Economics Bulletin

Volume 41, Issue 1

Beyond the chains: Slavery and Africa's wealth gap with the world

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Abstract

Slave trades represent one of the most controversial historical events experienced over the last millennium and many researchers are in consensus of the legacy of slavery being one of the deepest underlying factors behind Africa's current state of underdevelopment. This study seeks to quantify the effects which slave exports exerted on per capita GDP for 49 African countries as well as on the 'income gap' between Africa and Western slave beneficiaries. Our findings unanimously point to a statistically significantly inverse relationship between slave exports and income/income differences hence supporting the intuition of slavery being a fundamentally deep root of developmental differences between Africa and the Western world beneficiaries. Our results are robust to adjusted measures of slave exports; inclusion of additional control variables; dummy variables well as to different subsamples.

We are thankful to an anonymous reviewer whose comments improved an earlier draft of the paper. All remaining errors are the authors.
Citation: Andrew Phiri, (2021) "Beyond the chains: Slavery and Africa's wealth gap with the world", *Economics Bulletin* ,Vol. 41 No. 1 pp. 103-116
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Submitted: March 17, 2020. **Published:** March 10, 2021.

1. INTRODUCTION

Recently, there has been a widespread revolutionizing of thought amongst growth economists who have begun to literally think 'deep' on the possible causes of the wide differences in the developmental statuses of countries globally. The so-called 'deep roots' literature envisages on present day development patterns being traced to evolutionary and archaeological artefacts which existed way before the emergence of our modern civilizations (see Diamond (1997), Putterman (2000), Acemoglu et al. (2001, 2002), Bloom and Sachs (2008), Olsson and Paik (2016) and Spolaore and Wacziarg (2018)). Thus far, the 'deep roots' literature generally proposes five observable 'pre-historic' artefacts which empirical academics use as predictors of modern day development and institutional patterns. The first is the state history index which measures the 'antiquity' of state institutions by capturing the strength of locally-dominated government structures above tribal levels within a territorial geographic scope (Putterman (2000), Putterman and Weil (2010), Borcan et al. (2018)). The second measure is the transition into the Neolithic era and predicts how early nations transitioned from hunter-gathering to agricultural-based societies (Olsson and Hibbs (2004, 2005), Putterman (2008), Olsson and Paik (2016)). The third is a measurement of the time elapsed, in years, since the first uninterrupted settlement by '*homo sapiens*' (Ahlerup and Olsson, 2012). The fourth is a measure of technology advancement in the pre-colonization era for periods as early as 1500AD, 0AD and 1000BC (Comin et al., 2010). The fifth deep measure is the number of slaves exported from Africa during the four major waves of slave trading experienced between 1500 and 1900 (Nunn (2008) and Bhattacharyya (2009)).

Of all the aforementioned indicators of pre-historic development, slave trades presents the most interesting, relevant and thought-provoking explanatory variable used in trying to enhance our understanding of the deep causes of underdevelopment in African countries. Crudely speaking, slavery in Africa can be described as an illegal institution and unjust form of human trade whereby African slave exporters exchanged captured human beings for flintlock firearm technology and advanced iron artillery from Western slave traders, which in turn, was used by Africans to increase resources dedicated to capturing, exploiting and selling of more slaves i.e. guns-slave hypothesis (Whatley, 2018). The four waves of slave trades (trans-Atlantic slave trade; trans-Saharan slave trade, Red Sea slave trade; Indian Ocean slave trade) experienced between 1400 and 1900 led to massive depopulation and high ethnic diversity amongst Africans (Ashraf and Galor, 2013), vulnerability to colonization (Acemoglu et al., 2001), lower levels of trust amongst African populations (Nunn and Wantchekon, 2011) as well as weakened state development and insufficient legal institutions (Bhattacharyya, 2009). So even though modern human lifeform (i.e. *homo sapiens*) has its exodus within the African continent, adverse historical events such as slavery are amongst the deeper causes of why the 'early evolution' of African people has not translated to higher progression in terms of present-day economic development.

In a much celebrated paper, Nunn (2008) uses information from historic slave trading records to create a series of slaves export data for 52 countries corresponding to the total number of slaves captured and sold during the four waves of African slave trades. Using cross sectional OLS estimates Nunn (2008) finds slave exports to be negatively related with 2000 per capita GDP levels and concludes on slavery creating institutions which inhibit current economic growth levels in African countries such that nations with the most historic slave exports suffer the most in terms of underdevelopment. Bhattacharyya (2009) uses Nunn's (2008) slave exports data alongside colonization and incidence to malaria measures as possible deep determinants of development in African countries. Bhattacharyya (2009) fails to replicate

Nunn's findings of a significant relationship between slave exports and 2000 per capita income levels but rather finds the incidence of malaria to be the more significant 'deep factor' in explaining current low levels of development Africa. More recently, Bezemer et al. (2014) investigate the relationship between indigenous slavery and per capita GDP for 43 African countries. The authors use measures of population fractions which historically had institutions of indigenous slavery, and find a negative, cross-sectional relationship with per capita GDP in 1990, 2000 and 2008. Bertocchi and Dimico (2014) present a study which investigates the effects of US state-level slaves per capita (i.e. slaves divided by the population at 1860) on nation-wide income inequality. Their study uses the Theil distribution to distinguish between inequality across races as well as inequality within races and their results confirm that states with higher per capita slaves have significant 'racial inequality', compared to states which had less slaves per capita, although there are no significant effects established for 'within equality', that is inequality within each race.

