How Does Colonial Origin Matter for Economic Performance in sub-Saharan Africa?[1]

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Working Paper Number 176

[1] We would like to thank participants at the following conferences – March 2010 Conference of the Centre for the Study of African Economics (Oxford), December 2009 UNU-WIDER Project Conference on African Economic Development: Myths & Realities (Accra, Ghana); September 2009 Economic Society of South Africa Conference (Port Elizabeth); and August 2009 Macro Workshop Seminar Series of the School of Economics (University of Cape Town), and an anonymous referee for helpful comments. The standard disclaimer applies. Financial support for this research received from the A.W. Mellon Foundation Fellowship and the African Economic Research Consortium is gratefully acknowledged. The views expressed in this paper are those of the authors and do not necessarily reflect the views of the sponsoring organisations.
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How Does Colonial Origin Matter for Economic Performance in sub-Saharan Africa?*

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April 29, 2010

Abstract

This paper investigates the channels through which colonial origin affects economic outcomes in sub-Saharan Africa (SSA). It focuses on four key channels of transmission namely, human capital, trade openness, market distortion and selection bias. In contrast with previous studies where only initial conditions at independence were held to influence the subsequent growth path, the methodology that we apply in this paper combines (1) the pre-colonisation initial conditions, (2) the initial conditions at independence and (3) the subsequent post-colonial changes in explaining income differences amongst former SSA colonies. Our sample comprises of 38 SSA countries studied over the period 1960-2000, and we use pooled OLS and Hausman-Taylor estimation techniques in a panel framework. The results suggest that former British colonies have had marginally higher income levels than former French colonies, and this is attributable to the legacy of British colonisation in trade openness and human capital. We do not find robust evidence in support of the market distortion and selection bias channels. Besides highlighting the importance of the trade openness channel, the study is also the first, to the best of our knowledge, to simultaneously examine a range of feasible transmission channels between colonial origin and economic growth performance.

Keywords: Colonial Origin, Human Capital, Institutions, Hausman-Taylor, sub-Saharan Africa.

JEL Codes: F54, O47, I20, N17.

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1 Introduction

Over the past decades, a substantial volume of literature has dwelled on the subject of colonisation and economic performance of former colonies. Economists became interested in colonial legacies in their search for the reasons why some countries have grown relatively slower than others. Notably, recent cross-country empirical evidence suggests that the identity of the colonising power (or colonial origin) might help explain the observed growth differential amongst former colonies around the world.[1] In particular, it is claimed that, on average, former British colonies have grown faster than former French colonies, although much controversy still surrounds the likely mechanisms of transmission of any such colonial legacy.

For instance, some economists have attempted to establish a causal relationship between one aspect of colonial legacy - the coloniser's legal tradition (or legal origin) and a broad range of variables that are important for economic growth.[2] A key feature in many of these empirical studies is that, when regional dummies for sub-Saharan Africa and Latin America are introduced in the regressions[3] or when other aspects of colonial policy such as human and physical capital indicators at the end of colonial rule are controlled for,[4] the coefficient of the legal origin dummy generally tends to diminish in magnitude and significance. Interestingly also, when one considers only the sub-Saharan African (henceforth, SSA) dataset, the internationally observed growth differential between Common Law and Civil Law countries disappears.

Furthermore, most of these empirical studies have fallen short of establishing a direct impact of legal origin on economic growth. In their recent findings, Acemoglu & Johnson (2005) and Klerman *et al* (2008) have concluded that legal origin cannot explain economic growth performance. Roe & Siegel (2009), also present a range of conceptual and factual evidence in support of why the legal origins explanations are flawed.

[1] See for instance, the works by Klerman *et al* (2008), Rostowski & Stacescu (2006), Bertocchi & Canova (2002), and Grier (1999).

[2] These cross-country studies show that countries that followed the English Common Law legal tradition (henceforth referred to as Common Law countries) by colonisation or conquest, have on average grown faster than countries that followed the Civil Law tradition (henceforth, Civil Law countries), specifically, the French Civil Law countries. The protagonists of this debate are Raphael La Porta, Florencio Lopez-de-Silanes, Andrei Shleifer and Robert Vishny - henceforth LLSV (1997, 1998, 1999) & LLS (2008). See also Levine *et al* (2000, 2002).

[3] Mahoney (2001:517) reports a drop in the coefficient of the Common Law dummy from 0.714 (significant at the 1% level) to 0.561(significant at the 5% level) when dummies for sub-Saharan Africa and Latin America are introduced in the regressions. It is equally important to note that, the dummies for these two regions are each highly statistically and economically significant.

[4] See Grier (1999), Bertocchi & Canova (2002) and Klerman *et al* (2008).

Even supposing that the evidence on legal origins is robust, as Klerman *et al* (2008) have argued, it will still be difficult to attribute the differences in economic performance between Common Law and Civil Law countries *uniquely* to legal origin (or law) because other aspects of colonial policy such as education, trade, exchange regimes, fiscal and monetary policies or the style of local governance might also matter. Against this backdrop, the present study seeks to investigate the channels through which colonial origin affects income, using SSA as a case study. But first the historical foundations of the study is in order.

2 Historical Foundations

This section provides the historical basis for our choice of the different transmission mechanisms between colonial origin and economic growth performance.

Historical sources claim that as of the late nineteenth century, Britain was the only imperial power that was committed to free trade, whilst the other European powers, notably France, were still building up their rival industries through protectionism.[5] Correspondingly, whilst British colonial economies were not under the obligation to export only to England, French colonial economies were compelled to trade mainly with France.[6] As such, it can be argued that one of the important legacies of British colonisation on its former colonies has been a long exposure to world competition through trade openness,[7] which might possibly explain why former British SSA colonies adjusted more rapidly to structural adjustment programmes implemented in the late 1980's in comparison with their French counterparts.[8]

Another channel through which the legacy of colonisation might have been perpetuated, which does not yet seem to find expression in the literature, is the distortionary impact of different colonial taxation systems on private investment incentives. Historical

[5] Grier (1999:320) reports that since 1830, Britain has had a free trade policy and as from 1846, British colonies were no longer forced to give British goods preferential treatment. Hence these colonies have had a long history of free trade, while the French enforced mercantilist and protectionist measures throughout the colonial period. For additional evidence see also, Maddison (1971:35), Bolton (1973:24) and Duignan & Gann (1975).

[6] See Fieldhouse (1966:306)

[7] During the inter-war period, Nigeria alone exported five times as much as all the French colonies in West Africa, Rostowski & Stacescu (2006:12).

[8] The evidence also points to the fact that former British SSA colonies grew much faster than French SSA colonies after structural adjustment.

sources[9] claim that the dual system of administration of their colonies, characterised by punitive taxation and forced labour on the general population, was a distinctive feature of French colonial rule in sub-Saharan Africa.[10] The implications of this unique approach to local administration is to be found in the colonial legacy of taxation pursued in the post-colonial era.

By contrast, Maddison (1971) has argued that one of the important legacies of British colonisation is that its former colonies inherited relatively lower levels of taxation, because indirect rule is cheaper to administer compared to direct rule. Austin (2008:1011) also argues that until very late in the colonial period, there was no direct taxation in southern Ghana and Nigeria - two of the most successful British colonies in tropical Africa. If this is true, then it could imply that former British colonies are associated with relatively lower degrees of distortions of economic activity through taxation, which could in turn imply greater private investment incentives or more free trade on the domestic scale.

