisan(2008) concurred with the criticism by Sutcliffe(2004) only with respect to the income dimension of the HDI and went forth to use the HDI in its integrality. By distinguishing the income effect from the integral HDI effect, our findings have confirmed the Konya & Guisan(2008) criticism on this partial validity of the Sutcliffe(2004) hypothesis. It follows that with respect to various homogenous strands in the African continent while the HDI converges, its income component doesn't.

4.4.5 Policy implications: beyond income convergence

The debate on convergence has tended to be linked with a radical defense of the neoclassical growth model. Proponents supporting this thesis have mostly focused on income convergence. However there is need to focus beyond income convergence and objectively assess other components beside income that can wheel the transitions that are essential in the development process. The convergence decomposition must extend well beyond GDP growth mechanisms. Our analysis shows that different human development variables like life expectancy and literacy levels have been converging in the African continent. The weak case for income convergence(in support of the endogenous growth model) in our findings suggests in substance that convergence in institutional factors affecting, life-expectancy, literacy and democracy are also crucial in the formulation and implementation of policies aimed at reducing cross-country human development variations. A corollary of above explanation is that certain human development variables naturally

converge and do not require much policy intervention. At this point in time, it could be established that the income component of the human development index moves slower than others in the convergence process and thus requires a more focused policy intervention.

4.4.6 Future directions

Given significant convergence findings in human development across homogenous strands in the African continent, future research aimed at further elucidating this human development-convergence nexus could be directed at assessing which variables have most intervened in improving human development. In other words, what roles have income improvement, life expectancy, literacy and gross enrolment ratios played in human development-convergence? Mayer-Foulkes(2010) has documented an analysis of this kind with a broad and global appeal, however a replicate for the African continent could result in interesting policy implications.

5. Summary

In examining some big questions on African development, we have provided evidence that dynamics of some development indicators could support both endogenous and neoclassical growth theories in the convergence debate. This paper has investigated convergence in real per capita GDP and inequality adjusted human development in African countries, disaggregated into 11 homogenous panels based on regions(Sub-Saharan and North Africa), income-levels(low, middle, lower-middle and upper-middle), legal-origins(English common-law and French civil-law) and religious dominations(Christianity and Islam). Findings suggest, while human development supports the exogenous growth model and rejects the endogenous theory, its income component suggests the contrary. As a policy implication, looking beyond income convergence can provide a concrete agenda for development involving all aspects of economic, institutional and social life.

Also the income component of the human development index moves slower than others in the convergence process and thus requires a more focused policy intervention.

Appendices

Appendix 1: Summary statistics

		Mean	S.D	Minimum	Maximum	Observations
Development	GDP pc growth	1.071	7.447	-30.430	90.140	292
	Human development	1.763	7.590	0.163	47.475	297
Control	Openness(Trade)	65.889	34.606	10.079	192.29	285
Variables	Inflation	22.145	123.54	-100.00	1986.9	281
	Public Investment	7.527	4.393	0.000	27.523	248
	Population growth rate	2.539	1.236	-8.271	8.314	304

S.D: Standard D. GDPpc : Gross Domestic Product per capita.

Appendix 2: Correlation analysis

GDP pcg	Human Dev.	Openness	Inflation	P. Investment	Pop. growth	
1.000	-0.020	0.118	-0.256	0.149	0.291	GDP pcg
	1.000	-0.067	-0.011	-0.137	-0.007	Human Dev.
		1.000	-0.122	0.272	-0.191	Openness
			1.000	-0.162	0.079	Inflation
				1.000	-0.057	P. Investment
					1.000	Pop. growth

GDPpcg : GDP per capita growth rate. Inequality Adjusted Human Development Index. P: Public. Pop: Population. Dev: Development.

Appendix 3: Variable definitions

Variables	Sign	Variable Definitions	Sources
Inflation	Infl.	Consumer Prices (Annual %)	World Bank(WDI)
Openness	Trade	Imports(of goods and services) plus Exports(of goods and services) on GDP	World Bank(WDI)
Public Investment	PubI	Gross Public Investment(% of GDP)	World Bank(WDI)
Population growth	Popg	Average annual Population growth rate	World Bank(WDI)
Human Development	HD	Inequality Adjusted Human Development	World Bank(WDI)

Appendix 4: Presentation of countries

Group	Group category	Countries	Num
Legal origin	English Common-Law	Botswana, The Gambia, Ghana, Kenya, Lesotho, Liberia, Malawi, Mauritius, Nigeria, Sierra Leone, South Africa, Sudan, Swaziland, Uganda, Zambia, Tanzania.	16
	French Civil-Law	Algeria, Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Ivory Coast, Djibouti, Egypt, Equatorial Guinea, Ethiopia, Gabon, Madagascar, Mali, Morocco, Niger, Rwanda, Senegal, Togo, Tunisia, Libya	22
Religions	Christianity	Benin, Botswana, Burundi, Cameroon, Central African Republic, Ivory Coast, Equatorial Guinea, Ethiopia, Gabon, Ghana, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mauritius, Rwanda, South Africa, Swaziland, Togo, Uganda, Zambia, Tanzania.	23
	Islam	Algeria, Burkina Faso, Chad, Djibouti, Egypt, The Gambia, Mali, Morocco, Niger, Nigeria, Senegal, Sierra Leone, Sudan, Tunisia, Libya.	15
Regions	Sub-Saharan Africa	Benin, Botswana, Djibouti, The Gambia, Ghana, Kenya, Lesotho, Liberia, Malawi, Mauritius, Nigeria, Sierra Leone, South Africa, Sudan, Swaziland, Uganda, Zambia, Tanzania, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Ivory Coast, Equatorial Guinea, Ethiopia, Gabon, Madagascar, Mali, Niger, Rwanda, Senegal, Togo.	33
	North Africa	Algeria, Egypt, Morocco, Tunisia, Libya.	5
Income Levels	Low Income	Benin, Burkina Faso, Burundi, Central African Republic, Chad, Djibouti, Ethiopia, The Gambia, Ghana, Kenya, Liberia, Madagascar, Malawi, Mali, Niger, Rwanda, Sierra Leone, Togo, Uganda, Zambia, Tanzania.	21
	Middle Income	Algeria, Botswana, Cameroon, Ivory Coast, Egypt, Equatorial Guinea, Gabon, Lesotho, Mauritius, Morocco, Nigeria, Senegal, South Africa, Sudan, Swaziland, Tunisia, Libya.	17
	Lower Middle Income	Cameroon, Ivory Coast, Egypt, Lesotho, Morocco, Nigeria, Senegal, Sudan, Swaziland, Tunisia.	10
	Upper Middle Income	Algeria, Botswana, Equatorial Guinea, Gabon, Mauritius, South Africa, Libya.	7

Num: Number of cross sections(countries)

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