Our study contributes to the current line of existing empirical research by examining the impact of slave trades on the wealth gap of 43 African countries against the European countries and their 'neo-European' offshoots. We are primarily motivated by the contradicting results observed for the African literature on slavery as a deep determinant of development, with the study of Nunn (2008) finding a negative and significant relationship between slaves and African economic development whereas Bhattacharyya (2009) does not find any significant relationship. We further note that these studies do not incorporate the effect, if any, which slavery has on the development of Western countries. For this reason, we adopt the approach of Bertocchi and Dimico (2014) in assuming that slavery exerted more of an impact on inequality differences between African descendants adversely affected by slavery and Western populations who benefited from this peculiar institution. We particularly take heed of Eltis and Engerman (2000) who present arguments on how slavery assisted Western nations such as Britain to breakthrough to early industrialization ahead of its rivals and how slavery is considered the most important early institution fostering Britain's industrial development compared to any other domestic or foreign sector/industry between 1750 and 1830. Eltis and Engerman (2000) and more recently Harvey (2019) collectively articulate four broad channels through which this occurred, namely i) slavery generating profits to underwrite the capital stock of the early industrial revolution ii) slaves, via cheap raw materials and labour, being used to promote the sugar and cotton industries which became the backbone of early industrial factory production iii) slave grown, exotic products assisting to stimulate consumerism and incentives for Western consumers iv) the exchange of 'guns for slaves' between Western and African slave traders which stimulated the industrial development of metalwork and the arms industry in earlier centuries. Similar sentiments on the contribution of slavery towards Western development are also elaborated in earlier contributions presented by Williams (1966) and Solow (1985) who find Carribean (British West Indies) slaves to have made an invaluable contribution towards British industrialization in the early 18th Century. In linking these observations in conjunction with those particular hypothesized recently by Nunn (2008) and Nunn and Wantchekon (2011), it would only be logical to assume that the economic effects of slavery, on a wide-scale, were two fold, with slavery deteriorating Africa's potential economic development on one hand, and slavery uplifting economic development in other regions of the world, on the other hand. Put together, the aforementioned would ultimately imply slavery resulting in a higher income gap between Africa and the European countries and their 'neo-European' offshoots, which is the hypothesis that our study empirical addresses.

Having provided a general background, we structured the rest of the study as follows. Section 2 presents the methodology and the empirical data of the study. Section 3 presents the empirical findings whilst the paper is concluded in Section 4.

2. MODEL SPECIFICATION AND DATA

To test our hypotheses, we borrow our empirical specifications from Nunn (2008) and specify two estimation regressions, the first which examines the effect of slavery on modern-day economic development in African countries i.e.

$$y_i = \beta_0 + \beta_1 ST_i + \beta_2 X_i + \beta_2 D_i + \varepsilon_i \quad (1)$$

And a second regression which examines the impact of slavery on the 'income gap' between African countries and the Western Europe and Neo Europeans countries who were prime recipients of African slave exports i.e.

$$(y_i - y_w) = \beta_0 + \beta_1 ST_i + \beta_2 X_i + \beta_2 D_i + \varepsilon_i \quad (2)$$

Where y_i is the average real per capita GDP for the 49 African countries, y_w is the average real GDP per capita of the Western world's prime recipients of African slave exports (Portugal, the UK, Spain, France, Netherlands, Germany, the US, Canada, Australia and New Zealand) such that $(y_i - y_w)$ is the income gap between the individual African country and Western 'slave-recipients'. The aforementioned variables are assembled using the GDP per capita at constant 2010 US dollars values collected for the individual 49 African countries and the individual Western 'slave-recipients' from the World Bank online database (World Development Indicators). The per capita GDP values are collected on annual intervals for periods ranging from 1990-2018 and the variables are averaged over different time periods for empirical purposes. ST_i is the slave exports data which is extracted from study of Nunn (2008) and represents the main independent variable in regression (1). Since there are some countries which have had zero slave exports, hence causing the data to be positively skewed, we follow Nunn (2008) and transform the data by adding 0.1 to all slave export data and thereafter taking the natural logarithm of the new data.