Furthermore, it is well documented that educational policy was potentially the area of greatest distinction between different imperial colonial administrations. It is generally claimed that England pursued more enlightened educational policies in its colonies than did France, whose educational objective aimed essentially at training personnel for the colonial bureaucracy. For instance, Gann & Duignan (1970:354), argue that:

> "mission teachers in British Africa not only taught their pupils how to read and write, but also taught them how to try their hands at many different jobs because the teachers themselves, besides giving lessons, were also engaged in such diverse activities as constructing their own buildings, cultivating their own crops, experimenting in agriculture and building roads".

In addition, it is widely held that primary instruction in former British colonies was administered through village schools using native teachers and the local vernacular languages of the people, whilst in former French colonies, pupils were generally boarded from their homes to far away schools where they were taught in the French language, using French textbooks, and by French teachers. This is suggestive of a different approach to educational provision with different repercussions on post-independence human capital accumulation and development.

[9] See for instance, Crowder (1968:185) and Asiwaju (2000).

[10] Crowder (1968:186) argues that the "code d'indigénat", which was instituted in French sub-Saharan Africa aimed at achieving the employment of native labour through the imposition of relatively high taxes on blacks and in default of payment they would incur a sentence of forced labour.

Yet another important factor that shaped colonial institutions and hence the colonial heritage, that has often been overlooked in the colonisation and growth literature, is geography[11] or the influence of the disease environment. As Acemoglu *et al* (2001) have shown, the major colonial powers did not choose empires randomly. Klerman *et al* (2008) argue that England, being the dominant colonial power in the late nineteenth century tended to colonise places of strategic advantage[12] such as coastal locations or colonies with natural resource endowments. This first-mover advantage or "selection bias" might possibly suggest that British colonies were endowed with better initial conditions, consistent with the Acemoglu & Johnson (2005) hypothesis.[13]

As evidence, Klerman *et al* (2008) show that colonial origin does not matter after geographical factors are controlled for, which lends support to the selection bias hypothesis that differences in pre-colonisation initial conditions rather than in colonial policy (legal, educational, or other) are the best explanation for different growth rates amongst former colonies. However, Klerman *et al* (2008) results on geography are inconclusive as they themselves admit.[14]

Finally, an important colonial legacy that also merits attention in the empirical literature is the impact of the Franc CFA[15] currency board which links France to most of its former SSA colonies. The Franc CFA currency board, it is argued, has been instrumental in lowering inflation and the black market exchange premium while enhancing the contribution of imports to GDP growth. However, as the evidence also suggests, the impact of the currency board on market distortion could go the other way.[16] Considering the fact that almost all former British SSA colonies have floating exchange regimes, these different exchange regime structures might well serve as a plausible channel for explaining the different growth outcomes in the two former empires.

From the preceding discussion, it is clear that the legal origins theory, no matter how

[11] Sachs (2003) and Engerman & Sokoloff (2002) have shown that geography matters for economic growth and that its effect could either be direct or indirectly through institutions.

[12] Britain in Egypt is often quoted as a good example as it provided a naval vantage point in the Mediterranean, as well as a gateway to India through the Suez Canal, Thorn (2000:11).

[13] According to this hypothesis, the depth of colonial engagement in moulding growth-conducive institutions is a function of the first-mover advantage.

[14] For instance, Klerman *et al* (2008:19) admit that their results controlling for geographical factors are highly dependent on their definition of the regional dummies for Latin America and sub-Saharan Africa and on which set of countries is analysed.

[15] The Franc CFA stands for Franc de la Communauté Financiere en Afrique meaning Financial Community of Africa Franc.

[16] For instance, one of the main arguments for devaluing the Franc CFA by 50% in January 1994, was because of its excessively distortionary effects on the economies of those countries. See Collier & Gunning (1999).

elaborate and expansive its proponents make it to be,[17] is unlikely to be the *sole* or even the main source of influence of colonial legacy on the post-independence economic performances of former colonies. Klerman *et al* (2008:4) also agree that there is no rationale for broadening the conception of legal origin to include all aspects of colonial policy since this is equivalent to substituting this broad conception of legal origin with the identity of the colonial power.

Because colonial origin encompasses all aspects of colonial legacy including legal origin, studies seeking a holistic understanding of the influence of colonisation on former colonies' post-independence economic performances should instead be analysing the impact of colonial origin on growth alongside its different transmission channels, rather than just the impact of one channel (i.e. legal origin).

The tasks of this paper therefore, is to investigate further the channels through which colonial origin affects economic outcomes, using only the SSA dataset. The interest in a SSA case study is based on two main reasons.

The first and most important reason why a separate study of SSA might prove insightful to the current debate is that SSA offers a more balanced framework of analysis than the world pool of colonies owing to the fact that nearly all French colonies studied in the world sample are from SSA, while British colonies in the sample are spread more evenly across the globe.[18] The preceding point is dramatised by the fact that nearly all SSA countries experienced poor growth performances during most of the period of these cross-country studies. To eliminate this possible selection bias against former French colonies, it is appropriate not only to compare them with other countries in the same region, but also with countries that faced similar growth challenges such as structural adjustment programmes, during the same period of time.

Secondly, as mentioned earlier, one of the currently contentious issues in colonial origins debate is the influence of geography or "selection bias". Because European powers did not choose empires randomly, the possibility of "selection bias" explaining the observed growth differential amongst former colonies is plausible. However, previous studies have either not given a thorough examination of this transmission mechanism or the existing

[17] Following the persistent lack of significance of legal origins in growth regressions, La Porta *et al* (2008:286) in their latest article, have adopted a somewhat broader and seemingly ambiguous conception of the notion of legal origin *"as a style of social control of economic life"* implying legal origin should stand for "strategies of social control that can either support private market outcomes or implement specific state policies".

[18] For instance, in Grier's (1999) study, the only non-African former French colonies included are Reunion and Haiti.

evidence is inconclusive.

Therefore, by focusing on a sample of countries with similar geographical conditions,[19] a SSA case study isolates "pure" geographical conditions from other forms of selection, thereby allowing for a thorough exploration of the different transmission mechanisms between colonial origins and economic outcomes.

In summary, this paper will investigate the following likely channels of transmission between colonial origin and economic growth outcomes:

■ *The human capital channel*: which will be proxied by two variables, namely, secondary enrolment rates during 1960-2000 (SEC), and the average schooling years in the population aged 15 and above during 1960-2000 (AYS).

■ *The trade openness channel:* which will be proxied by two variables namely, openness to international trade during 1960-2000 (OPEN) and export share in GDP during 1960-2000 (EXP).

■ *The market distortion channel:* which will be captured by the black market exchange rate premium during 1960-2000 (BMP).

■ *The selection bias channel:* which will be captured by the interaction of two variables namely, natural resource endowments dummy[20] and ethno-linguistic fractionalisation index (ETHNIC). The dummy for natural resource endowments (DNRES) captures the presence of natural resources in the country and takes the value 1, if the country has a rich endowment of either oil, gold, diamonds or cocoa and zero otherwise. Some historical sources claim that colonial policies in black Africa tended to succeed most in societies that are both ethnically divided and resource rich.[21] Hence the intuition to interact natural resources with ethnic diversity in capturing this specific type of selection bias.[22] The product of the interaction of these two variables is denoted by ETHNRES.