The vector X_i contains additional control variables inclusive of i) vulnerable populations exposed to intermediate endemicity of malaria expressed as a percentage of total population (*i.e. malaria*) collected from the World Development Indicators as inspired by Acemoglu et al. (2001) and Bhattacharyya (2009) ii) Agricultural history (i.e. *Agrihist*) sourced directly from the works/appendices of Putterman and Weil (2010) iii) The original time variable (i.e. Origtime) which measures the time elapsed since the first settlement on the territory of the modern-day country by 'homo sapiens' and the series is sourced from Ahlerup and Olsson (2012) iv) A measure of technological advancement in the year 1500 (i.e. *tech1500*) which is collected form the appendices of Comin et al. (2010) v) Latitude which measures the absolute attitude of country's geography and is relative measure of the distance away from the equator (i.e. *latitude*). The series is sourced from the CIA World Fact Book vi) arable land as a percentage of land area (i.e. *arable*) which was proposed by Khalaf (1979) as a possible determinant of growth and development particularly in African countries, and the series is collected from the World Bank development indicators vii) The number of years from which African countries attained independence up to 2000 (i.e. *indep*). Note that this variable is premier in the 'deep roots' literature as we are the first, as far as we are concerned, to use it in the literature. This data is sourced from CIA World Fact Book. The vector D_i is made up of a set of two dummy variables. The first set of dummy variables consider 3 colonial dummies corresponding to British colonies (i.e. *British_dum*), French colonies (i.e. *France_dum*), Portuguese colonies (i.e. *Portugal_dum*). The second set of dummy variables corresponding to landlocked dummy which may 'some-what' considered as a proxy for access to sea as in the study of Spolaore and Wacziarg (2018). We also make use of an oil and gas dummy which captures the presence of petroleum (oil and gas) reserves in African countries and this series is sourced from Lujala et al. (2007).

The summary statistics of the variables used in our study alongside their computed 'correlation coefficients' with African per capita GDP and the 'income gap' are reported in Table 1. Note that the average income of African countries between the periods 1990-2018 is $1,744.80 whereas the average 'income gap' over the same sample period is $30,276.51 and the correlation of both of these variables with slaves exports is -0.02. The implied inverse correlation between slave exports and 'income gap' can be easily observed in Figures 1 and 2 which presents the cross-sectional scatterplot between slave exports and each African country's per capita GDP gap, on one hand, and with the 'income gap, on the other hand. From Figures 1 and 2 we note a number of outliers in the data. For instance, Angola (3,607,020), Ghana (1,614,793), Nigeria (2,021,859) and Ethiopia (1,447,455) have slave exports which are way above Africa's average of 319,265 reported in Table 1 even after accounting for the computed standard deviation of 653,790. Moreover, we also observe that a number of African countries have zero slave exports (i.e. Botswana, Lesotho, Cape Verde, Comoros, Lesotho, Mauritius, Morocco, Rwanda, Tunisia) which can be seen by the positioning of their scatterplots which lie directly on the vertical axis of Figures 1 and 2.

Table 1: Summary statistics of the times series

time series	Mean	s.d.	Min	Max	j-b (p-value)	Correlation with y_i	Correlation with $(y_i - y_w)$
y_i	1,744.80	2,009.09	197.02	8,354.43	0.00	1.00	1.00
$(y_i - y_w)$	-30,276.51	1986.04	-31,767.99	-23,610.6	0.00	1.00	1.00
Slaves	319,264.9	653,789.8	0	3,607,020	0.00	-0.02	-0.02
Malaria	1.26	5.49	0	36	0.00	-0.19	-0.19
Agrichist	2,893.46	1,251.06	362	7,200	0.00	-0.31	-0.31
Origtime	115,383.7	45,506	500	160,000	0.00	0.05	0.05
Tech1500	0.35	0.18	0.15	0.78	0.00	-0.19	-0.19
Latitude	1,355.21	1,019.76	0	3,400	0.14	0.26	0.26
Independence	78.71	280.87	6	2,000	0.00	-0.16	-0.16
Oil_exports	11.38	25.08	0	95.84	0.00	0.02	0.02
Oil&gas_dum	0.37	0.49	0	1	1.30	0.09	0.09
Landlocked	0.29	0.46	0	1	0.01	-0.14	-0.14
British_dum	0.35	0.48	0	1	0.01	0.09	0.09
French_dum	0.41	0.49	0	1	0.02	-0.09	-0.09
Portugal_dum	0.08	0.28	0	1	0.00	0.14	0.14

Figure 1: Scatterplot between African per capita GDP gap and slave exports

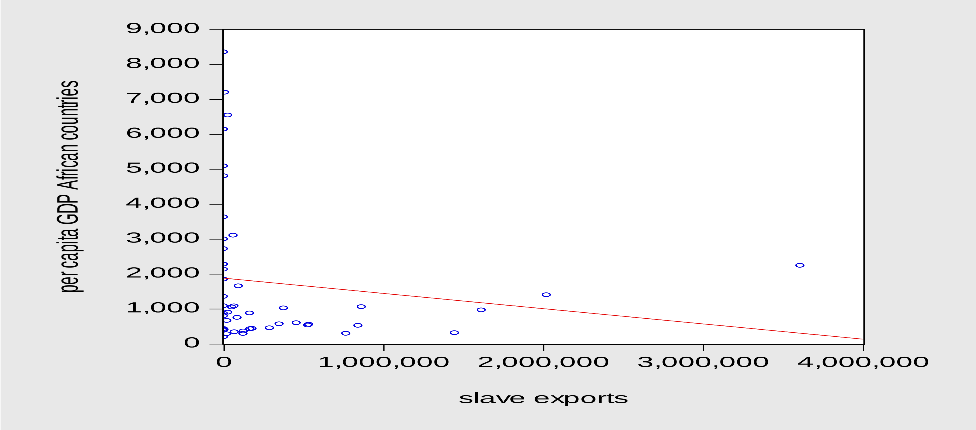
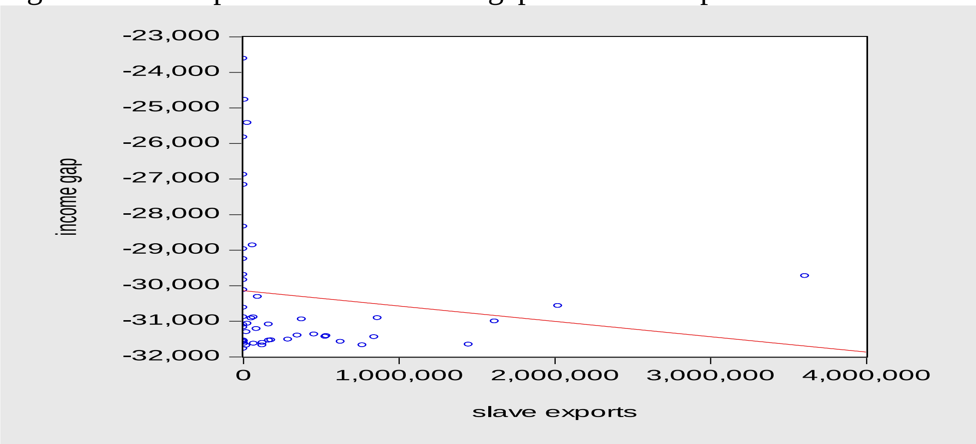


Figure 2: Scatterplot between income gap and slave exports



3. EMPIRICAL FINDINGS

Table 2 presents our baseline ordinary least squares (OLS) estimates for equations (1) and (2) reported in Panels A and B, respectively. Note that our baseline estimates are basic bivariate regressions estimates across 4 sample periods (i.e. 1990-2018; 1990-2000; 2000-2010; and 2010-2018). As can be observed from Panels A and B in Table 2, the 'slave' variable produces its expected negative coefficient estimates across all sample periods and these estimates are statistically significant at all critical levels. Recall, that negative coefficient implies that high (lower) slaves exports are associated with a higher (lower) per capita GDP (Panel A) and income-gap (Panel B). Interestingly enough, whilst the coefficient estimates do not differ much between equation (1) and (2), there is notable discretion between the intercept values of the regressions. The positive intercept estimates observed in Panel A indicate that starting or initial values of per capita GDP are positive for the African countries but once compared with the starting values for the 'gap' between Africa and the Western countries, as reported in Panel B, the initial values turn negative. This later result could be interpreted to imply that slavery had a significant adverse effect on the differences in starting per capita GDP vales between Africa and Western nations who benefitted from slavery. Altogether, the collective empirical evidence presented in Table 2 sufficiently validates the hypothesis that slave exports not caused slow development in Africa but also exacerbate the wealth gap between Africans and Western world. However, we are a bit concerned with low values of the predictive power of the regressions as reflected by the low R^2 values and we attribute this to omitted variables bias.

Table 3 and 4, respectively, present the regression estimates of equations (1) and (2) inclusive of additional regressors (i.e. ‘statehist’, ‘Agrichist’, ‘origtime’, ‘Tech1500’, ‘Latitude’, ‘Malaria’, ‘Independence’, ‘Arable’, ‘Oil-exports’) and dummy variables (i.e. ‘British_dum’, ‘France_dum’, ‘Portugal_dum’, ‘landlocked’, ‘Oil&gas_dum’). As can be observed the inclusion of additional regressors and dummy variables produces negative and statistically significant coefficients on the ‘*slave*’ variables across all sample period and also dramatically improves the predictive power of the explanatory variables as the R^2 values in all regressions lie between 0.63 and 0.66. Moreover, as previous observed, the coefficient estimates obtained on slavery and the control variables in equation (1) and equation (2) do not differ in value and significance. However, there are discrepancies in intercept values, which are positive when per capita African GDP is used as the dependent variable and negative when the ‘income gap’ is the dependent variable. Concerning the control variables, we note that agriculture history and the landlocked dummy variables produce negative and statistically significant coefficient estimates whereas the oil and gas as well as British colony dummies produce positive and significant estimates. In general, these findings on these condition variables more-or-less contradict those previously obtained in the works of Acemoglu et al. (2001, 2002), Putterman and Weil (2010), Cinyabuguma and Putterman (2011), Ahlerup and Olsson (2012), Spolaore and Wacziarg (2018) and, as argued by Chanda et al. (2014), this may be due to the high correlation between some of the variables, such as state and agriculture history. Nevertheless, the inclusion of additional control and dummy variables improves on the evidence of slavery negatively influencing the income gap between African and the world.