It is also important to note that in 1960, former British SSA colonies had, on average,

[19] The summary descriptive statistics in Figure 1 in the Appendix show that 20% of former French SSA colonies are endowed with natural resources as opposed to 25% in former British colonies. Also, 30% of former French colonies are landlocked, as opposed to about 44% landlock rate in British colonies.

[20] Rhoda (1973:19), Bolton (1973:24) and Douglas (1978:265) have argued that an important motive for acquiring colonies was the search for raw materials for use in production in the imperial economy.

[21] According to Asiwaju (2000), the colonial policy of "divide and rule" was most effective in ethnically divided societies because, by pitting one ethnic group against another, the colonisers were able to extract a greater share of the colony's resources.

[22] Furthermore, the association between natural resources and ethnic diversity, as institutional determinants of growth, is not new in the empirical growth literature. For instance, Mauro (1995) shows that natural resources-rich countries which are also ethnically divided tend to grow much slower. Collier *et al* (2006) identify the presence of natural resources as one of the main drivers of societal conflict which can be negatively associated with growth. Svensson (2000) provides evidence to show that countries that are both commodity (like cocoa or oil) producers and ethnically divided are likely to be more corrupt.

lower per capita GDP than former French colonies, which suggests that convergence might also be part of the story. However, in the context of this study, we do not directly investigate the convergence channel, although we control for convergence effects by including the natural logarithm of real per capita GDP in 1960 in our regressions.[23]

Table 1 above presents results from partial correlations of the different causal mechanisms on colonial origins. Panel A shows the association or correlation between the different causal mechanisms and colonial origin, controlling for initial income levels in 1960. Panel B performs the same exercise but further controls for initial colonial conditions, in other words, the level of each transmission channel at the end of colonial rule.[24] The intended goal is to differentiate the effects due to the legacy of colonisation from those resulting from the actions of the independent nations themselves.

The results in Panel A show that, in comparison with former French colonies, former British colonies are strongly associated with high human capital endowment as proxied by the two human capital measures listed above. Panel B also suggests that this high human capital endowment is largely the result of the legacy of colonisation and not so much the result of post-independence policies. In fact, the positive sign on SEC60 in Panel B suggests a strong persistence of the colonial legacy of human capital in the post-independence era.

The results in Table 1 also suggest that former British colonies are associated with greater trade openness than former French colonies and this performance is linked to the colonial legacy of trade openness. Panel B also suggests a strong persistence of the colonial legacy of trade openness in the post independence era.

Table 1 further suggests that former British colonies are associated with greater market distortion than former French colonies, as proxied by the black market exchange premium. Furthermore, this market distortion reputation, as Panel B suggests, is partly as a result of the legacy of colonisation.

Finally, Panel A suggests that, in comparison with the French, the British Crown generally tended to choose colonies that are both resource rich and ethnically divided. This also suggests that former British colonies are more prone to the "natural resource curse" than former French colonies.

[23] Quah (1993) argues that the sign on initial per capita income can either be positive or negative depending on the sample.

[24] The initial colonial condition variables are measured in the year of independence of the country or in 1960 for countries where pre-1960 data is not available (e.g. Sudan, Ghana and Guinea). For notational purposes, these variables are associated with the symbol "60", in order to distinguish them from their post independence counterparts.

Table 1: Partial Correlations of Different Transmission Mechanisms on Colonial Origins

PANEL A

	SEC	AYS	OPEN	EXP	BMP	ETHNRES	LANDLOCK
BCORG	11.38***	1.57***	26.23***	8.64***	69.90***	9.33***	0.06**
	(1.52)	(0.13)	(2.89)	(1.07)	(13.24)	(1.99)	(0.03)
OCORG	-3.75***	-0.17	0.46	-2.48*	156.76***	28.06	-0.03
	(1.30)	(0.12)	(4.03)	(1.39)	(55.86)	(3.27)	(0.03)
LOGPCGDP60	8.00***	0.55***	3.45	12.12***	27.02**	18.81***	-0.21***
	(1.43)	(0.11)	(2.69)	(0.99)	(13.66)	(1.52)	(0.02)
CONSTANT	-41.58***	-2.55***	41.30**	-60.09***	-176.36*	-119.1***	1.88***
	(1.43)	(0.86)	(2.69)	(0.99)	(13.66)	(1.52)	(0.02)
No. OBS	781	612	1382	1199	1071	1271	1394
R-SQUARED	0.18	0.38	0.07	0.20	0.03	0.14	0.08

PANEL B

	SEC	AYS	OPEN	EXP	BMP	ETHNRES	LANDLOCK
BCORG	1.56	0.82***	12.77***	-4.87***	61.57***		
	(1.99)	(0.12)	(2.33)	(1.25)	(15.99)		
OCORG	-7.38***	0.004	1.14	-9.19***	13.42		
	(1.35)	(0.11)	(3.58)	(1.31)	(21.73)		
SEC60	1.20***						
	(0.13)						
AYS60		0.61***					
		(0.04)					
OPEN60			0.40***				
			(0.03)				
EXP60				0.67***			
				(0.03)			
BMP60					0.48**		
					(0.22)		
LOGPCGDP60	-1.36	0.39***	9.88***	-0.96	-20.33*		
	(1.75)	(0.07)	(1.98)	(1.20)	(11.60)		
CONSTANT	22.95*	-2.04***	-27.15*	21.58**	150.22*		
	(12.86)	(0.48)	(14.42)	(8.36)	(82.04)		
No. OBS.	776	558	1382	1149	994		
R-SQUARED	0.33	0.64	0.33	0.40	0.08		

Robust standard errors are presented in parentheses. 1% level of significance is denoted by ***, 5% by ** and 10% by *

(1) These results are robust to the exclusion of Botswana. French Colonial Origin (FCORG) is the omitted category.

N.B. ETHNRES and LANDLOCK remain unchanged in Panel B.

The paper is organised as follows. Section 2 is the methodology section. Section 3 presents our most important results and checks for their robustness. Section 4 compares our results to those in the literature, notably by Klerman *et al* (2008), Rostowski & Stacescu (2006), Bertocchi & Canova (2002) and Grier (1999). Section 5 concludes.

3 Methodology

This section describes the empirical model, the estimators, the estimation strategy and also presents the variables and datasets used in the study.

3.1 Empirical Model

The question we seek to answer is whether colonial origin really matters for income in SSA during 1960-2000. If yes, what are its channels of transmission?

To answer this question, we specify the regression model as follows:

$$GROW_{it} = \alpha + \beta_i COLO_i + \gamma_i TRANSM_{it} + \delta_i X_{it} + \mu_i + \varepsilon_{it} \quad (1)$$

where $GROW_{it}$ is income (natural logarithm of per capita GDP Purchasing Power Parity). $COLO_i$ is a matrix of colonial origin dummies comprising $BCORG$ (which takes the value 1 for British colonial origin and zero otherwise), $FCORG$ (which takes the value 1 for French colonial origin and zero otherwise) and $OCORG$ (which takes the value 1 for non-British and non-French colonial origins and zero otherwise).[25] $TRANSM_{it}$ is a matrix of control variables that serve as likely transmission channels between colonial origin and growth, while X_{it} is a matrix of other control variables that are standard in the growth literature, notably - initial real per capital incomes, population growth, investment, inflation and ethnolinguistic fractionalisation. μ_i is a vector of individual-country effects reflecting unobservable country heterogeneity and ε_{it} is a vector of error terms. The advantage of using panel data is that it allows for individual country heterogeneity, in addition to the fact that it also allows for less collinearity among the variables, more degrees of freedom and more efficiency, Baltagi (2005:5).