Table 5 and 6, respectively, present the estimation results of regressions (1) and (2) inclusive of additional regressors and dummy variables and using different subsamples for our ‘income gap’ data. On one hand, we employ ethnic fractionalization index sourced from Fearon (2003), linguistic and religious fractionalization sourced Alesina et al. (2003), mean elevation from Nordhaus (2006); as well as mean precipitation from Harris et al. (2014) as our additional control variables. On the other hand, we use 8 different sub-samples corresponding to the periods 1990-1995, 1995-2000, 2000-2005, 2005-2010, 2010-2015, 2015-2018, 1990-2010, 2000-2018. From the results reported in Table 4 and 5, we firstly observe negative and statistically significant coefficient estimates at a 1 percent critical level on the ‘*slave*’ variables in both estimated regressions across all new subsamples. Moreover, the inclusion of extra explanatory variables has improved the explanatory power of the estimated regressions which lies between 0.83 and 0.86, and we also observe that the linguistic fractionalization variables produces a positive and statically significant estimate in most regressions. This latter result is comparable to that of Easterly and Levine (1997) who similarly find that higher linguistic fractionalization is determinantal to economic growth. The remainder of the control variables ‘more-or-less’ produce the same signs and exert same levels statistical significance with the slight exception of the Portuguese colony dummy variable which is now positive and weakly significant.

Table 2: Baseline regression estimates

Panel A:	Dependent variable: y_i			
	(1) (1990-2018)	(2) (1990-2000)	(3) (2000-2010)	(4) (2010-2018)
Independent variable				
C	2203.93	1254.04	2187.19	3209.90
	(0.00)***	(0.00)***	(0.00)***	(0.00)***
Slave	-158.05	-88.99	-166.56	-234.66
	(0.00)***	(0. 00)***	(0.00)***	(0.00)***
Obs	49	49	49	49
F-statistic	9.21	7.06	8.41	9.54
	[0.00]***	[0.00]***	[0.00]***	[0.00]***
R^2	0.17	0.14	0.15	0.17
Panel B:	Dependent variable: $(y_i – y_w)$			
	(1) (1990-2018)	(2) (1990-2000)	(3) (2000-2010)	(4) (2010-2018)
Independent variable				
C	-29791.70	-19825.70	-30698.01	-39641.60
	(0.00)***	(0.00)***	(0.00)***	(0.00)***
Slave	-161.27	-90.96	-166.56	-234.66
	(0.00)***	(0.00)***	(0.00)***	(0.00)***
Obs	49	49	49	49
F-statistic	10.01	7.69	8.41	9.54
	[0.00]***	[0.00]***	[0.01]**	[0.00]***
R^2	0.18	0.14	0.15	0.17

Notes: "***", "**", "*" denote 10%, 5% and 1% critical levels, respectively. OLS regressions are estimated with white heteroscedasticity-consistent standard errors. P-values for the regression estimates report in () whereas those for the F-statistics are reported in [].

Table 3: Regression estimates with controls and dummy variables: Equation (1)

	Dependent variable: y_i			
	(1) (1990-2018)	(2) (1990-2000)	(3) (2000-2010)	(4) (2010-2018)
Independent variable				
c	1298.17	755.05	1210.66	2038.19
	(0.65)	(0.71)	(0.65)	(0.57)
slave	-529.42	-342.18	-529.23	-735.88
	(0.01)**	(0.02)**	(0.00)***	(0.00)***
Statehist	-3200.18	-236.17	-3510.78	-3713.47
	(0.32)	(0.27)	(0.25)	(0.37)
Agric	-0.79	-0.48	-0.80	-1.09
	(0.18)	(0.24)	(0.12)	(0.13)
Origtime	0.01	0.01	0.01	0.02
	(0.29)	(0.29)	(0.25)	(0.29)
Tech1500	7939.30	4708.89	8167.56	11252.68
	(0.23)	(0.31)	(0.18)	(0.18)
Latitude	-0.93	-0.56	-0.95	-1.31
	(0.26)	(0.34)	(0.22)	(0.22)
Malaria	1360.04	660.76	1386.63	2121.90
	(0. 49)	(0.63)	(0.44)	(0.39)
Independence	2.35	1.73	2.42	2.97
	(0.17)	(0.15)	(0.13)	(0.17)
Oil_exports	-11.27	-9.36	-10.97	-12.99
	(0.64)	(0.58)	(0.60)	(0.65)
British_dum	2744.36	1792.11	2727.88	3723.13
	(0.13)	(0.16)	(0.07)*	(0.07)*
France_dum	1916.87	1516.37	1969.22	2216.66
	(0.20)	(0.16)	(0.11)	(0.19)
Portugal_dum	2651.16	1112.14	2492.09	4400.16
	(0.35)	(0.57)	(0.32)	(0.21)
landlocked	-3747.45	-2472.62	-3762.32	-5133.37
	(0.01)**	(0.01)**	(0.00)***	(0.00)***
Oil&gas_dum	1726.80	1245.15	1794.68	2167.81
	(0.26)	(0.12)	(0.08)*	(0.12)
Obs	49	49	49	49
F-statistic	12.81	12.03	14.88	15.40
	[0.00]***	[0.00]***	[0.00]***	[0.00]***
R^2	0.64	0.63	0.65	0.66

Notes: "***", "**", "*" denote 10%, 5% and 1% critical levels, respectively. OLS regressions are estimated with white heteroscedasticity-consistent standard errors. P-values for the regression estimates report in () whereas those for the F-statistics are reported in [].

Table 4: Regression estimates with controls and dummy variables: Equation (2)

	Dependent variable: $(y_i - y_w)$			
	(1) (1990-2018)	(2) (1990-2000)	(3) (2000-2010)	(4) (2010-2018)
Independent variable				
c	-30664.50	-20347.60	-31674.54	2038.19
	(0.00)***	(0.00)***	(0.00)***	(0.00)***
slave	-529.42	-342.58	-529.23	-735.88
	(0.01)**	(0.01)**	(0.00)***	(0.00)***
Statehist	-3201.74	-2507.33	-3510.78	-3713.47
	(0.29)	(0.25)	(0.25)	(0.37)
Agric	-0.79	-0.50	-0.80	-1.09
	(0.13)	(0.18)	(0.12)	(0.13)
Origtime	0.01	0.01	0.01	0.02
	(0.26)	(0.25)	(0.25)	(0.29)
Tech1500	7934.31	4800.97	8167.56	11252.68
	(0.19)	(0.27)	(0.18)	(0.18)
Latitude	-0.93	-0.56	-0.95	-1.31
	(0.24)	(0.30)	(0.22)	(0.22)
Malaria	1361.09	641.35	1386.63	2121.90
	(0.46)	(0.62)	(0.44)	(0.39)
Independence	2.35	1.73	2.42	2.97
	(0.15)	(0.13)	(0.13)	(0.17)
Oil_exports	-11.24	-9.85	-10.97	-12.99
	(0.60)	(0.51)	(0.60)	(0.65)
British_dum	2741.60	1843.16	2727.88	3723.13
	(0.07)*	(0.08)*	(0.07)*	(0.07)*
France_dum	1914.49	1560.22	1969.22	2216.66
	(0.13)	(0.08)*	(0.11)	(0.19)
Portugal_dum	2647.89	1172.37	2492.09	4400.16
	(0.30)	(0.51)	(0.32)	(0.21)
landlocked	-3747.18	-2477.82	-3762.32	-5133.37
	(0.00)***	(0.01)**	(0.00)***	(0.00)***
Oil&gas_dum	1725.75	1264.46	1794.68	2167.81
	(0.09)*	(0.08)*	(0.08)*	(0.12)
Obs	49	49	49	49
F-statistic	14.51	13.71	14.88	15.40
	[0.00]***	[0.00]***	[0.00]***	[0.00]***
R^2	0.65	0.64	0.65	0.66

Notes: "***", "**", "*" denote 10%, 5% and 1% critical levels, respectively. OLS regressions are estimated with white heteroscedasticity-consistent standard errors. P-values for the regression estimates report in () whereas those for the F-statistics are reported in [].

Table 5: Regression estimates with additional controls and different subsamples: Equation (1)