[25] Of course, only two of the colonial origin dummies enter the regression at a time, while the third dummy serves as base.

3.2 Choice of Estimator

We perform the analysis on the empirical model specified in equation 1 above, using a core dataset of thirty-eight (38) SSA countries during 1960-2000. A key consideration in choosing a suitable estimator for the model is how well the estimator handles the problem of endogeneity resulting from the fact that some of the explanatory variables might be correlated with the un-observed country effects. As Baltagi (2005:125) argues, the fixed effects (within) estimator assumes that all the explanatory variables are related to the individual effects and the within-estimator is a best linear unbiased estimator (BLUE) once the individual effects are modelled as a linear function of all the explanatory variables. Using the within-transformation (henceforth, FE) in estimating equation 1 above, results in the elimination of the μ_i term, and hence the bias. However, the FE also eliminates the time-invariant regressors, and is therefore incapable of giving estimates of β_i.[26]

The random-effects (RE) model, on the other hand, assumes no correlation between the explanatory variables and the individual effects, implying that, in the presence of endogeneity RE will yield biased estimates. Hence, inferences from the RE model are likely to be misleading. This is equally true for the OLS estimator, which also assumes exogeneity of all regressors and the random individual effects.

Against these two contrasting worlds of all or nothing correlation between the individual effects and the regressors, Hausman and Taylor (1981) in Baltagi *et al* (2003) proposed a model where *some* of the regressors but not all, are correlated with the individual effects. The Hausman-Taylor (HT) model thus bridges the two extreme worlds of all (FE world) or nothing (RE world) choice of correlation between the individual effects and the regressors. As Baltagi *et al* (2003:362) have argued, the HT model is preferable whenever the model requires *some* of the regressors, but not all, to be correlated with the individual effects.

The HT model can be written as:

$$y_{it} = X_{it}\beta + Z_i\eta + \alpha_i + \mu_{it} \tag{2}$$

where $i = 1, 2, ..., N$ and $t = 1, 2, ..., T$. α_i is $IID(0, \sigma_\alpha^2)$ and μ_{it} is $IID(0, \sigma_\mu^2)$.
Both α_i and μ_{it} are independent of each other and among themselves. The Z_i are individual time-invariant variables.

[26] Baltagi (2005:13) argues that the within estimator is incapable of estimating the effect of any time-invariant variable like colonial origins, sex, race, religion, schooling or union participation because these time-invariant variables are wiped out by the deviations from mean transformations.

Hausman and Taylor split $X = [X_1, X_2]$, and $Z = [Z_1, Z_2]$ into two sets of variables such that X_1 is $n \times k_1$, X_2 is $n \times k_2$, Z_1 is $n \times g_1$, Z_2 is $n \times g_2$ and $n = NT$.

X_1 and Z_1 are assumed exogenous and not correlated with α_i and μ_{it}, while X_2 and Z_2 are endogenous due to their correlation with α_i but not with μ_{it}.

Under equation 2 above, OLS will yield biased and inconsistent estimates, while the FE (or within-transformation) estimator gives consistent estimates. The FE *sleeps* the α_i and removes the bias, but, in the process, it also eliminates the time-invariant variables, Z_i. Hence it cannot yield estimates of η. The RE estimator, which is Generalised Least Square (GLS) estimation on equation 2, ignores the endogeneity due to the presence of the α_i term and will therefore yield biased though consistent estimates.

To get around the shortcomings of the within-estimator in estimating the time-invariant regressors, Hausman and Taylor suggest an instrumental variable estimator which premultiplies equation 2 by $\Omega^{\frac{-1}{2}}$ where Ω is the variance-covariance term of the error component $\alpha_i + \mu_{it}$, and then performs two-stage least squares (2SLS) using as instruments $[Q, X_1, Z_1]$. Q is the within-transformation matrix with $\widetilde{y} = Qy$ having a typical element $\widetilde{y_{it}} = y_{it} - \overline{y_i}$ where $\overline{y_i}$ is the individual mean. As Baltagi *et al* (2003) show, this turns out to be equivalent to running 2SLS with $\left[\widetilde{X}, \overline{X_1}, Z_1\right]$ as the set of instruments.[27]

It is important to emphasize that the order of identification ($k_1 \geqslant g_2$) must hold for equation 2 to be non-singular. In other words, the number of time-varying exogenous regressors X_1, must be at least as large as the number of individual time-invariant endogenous regressors Z_2. Specifically, the model is said to be just-identified, when $k_1 = g_2$ and in this case, the HT estimates of η are equivalent to estimates obtained from 2SLS estimation. The model is said to be over-identified, when $k_1 > g_2$ and in this case, the HT estimates of η are more efficient than estimates obtained from the FE estimator. Finally, the model is under-identified when $k_1 < g_2$ and in this case, the HT model cannot provide estimates of η.

3.3 Estimation Strategy

The empirical strategy consists of two stages. Stage one is based on simple OLS estimation while stage two employs the HT estimator.

[27] Baltagi *et al* (2003) also argue that the HT estimator is based on an instrumental variable estimator which uses both the between and within variation of the strictly exogenous variables as instruments. More specifically, the individual means of the strictly exogenous regressors are used as instruments for the time-invariant regressors that are correlated with the individual effects, as in Baltagi (2005).

3.3.1 Stage One

In the first stage, we test the hypothesis that colonial origin matters for income in SSA, using simple ordinary least squares (OLS) regression with robust standard errors. We estimate twenty different model specifications of the OLS model with per capita GDP purchasing power parity levels (constant 1995 international $) as the dependent variable in all specifications. Model 1 includes only colonial origin dummies as the explanatory variables. Models 2 to 6 investigate the influence of the market distortion transmission channel using black market exchange rate premium as proxy. In particular, model 2 controls only for the level of market distortion at the end of colonial rule (or initial colonial conditions). Model 3 includes, in addition to all the variables in model 2, the interaction terms of colonial origin with initial levels of black market exchange premium. The reason for introducing the interaction terms is to find out whether differences in growth as a result of market distortion can be attributed to differences in colonial origins.

More generally, the interaction terms for each transmission channel are obtained by multiplying each colonial origin dummy by the variable that proxies for the channel of interest. Its purpose is to tell us whether the impact of that channel on economic performance in a specific colonial origin context is more important than in another colonial origin context.[28]

Model 4 controls only for variations in the black market premium during 1960-2000. The objective is to capture possible changes in the colonial legacy of market distortion, brought about by changes in post-independence policies. Model 5 includes, in addition to all the variables in model 4, the interaction terms of colonial origin with black market exchange rate premium during 1960-2000. Model 6 includes all the variables used in models 1 to 5. The purpose for this is to distinguish whether what really mattered was the persistence of initial conditions left by the colonisers, or whether the evolution of the society after independence had any impact on post independence economic performance. In other words, "removing" the impact of the history of the coloniser so as to see whether the changes that the newly independent nations "added on" could separately explain the economic performance path of different countries.

Models 7 to 11 investigate the influence of the trade openness transmission channel using openness to international trade as proxy. The approach followed is similar to that

[28]The growth model with interaction terms can be expressed as: $Y = a + bX_1 + cX_2 + dX_1X_2 + \mu_i$, where X_1 and X_2 represent the matrix of transmission channels and the vector of colonial origin dummies respectively. $\frac{\partial Y}{\partial X_1} = b + dX_2$ tells us whether the impact of a channel, X_1, is different in British colonies as opposed to French colonies.

in models 2 to 6 above.

Models 12 to 16 follow a similar approach to models 2 to 6, in investigating the influence of the human capital transmission channel, while models 17 and 18 investigate the influence of the selection bias channel. Model 19 includes, besides the colonial origin dummies, the levels of all four transmission channels at independence, and their evolution during 1960-2000. In addition, model 19 also includes the interaction terms of colonial origin dummies with the respective time elements of the different transmission channels. Model 20 includes, in addition to all the variables in model 19, a set of five control variables that are standard in empirical growth models, namely, initial real per capita income, population growth, investment, inflation growth and ethnolinguistic fractionalisation. Model 20 also includes a variable called DUREE, which captures the duration of colonial rule.

Considering the fact that the results obtained under OLS estimation are biased and inconsistent, inferences made on them are likely to be misleading. Thus, the second stage of the estimation strategy will consist of submitting the above strategy to an alternative and more appropriate estimator namely, the HT estimator.

3.3.2 Stage Two

Stage two estimation comprises four model specifications of the HT model with the natural logarithm of per capita GDP PPP (levels) as the dependent variable in all specifications, as before. Model 1 includes only the four transmission channels, besides the colonial origin dummies. Model 2 includes all the interaction terms of the four channels explored in model 1, in addition to the channels themselves. Model 3 includes the levels of each transmission channel at independence, in addition to all the variables in model 2. Model 4 controls for the standard determinants of growth (the same five controls used in stage one above) and includes all the variables in model 3. Model 4 also controls for the duration of colonial rule (DUREE).

3.4 Variables and Data

We classify SSA countries into three broad colonial origin families, namely - British colonial origin (BCORG) for colonies that acquired their independence from Britain, French colonial origin (FCORG) for countries that acquired independence from France and other colonial origin (OCORG) for countries that acquired independence from European powers other than Britain and France. By basing colonial origin on the identity of the coloniser through which independence was acquired, we are assuming in line with the tradition in

the literature, that it is the colonial power that granted independence that significantly shaped the country's post-colonial future.[29]

The decision to bundle all the non-British and non-French SSA colonial origins (mainly Portuguese, Belgian, Italian and Spanish) into one common group (Other Colonial Origins) is for purely practical reasons as the number of countries in these categories are relatively small. Countries that witnessed a relatively short period of colonisation (e.g. Ethiopia) or which were never colonised (e.g. Liberia) are excluded from the sample. Furthermore, countries that had multiple colonisation experiences with the experience of the previous colonisers impacting for a significant period of the country's colonial history (e.g. South Africa) are also excluded. We also exclude Cape Verde and the Comoros Islands for lack of consistent data. See Appendix A for a classification of the countries in the dataset.

The dependent variable in all regressions is the natural logarithm of per capita GDP PPP (constant 1995 international $) obtained from The Africa Research Program datasets. We use annual data for all variables covering the period 1960-2000.[30] Annualised data in a panel framework such as this, is suitable for differentiating the effects of initial colonial conditions[31] from those brought about by changes in post-independence policies.

Besides the colonial origin dummies, our other choice explanatory variables are a set of variables that capture the four different transmission mechanisms between colonial origin and growth. These are:

■ The gross secondary enrolment rates during 1960-2000 (SEC) to capture the human capital transmission channel. The conventional growth literature suggests that human capital enhancement is good for growth either because it raises the overall productivity of the economy or because it favours the development of pro-growth institu-

[29] This might be a significant limitation, especially for those countries that had more than one European colonial experience. This is especially true for Cameroon and all the former German colonies (Togo, Tanzania and Namibia). One way to get around this limitation is to add another set of dummy variables capturing "prior colonisers". However, this option leaves us with another problem - that of a small sample - as a result of the reduced degrees of freedom. Furthermore, this detail adds less to the analysis. Admittedly, including the "prior colonisers" would add substantially to the results only where the first coloniser stayed for a significant period. This is perhaps true only for South Africa, which had a long Dutch tenure followed by extended British rule, but we have excluded this case from our sample.

[30] We use the levels of the dependent variable instead of rates, as is the tradition in the literature, because most of our explanatory variables are in levels.

[31] Although the impact of initial colonial conditions is a cross-country issue that is better captured in cross-sectional studies, by including the initial conditions alongside the annualised data in a panel framework, we effectively isolate the impact of initial colonial conditions from subsequent post-independence changes.

tions.[32] However, this evidence is inconclusive as other empirical studies, notably by Pritchett (2001) suggest that growth in human capital can be detrimental for per capita GDP growth. The interaction terms of colonial origin with secondary enrolment rates during 1960-2000, are SECBRI, SECFRE, and SECOTH, for British, French and Other colonial origins respectively. Similarly, the interaction terms of colonial origin with initial secondary enrolment rates in the year of independence of the country (SEC60), are SEC60BRI, SEC60FRE, and SEC60OTH, for British, French and Other colonial origins respectively.

■ The average share of exports and imports in GDP during 1960-2000 (OPEN) to capture the trade openness transmission mechanism. The literature suggests that SSA countries that were more open to trade have indeed grown faster than those that were not.[33] Rodrik (2002) however holds a dissenting view. Thus, there is no unanimity as to the expected sign of the openness variable in the growth regressions. The interaction terms of colonial origin with openness during 1960-2000 are OPENBRI, OPENFRE and OPENOTH, for British, French and Other colonial origins respectively. Similarly, the interaction terms of colonial origin with initial openness measure in the year of independence of the country (OPEN60), are OPEN60BRI, OPEN60FRE, and OPEN60OTH, for British, French and Other colonial origins respectively.

■ An annual index of the black market exchange rate premium during 1960-2000 (BMP) to capture the market distortion mechanism. Easterly & Levine (1997) find a strong negative association between black market premiums and growth. The interaction terms of colonial origin with market distortion during 1960-2000 are BMPBRI, BMPFRE and BMPOTH, for British, French and Other colonial origins respectively. Similarly, the interaction terms of colonial origin with initial market distortion measures in the year of independence of the country (BMP60), are BMP60BRI, BMP60FRE, and BMP60OTH, for British, French and Other colonial origins respectively.

■ Finally, a time-invariant index (ETHNRES) obtained from the interaction of the natural resource endowment dummy with the ethnic fractionalisation index to capture the selection bias transmission channel. The expected sign of ETHNRES in the growth regression is negative, according to the evidence from Mauro (1995). The interaction terms of colonial origin with "selection bias" channel are ETRESBRI, ETRESFRE and ETRESOTH, for British, French and Other colonial origins respectively.

[32] For instance, Easterly & Levine (1997) and Glaeser *et al* (2004) find a positive contribution of human capital to GDP growth in their regressions.

[33] See for instance, Sachs & Warner (1997).