	Dependent variable: y_i							
	(1) (1990-1995)	(2) (1995-2000)	(3) (2000-2005)	(4) (2005-2010)	(5) (2010-2015)	(6) (2015-2018)	(7) (1990-2010)	(8) (2000-2018)
Independent variable								
C	-16238.54	-18997.37	-23216.70	-33194.01	-35722.78	-34947.67	-22938.85	-31416.96
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
Slave	-430.43	-444.96	-560.08	-820.26	-974.14	-878.21	-564.98	-800.57
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
Statehist	-1185.57	-1007.42	-849.79	-2148.99	-2002.98	-186.97	-1342.48	-1326.74
	(0.67)	(0.68)	(0.75)	(0.66)	(0.74)	(0.97)	(0.68)	(0.77)
Agric	-1.25	-1.14	-1.40	-2.35	-2.64	-1.97	-1.55	-2.08
	(0.07)*	(0.07)*	(0.04)*	(0.04)*	(0.06)*	(0.08)*	(0.05)*	(0.05)*
Origtime	-0.03	-0.03	-0.03	-0.05	-0.06	-0.03	-0.03	-0.04
	(0.27)	(0.27)	(0.28)	(0.24)	(0.26)	(0.40)	(0.26)	(0.28)
Tech	11129.71	10395.84	12785.24	22520.54	25322.67	17843.16	14296.60	19512.36
	(0.12)	(0.11)	(0.07)*	(0.07)*	(0.09)*	(0.14)	(0.09)*	(0.09)*
Latitude	-1.04	-1.00	-1.24	-1.98	-2.35	-1.96	-1.33	-1.89
	(0.21)	(0.19)	(0.14)	(0.16)	(0.17)	(0.16)	(0.17)	(0.16)
Malaria	2658.92	2423.78	2958.67	5446.29	6193.43	4508.82	3413.87	4760.22
	(0.19)	(0.18)	(0.13)	(0.11)	(0.13)	(0.18)	(0.14)	(0.13)
Independence	1.67	1.66	1.87	2.79	3.19	2.76	2.02	2.64
	(0.29)	(0.23)	(0.24)	(0.33)	(0.36)	(0.34)	(0.28)	(0.32)
Oil_exports	-40.43	-34.87	-39.82	-64.48	-69.52	-52.25	-45.01	-56.25
	(0.15)	(0.16)	(0.15)	(0.19)	(0.24)	(0.28)	(0.17)	(0.22)
British_dum	3244.95	3005.08	3574.91	5888.25	6646.19	5148.63	3962.80	5289.14
	(0.05)*	(0.05)*	(0.03)*	(0.04)*	(0.06)*	(0.07)*	(0.04)*	(0.05)*
France_dum	2293.79	1980.35	2196.42	3455.20	3558.97	2676.79	2507.66	2969.38
	(0.04)*	(0.04)*	(0.04)*	(0.06)*	(0.11)	(0.14)	(0.05)*	(0.08)*
Portugal_dum	3574.97	3224.65	4223.99	7608.61	9419.65	7523.21	4693.41	7124.36
	(0.11)	(0.12)	(0.06)*	(0.05)*	(0.06)*	(0.07)*	(0.08)*	(0.06)*
Landlocked	-2888.70	-2835.56	-3334.90	-5300.77	-6213.61	-5428.52	-3614.79	-5024.69
	(0.01)**	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
Oil&gas_dum	2046.55	1718.53	2032.12	3484.64	3820.06	2583.47	2342.74	2970.45
	(0.05)*	(0.07)*	(0.05)*	(0.05)*	(0.08)*	(0.14)	(0.05)*	(0.07)*
Eth_frac	-9369.94	-8114.46	-8775.21	-15735.43	-17906.60	-11838.60	-10655.74	-13578.34
	(0.15)	(0.16)	(0.16)	(0.15)	(0.17)	(0.26)	(0.15)	(0.18)
Lan_frac	8735.97	7773.39	8585.46	15036.89	16627.21	10727.67	1047.06	12717.83
	(0.09)*	(0.10)	(0.09)*	(0.07)*	(0.09)*	(0.17)	(0.08)*	(0.10)
Rel_frac	2400.93	1897.46	1905.23	3648.12	4150.36	2994.02	2485.93	3139.54
	(0.39)	(0.43)	(0.49)	(0.47)	(0.49)	(0.55)	(0.45)	(0.50)
Elevation	-0.68	-0.68	-0.90	-1.13	-1.53	-1.63	-0.85	-1.28
	(0.49)	(0.46)	(0.34)	(0.45)	(0.39)	(0.29)	(0.44)	(0.37)
Precipitation	1.16	0.99	1.29	2.18	2.33	1.45	1.41	1.81
	(0.24)	(0.26)	(0.19)	(0.21)	(0.27)	(0.40)	(0.22)	(0.26)
Obs	49	49	49	49	49	49	49	49
F-statistic	15.24	16.00	19.50	17.04	16.32	16.39	16.64	16.77
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
R^2	0.83	0.84	0.86	0.84	0.84	0.84	0.84	0.84

Notes: "***", "**", "*" denote 10%, 5% and 1% critical levels, respectively. OLS regressions are estimated with white heteroscedasticity-consistent standard errors. P-values for the regression estimates report in () whereas those for the F-statistics are reported in [].

Table 6: Regression estimates with additional controls and different subsamples: Equation (2)

	Dependent variable: $(y_i - y_w)$							
	(1) (1990-1995)	(2) (1995-2000)	(3) (2000-2005)	(4) (2005-2010)	(5) (2010-2015)	(6) (2015-2018)	(7) (1990-2010)	(8) (2000-2018)
Independent variable								
C	3542.86	3746.43	3843.68	5711.83	7720.07	6797.55	4341.41	6059.67
	(045)	(0.39)	(0.37)	(0.42)	(0.37)	(0.35)	(0.42)	(0.37)
Slave	-438.05	-457.67	-560.08	-820.26	-974.14	-878.21	-575.26	-800.57
	(0.01)**	(0.01)**	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.01)**	(0.00)***
Statehist	-1289.74	-1181.27	-849.79	-2148.99	-2002.98	-186.97	-1483.15	-1326.74
	(0.66)	(0.65)	(0.75)	(0.66)	(0.74)	(0.97)	(0.67)	(0.77)
Agric	-1.22	-1.09	-1.40	-2.35	-2.64	-1.97	-1.51	-2.08
	(0.13)	(0.14)	(0.04)*	(0.04)*	(0.06)*	(0.08)*	(0.11)	(0.05)*
Origtime	-0.03	-0.03	-0.03	-0.05	-0.06	-0.03	-0.03	-0.04
	(0.33)	(0.33)	(0.28)	(0.24)	(0.26)	(0.40)	(0.31)	(0.28)
Tech	10953.58	10101.90	12785.24	22520.54	25322.67	17843.16	14058.75	19512.36
	(0.18)	(0.17)	(0.07)*	(0.07)*	(0.09)*	(0.14)	(0.14)	(0.09)*
Latitude	-1.02	-0.97	-1.24	-1.98	-2.35	-1.96	-1.30	-1.89
	(0.28)	(0.27)	(0.14)	(0.16)	(0.17)	(0.16)	(0.24)	(0.16)
Malaria	2680.24	2459.35	2958.67	5446.29	6193.43	4508.82	3442.65	4760.22
	(0.24)	(0.23)	(0.13)	(0.11)	(0.13)	(0.18)	(0.19)	(0.13)
Independence	1.72	1.74	1.87	2.79	3.19	2.76	2.09	2.64
	(0.32)	(0.26)	(0.24)	(0.33)	(0.36)	(0.34)	(0.31)	(0.32)
Oil_exports	-38.92	-32.35	-39.82	-64.48	-69.52	-52.25	-42.98	-56.25
	(0.23)	(0.26)	(0.15)	(0.19)	(0.24)	(0.28)	(0.25)	(0.22)
British_dum	3146.58	2840.92	3574.91	5888.25	6646.19	5148.63	3829.96	5289.14
	(0.14)	(0.14)	(0.03)*	(0.04)*	(0.06)*	(0.07)*	(0.12)	(0.05)*
France_dum	2181.09	1792.25	2196.42	3455.20	3558.97	2676.79	2355.46	2969.38
	(0.18)	(0.21)	(0.04)*	(0.06)*	(0.11)	(0.14)	(0.21)	(0.08)*
Portugal_dum	3467.48	3045.27	4223.99	7608.61	9419.65	7523.21	4548.26	7124.36
	(0.17)	(0.18)	(0.06)*	(0.05)*	(0.06)*	(0.07)*	(0.13)	(0.06)*
Landlocked	-2879.80	-2820.71	-3334.90	-5300.77	-6213.61	-5428.52	-3602.78	-5024.69
	(0.02)**	(0.01)**	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.01)**	(0.00)***
Oil&gas_dum	2006.37	1651.48	2032.12	3484.64	3820.06	2583.47	2288.48	2970.45
	(0.09)*	(0.13)	(0.05)*	(0.05)*	(0.08)*	(0.14)	(0.10)	(0.07)*
Eth_frac	-9179.20	-7796.14	-8775.21	-15735.43	-17906.60	-11838.60	-10398.16	-13578.34
	(0.21)	(0.24)	(0.16)	(0.15)	(0.17)	(0.26)	(0.22)	(0.18)
Lan_frac	8664.69	7654.59	8585.46	15036.89	16627.21	10727.67	10050.93	12717.83
	(0.14)	(0.15)	(0.09)*	(0.07)*	(0.09)*	(0.17)	(0.13)	(0.10)
Rel_frac	2246.15	1639.14	1905.23	3648.12	4150.36	2994.02	2276.89	3139.54
	(0.49)	(0.57)	(0.49)	(0.47)	(0.49)	(0.55)	(0.55)	(0.50)
Elevation	-0.73	-0.76	-0.90	-1.13	-1.53	-1.63	-0.91	-1.28
	(0.52)	(0.47)	(0.34)	(0.45)	(0.39)	(0.29)	(0.47)	(0.37)
Precipitation	1.18	1.03	1.29	2.18	2.33	1.45	1.44	1.81
	(0.28)	(0.29)	(0.19)	(0.21)	(0.27)	(0.40)	(0.26)	(0.26)
Obs	49	49	49	49	49	49	49	49
F-statistic	12.45	13.32	19.50	17.04	16.32	16.39	13.71	16.77
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
R^2	0.83	0.84	0.86	0.84	0.84	0.84	0.84	0.84

Notes: "***", "**", "*" denote 10%, 5% and 1% critical levels, respectively. OLS regressions are estimated with white heteroscedasticity-consistent standard errors. P-values for the regression estimates report in () whereas those for the F-statistics are reported in [].

4. CONCLUSION

Recently, growth economists have gone beyond traditional neoclassical and endogenous growth mechanism/dynamics and have sought to examine the 'deeper' roots of economic growth and development. Our study borrows from the 'deep roots' literature and examines whether slave exports are a 'deep development root' of the income gap between 49 African countries and 'Europe and their offshoots'. Our empirical findings indicate that slave exports have exerted a negative and significant effect on income gap differences between Africa and the world between 2000 and 2018. These findings are robust to inclusion of additional control variables; colonial dummy effects; exclusion of outliers; as well as to the sub-sampling of our data into pre-crisis and post-crisis periods. However, our study does not examine the possible channels though which slave exports could have caused differences in income between Africans and 'Europe and their offshoots'. Moreover, we do not address the issue of reverse causality between the variables. These are issues which we reserve as possible avenues future studies.

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