In addition to this set of transmission mechanisms, we introduce a variable, DUREE, to capture the duration of colonial rule. DUREE is obtained by subtracting the respective country independence year from the year that the country was first colonised.[34]

Furthermore, we introduce another set of five control variables that are standard in the growth literature. These are:

- The natural logarithm of initial real per capita GDP in 1960 (LOGPCGDP60) to capture convergence effects. Quah (1993) argues that due to the problem of reversion to the mean, the sign on initial per capita income can either be positive or negative depending on the sample.
- The growth rate of population during 1960-2000 (GPO) to control for the effect of demographic factors on growth. We follow the endogenous growth literature, notably by Kremer (1993), in suggesting a possible correlation between labour force growth (proxied by population growth) and income growth. The two are expected to be positively correlated. Solow (1956) and Swan (1956) suggest the opposite.
- The growth rate of inflation during 1960-2000 (INFL) to capture the negative effects of price instability on growth. Hayek (1944) and Friedman (1977) in Grier (1999:322) both claim that inflation uncertainty increases price variability, thus harming economic growth.
- The average share of real investment[35] in GDP purchasing power parity during 1960-2000 (INV) to account for the contribution of physical capital accumulation in GDP growth. The standard neoclassical growth literature suggests that investment in physical capital is good for growth during transitional dynamics, although this might not be the case at steady states. The expected sign on INV in the regressions should therefore be positive.

Finally, we indicate the *à priori* classification of these variables into the various HT categories. The HT model requires classification of variables into the following four categories, namely, time-variant exogenous variables, time-invariant exogenous variables, time-variant endogenous variables and time-invariant endogenous variables. However, the latter category need not be included for the model to be correctly specified.

Based on economic theory, we classify our variables in the HT model as exogenous due to their *supposed* non-correlation with both the un-observed individual effects (α_i)

[34] It would have been consistent to take into account only the year that the last coloniser arrived (for those countries that had multiple colonisation experiences), but this detail would not add much to the present analysis.

[35] The variable includes both private and public investment.

and with the error term μ_{it}. Similarly, we classify some variables as endogenous in the model because of their *supposed* correlation with α_i but not with μ_{it}. We thus regroup the variables into the following four HT categories viz.

■ *Time-Variant Exogenous Variables:* The black market exchange rate premium during 1960-2000 (BMP), and the interactions of colonial origin with black market premiums, BMPBRI, BMPFRE and BMPOTH. Following Easterly & Levine (1997), we classify black market exchange premium as exogenous in the HT model because it tends to capture growth-inhibiting institutional imperfections that might not necessarily be correlated with the individual country effects.

■ *Time-Variant Endogenous Variables:* Secondary enrolment rates during 1960-2000 (SEC), Openness during 1960-2000 (OPEN), Investment during 1960-2000 (INV), Inflation during 1960-2000 (INFL), and Population growth during 1960-2000 (GPO). Accordingly, we also include the following interaction terms, SECBRI, SECFRE, SECOTH and OPENBRI, OPENFRE, OPENOTH for schooling and openness variables respectively. Following the tradition in the empirical growth literature, we classify these variables as endogenous in the HT model.[36]

■ *Time-Invariant Endogenous Variables:* Secondary enrolment rates at independence (SEC60), and openness at independence (OPEN60).

■ *Time-Invariant Exogenous Variables:* British colonial origin countries (BCORG), French colonial origin countries (FCORG), other colonial origin countries (OCORG),[37] duration of colonial rule (DUREE), the black market exchange rate premium at independence (BMP60), the ethnic fractionalisation - natural resource endowment index (ETHNRES), and the natural logarithm of initial real per capita income (LOGPCGDP60). We also include the following interaction terms for ethnic fractionalisation - natural resource endowment index, ETRESBRI, ETRESFRE, and ETRESOTH.

Figure 1 in the Appendix provides summary descriptive statistics for each variable that we use in the regressions. Panel A of Figure 1 describes statistics for the full SSA sample, while Panel B compares the means of variables by colonial origins. Most of our data comes from The Africa Research Program dataset, and Global Development Finance and World Development Indicators. Appendix B provides a full list of variable definitions and sources.

[36] For instance, Glaeser *et al* (2004) treat human capital as endogenous while Rostowski & Stacescu (2006) treat both human capital and openness as endogenous in their regressions.

[37] The intuition for placing colonial origin dummies in this category is mainly because of selection effects.

Considering the initial conditions at independence, Panel B of Figure 1 suggests that former British colonies had a lower initial GDP in 1960 than former French colonies. The evidence also suggests that at independence, former British colonies were more open to trade, had higher secondary enrolment rates and greater market distortion than former French colonies.

During the post-independence period from 1960-2000, Panel B suggests that former British colonies continued to experience greater openness to trade, higher secondary enrolment rates and greater market distortion than former French colonies. It is also striking to note that, in comparison with French colonial origin, British and Other colonial origins witnessed significantly longer durations of colonisation.

4 Results

This section presents results from the two-stage estimation strategy followed by checks for their robustness. A discussion of the results concludes the section.

4.1 Results using OLS estimator

Figure 2 in the Appendix reports results of twenty panel estimations of income (natural logarithm of per capita GDP PPP) on colonial origin sequentially controlling for each of the transmission channels (models 2 - 18), then controlling for all the transmission channels together (model 19), and finally controlling for other determinants of income and the duration of colonisation (model 20).

The results in model 1 of Figure 2 suggest that colonial origin does matter for income levels in SSA during 1960-2000, such that former British colonies have an income level slightly higher than former French colonies (about 0.2 times higher). The introduction of the colonial initial black market exchange premium conditions at independence in model 2 completely eliminates the economic and statistical significance of the British colonial origin dummy (BCORG), and the coefficient on initial black market premium is highly statistically significant although economically unimportant. Controlling for differences in initial market distortion conditions across colonial origins in model 3 gives no useful insight, as all of the variables are either economically unimportant or statistically insignificant. This suggests that initial market distortion conditions can not be held in explaining income differences amongst former SSA colonies during 1960-2000.

Controlling for only the post-independence market distortion conditions during 1960-2000 (BMP) in model 4, slightly reduces both the economic and statistical significance of BCORG, although the market distortion variable (BMP) is economically unimportant (although significant at the 1% level). This suggests that the post-independence market distortion policies of the former colonies might be partly responsible for the observed income differences amongst these countries. The results in model 5, which controls for possible differences in post-independence market distortion policies across colonial origins, does not alter the magnitude or statistical significance of BCORG, and all the distortion interaction terms (BMPBRI, BMPFRE & BMPOTH) are economically and statistically insignificant.

The results in model 6, which controls for the impact of both the colonial initial market distortion condition as well as the post-independence market distortion conditions, gives no useful insight as all of the variables are either economically unimportant or statistically insignificant. The tentative conclusion from models 2 to 6 is that, market distortion reduces income in SSA during 1960-2000 but that differences in both the initial colonial market distortion conditions as well as in the post independence market distortion policies across colonial origins, can not explain the observed income differences amongst former SSA colonies.

The results in model 7, where the initial colonial openness condition (OPEN60) alongside colonial origin dummies explain income, suggest that in general, the initial openness conditions of SSA countries at independence are not important in explaining post independence income differences amongst them. Controlling for differences in initial openness conditions across colonial origins in model 8, completely eliminates the economic and statistical significance of the British colonial origin dummy (BCORG), while the initial openness (OPEN60) and British colonial origin initial openness interaction term (OPEN60BRI) are both statistically significant at 1%. The sign on OPEN60BRI is positive, suggesting that the initial conditions of openness are a strong predictor of income in former British colonies. In other words, the legacy of trade openness might have contributed to the marginally higher income levels in former British SSA colonies. The results in model 9, where the post-independence openness conditions (OPEN) alongside colonial origin dummies explain income, suggest that the post-independence openness conditions of the countries are important in explaining post-independence income differences amongst former SSA colonies.

Controlling for differences in post independence openness conditions across colonial

origins in model 10 restores the statistical significance of BCORG,[38] while the post independence openness variable (OPEN) and British colonial origin post independence openness interaction term (OPENBRI) are both statistically significant at 1%. OPENBRI has a positive sign, suggesting that the post independence openness policies of former British SSA colonies are also important in explaining the observed marginal differences in income levels between former British and former French SSA colonies.

The results in model 11 which controls for the impact of both the colonial initial openness condition (OPEN60) as well as the post-independence openness conditions (OPEN),[39] show a slight reduction in the magnitude and statistical significance of BCORG, and both OPEN60 and OPEN are highly statistically significant. Model 11 results also suggest that for former British colonies, the colonial initial openness conditions (OPEN60BRI) mattered more than the post-independence openness conditions (OPENBRI). The tentative conclusions from models 7 to 11 are that:

- The colonial initial openness condition (OPEN60) influences post-independence income levels negatively, whereas the post-independence openness conditions (OPEN) positively affects income. This suggests that differences in both OPEN60 and OPEN across colonial origins, might help explain the observed differences in income levels amongst former SSA colonies.

- Furthermore, the colonial initial openness condition has had a far greater impact on income levels in former British colonies, than the post-independence openness conditions.[40]

The results in model 12, where initial colonial education condition (SEC60) alongside colonial origin dummies explain growth, show that BCORG is no longer economically and statistically significant, whereas SEC60 is highly statistically significant. This suggests that the initial education conditions of SSA countries at independence are important in explaining post independence income differences amongst these countries. Controlling for differences in initial education conditions across colonial origins in model 13 restores some statistical significance to BCORG, while completely diminishing SEC60 in both magnitude and statistical significance. However, both the British and Other colonial origin initial education interaction terms (SEC60BRI & SEC60OTH) are positive and highly significant at 1%. This suggests that, in comparison with former French colonies,

[38] BCORG also becomes economically meaningful, though assuming a negative sign.

[39] In addition to the respective interaction terms of the post independence variables.

[40] This could be explained by the fact that the marginal effects of openness in countries with more open initial conditions is lesser than otherwise.

the colonial initial education conditions in former British and Other colonies origins have been more favourable to income during 1960-2000.

The results in model 14, where the post-independence education conditions (SEC) alongside colonial origin dummies explain income, eliminate the statistical and economic significance of BCORG. This suggests that the post-independence education conditions of SSA countries are an important predictor of post-independence income.

Controlling for differences in post independence education conditions across colonial origins in model 15 restores the statistical significance of BCORG, while diminishing the magnitude and statistical significance of SEC. Furthermore, both the British and Other colonial origin post independence education interaction terms (SECBRI & SECOTH) are economically and statistically significant at 1%. This suggests that, in comparison with former French colonies, the post-independence education conditions in former British and Other colonies origins have been more favourable to income.

The results in model 16, which controls for the impact of the colonial initial education condition (SEC60), the post-independence education conditions (SEC), as well as the respective interaction terms of the latter, show a slight reduction in the magnitude of BCORG and SEC.[41] The British colonial origin initial education interaction term (SEC60BRI) is however, no longer significant while the British colonial origin post-independence education interaction term (SECBRI) remains significant at the 1% level. The sign on SECBRI is positive, suggesting that, in comparison with former French colonies, the post-independence education policies of former British colonies have been a good predictor of income. Also, model 16 results suggest that both the colonial initial education conditions as well as the post-independence education conditions, mattered for income in Other colonial origin countries.

The tentative conclusions from models 12 to 16 are that:

- Both the colonial initial education condition (SEC60) and the post-independence education conditions (SEC) positively influence post-independence income levels. Also, both the initial and the post-independence education conditions in former British colonies have contributed positively to income, with the contribution of post-independence education policies outweighing that at independence. This suggests that differences in both SEC60 and SEC across colonial origins, can help explain the observed income differences amongst former SSA colonies.

The results in model 17, where pre-colonisation initial conditions or selection bias

[41] SEC also reduces in statistical significance, to the 10% level.

(ETHNRES) alongside colonial origin dummies explain income, show that BCORG is no longer economically and statistically significant, whereas ETHNRES is highly statistically significant. This suggests that the initial conditions of SSA countries at the beginning of colonisation are an important predictor of post independence income levels. Controlling for differences in these pre-colonisation initial conditions across colonial origins in model 18 restores the statistical significance on BCORG, and both ETHNRES and the British colonial origin selection interaction term (ETRESBRI) are highly statistically significant. However, the sign on ETRESBRI is negative, suggesting that the pre-colonisation initial conditions have had a net detrimental impact on post independence income levels in former British colonies.

The results in model 19, which includes besides the colonial origin dummies, all the four transmission channels (with their respective interaction terms) alongside the initial levels of each transmission channel at independence, suggest the following:

- Both the initial and post-independence market distortion conditions are important predictors of post independence income levels in SSA, although the magnitude of their impacts is marginal. In comparison with former French colonies, market distortions have had more detrimental impacts on income in former British colonies.

- Only the colonial initial openness condition can help in explaining income differences amongst SSA countries, and the magnitude of its impact is marginal.

- Both the initial and post-independence education conditions can help in explaining income differences amongst SSA countries. In comparison with former French colonies, post-independence education policies in former British colonies have had a far more positive impact on income.

- In comparison with former French colonies, pre-colonisation initial conditions (selection bias) have had more detrimental impacts on post independence income in former British colonies.

These results significantly change upon controlling for the set of six conditioning variables included in model 20. Model 20 results now suggest that:

- *The initial market distortion conditions and not the post-independence conditions, are important in explaining income differences amongst SSA countries*

- *Both the initial and post-independence openness conditions are important in explaining income differences*

- *Both the initial and post-independence education conditions are important in explaining income differences*

- The pre-colonisation initial conditions (selection bias) are important in explaining income differences.

The findings from these different model specifications give an idea of the possible transmission channels between colonial origin and income in SSA. However, because of the bias and inconsistency of OLS estimation, this evidence is inconclusive and requires further investigation using alternative techniques and measurement.

4.2 Results using an Alternative Technique - The HT Estimator

Figure 3 in the Appendix provides results of four model specifications of the HT estimation of income on colonial origins. In model 1, where colonial origin dummies and the four post-independence transmission variables alone explain income, the results suggest that the post-independence policies of market distortion, openness and education, are important predictors of income levels in former SSA colonies during 1960-2000.[42] The results also suggest that the pre-colonisation initial conditions weakly account for income levels in former SSA colonies. In other words, there is weak evidence in favour of the selection bias channel.

The results in model 2, which includes, in addition to all the variables in model 1, the interaction terms for the respective transmission channels considered, suggest that differences in post-independence openness and education policies are important in explaining income differences amongst former SSA countries. In particular, the results suggest that, in comparison with former French colonies, the post-independence openness and education policies of former British colonies have contributed positively to income during 1960-2000.

After controlling further, for the colonial initial conditions, the results in model 3, suggest that, the post-independence openness and education policies in former British colonies (OPENBRI & SECBRI respectively) are responsible for the marginal income differential between former British and former French SSA colonies.[43]

However, the results in model 4, which controls for the set of six conditioning variables used in stage one above, suggest that the education channel matters only for former British colonies while openness seems to matter only for Other colonial origin countries. More specifically, the results suggest that post-colonial education policies have been more

[42] However, only the openness and education channels are economically important.

[43] The non-significance of the initial colonial openness and education variables (OPEN60 & SEC60) need not necessarily suggest that these do not matter. It could simply be that their effects have been "caught up" in the post independence variables. This is plausible considering the fact that earlier in the chapter, we noted a strong persistence of the British legacy of openness and human capital.

favourable to growth in former British colonies, in comparison with former French colonies, which probably explains the marginally higher income levels in former British colonies. Similarly, post colonial openness policies have been more beneficial to income in Other colonial origin countries, in comparison with former French colonies.

4.3 Robustness Checks

We use alternative proxies, namely, the average export share in GDP during 1960-2000 (EXP) and the average schooling years in the population aged 15 and above during 1960-2000 (AYS) to check for robustness of the openness and human capital channels respectively. Figure 4 in the Appendix provides results of four model specifications of the HT estimation following the same strategy employed in stage two above.

The results in Figure 4 uphold the previous HT results, suggesting that the post-colonial human capital and openness policies are important in explaining the observed income differences amongst former SSA colonies. More specifically, former British colonies have marginally higher income levels than former French colonies because of the favourable contribution of post-independence human capital and openness policies. Also, the results suggest that, in comparison with former French colonies, Other colonial origin countries perform comparatively worse because of the negative contribution of human capital to income.

It is worth mentioning that we repeated the empirical strategy used in this study using five year averages of all variables that span through 1960-2000 and obtained similar results. We do not report these results here due to space constraints. However, they are available on request.

In conclusion, it is worth recalling that only two of the four transmission channels explored have emerged after subjection to alternative techniques and to alternative proxies, namely - the openness and human capital channels. We do not find robust evidence in support of the market distortion and selection bias channels.

5 Comparative Review of Prior Literature

The most recent work that is closest to ours in the literature is an article by Klerman *et al* (2008). They investigate the influence of colonial and legal origins on growth during 1960-2003 using a sample of 49 former colonies around the world. Their results unambiguously

show that colonial origins matter for growth more than legal origin, and former British colonies have grown faster than former French colonies.

An important similarity between our results and those of Klerman *et al*, is that colonial origin matters because of differences in educational policies. It is important to mention that although we share this same result, we use a slightly different methodology from that used by Klerman *et al*. While Klerman *et al* use only initial conditions at independence to explain the subsequent growth path, this study analyses the pre-colonisation initial conditions, the initial conditions at independence, as well as the post-colonial changes. Furthermore, our results suggest that openness also matters, alongside education, in explaining the post colonial income differences amongst former SSA countries.

This study is also similar to the work of Rostowski & Stacescu (2006) which explores the empirical relationship between legal and colonial origin on growth. Like Klerman *et al* (2008), Rostowski & Stacescu also find that colonial origin matters more than legal origin and that education is the likely channel through which colonial origin affects growth. In the context of this study, the main problem with the Rostowski & Stacescu paper, as with the Klerman *et al* paper, is that they do not probe into the different mechanisms through which colonial origin affects income and their analyses are limited to the initial conditions at independence. For instance, Rostowski & Stacescu conclude their paper with this remark: "examining the channels through which colonial origin could affect growth is therefore the first priority for future research".

The results of this study are also consistent with prior work by Grier (1999) and Bertocchi & Canova (2002), who find that former British colonies have better economic performance than former French colonies. Grier (1999) focuses part of his results on the African sample and finds that French ex-colonies performed 1.38 percentage points worse on average than their British counterparts, and this growth differential is attributable to differences in educational policies at independence. Although this result concords with ours, Grier considers only initial conditions at independence.

In short, this study goes beyond the three previous studies not only by simultaneously investigating a range of feasible transmission channels between colonial origin and income, but also in jointly examining the pre-colonisation initial conditions, alongside the initial conditions at independence and the subsequent post-independence changes.

6 Conclusion

This study sought to investigate whether colonial origin really matters for economic performance in SSA during 1960-2000 and, if it does, what its likely transmission mechanisms are. The methodology that has been applied in this study is slightly different to that of previous works, where only initial conditions at independence were held to influence the subsequent growth path. This study combines both the pre-colonisation initial conditions, alongside the initial conditions at independence and the subsequent post-independence changes in explaining income differences amongst former SSA countries.

The results suggest that former British colonies have had marginally higher income levels than former French colonies during 1960-2000, and that this is attributable to the favourable contribution of the legacy of British colonisation in trade openness and human capital. We do not find robust evidence in support of the market distortion and selection bias channels.

The empirical literature has recently emphasised the specific colonial policy of education as the likely transmission mechanism between colonial origin and growth but, to the best of our knowledge, none of the previous studies have explored systematically a range of feasible channels simultaneously. Besides highlighting the importance of the trade openness channel, the study also makes a novel contribution by jointly examining the income influences of pre-colonisation initial conditions, the initial conditions at independence, and the post-colonisation changes brought about by the independence states themselves.

APPENDIX A: SAMPLE OF SSA FORMER COLONIES (38 COUNTRIES)

I. Former British SSA Colonies (16 COUNTRIES)

Botswana, Gambia, Ghana, Kenya, Lesotho, Malawi, Mauritius, Namibia, Nigeria, Sierra Leone, Sudan, Swaziland, Tanzania, Uganda, Zambia, and Zimbabwe.

II. Former French SSA Colonies (15 COUNTRIES)

Benin, Burkina Faso, Cameroon, Central Africa Republic, Chad, Congo Rep, Cote D'Ivoire, Gabon, Guinea, Madagascar, Mali, Mauritania, Niger, Senegal, Togo.

III. Former Portuguese, Belgian, Italian or Spanish SSA Colonies (7 COUNTRIES)

Angola, Burundi, Congo Dem, Equatorial Guinea, Guinea-Bissau, Mozambique, Somalia.

APPENDIX B: VARIABLE DEFINITION AND SOURCES

BCORG: Former British Colony dummy variable taking the value of 1 for countries that acquired their independence from Britain and 0 otherwise.

FCORG: Former French Colony dummy variable taking the value of 1 for countries that acquired independence from France and 0 otherwise.

OCORG: Other non-British and non-French former colony dummy taking the value of 1 for countries that acquired independence from any other European power besides Britain and France, and zero otherwise.

GROW: Annual levels of the natural logarithm of real GDP PPP during 1960-2000 (Africa Research Program datasets)

DUREE: The duration of colonial rule, obtained by subtracting the respective country independence year from the year of colonisation. Source of colonisation dates is from Wikipedia (http://en.wikipedia.org/wiki).

LOGPCGDP60: The natural logarithm of real per capita gross domestic product in 1960 (Penn World Table, Mark 5.6)

GPO: Annual growth rates of population during 1960-2000 (Global Development Finance & World Development Indicators-GDF&WDI)

ETHNIC: Ethno-linguistic fractionalisation (William Easterly & Ross Levine, Africa's Growth Tragedy: Policies & Ethnic Division, 112 Q.J. Econ. 1203 (1997).

SEC: Secondary enrolment rates during 1960-2000. (GDF & WDI)

INV: Annual shares of real investment in GDP PPP, 1960-2000 (Africa Research Program datasets)

BMP: Annual growth rates of the black market exchange rate premium, 1960-2000. (GDF & WDI)

EXP: Annual levels of export share in GDP during 1960-2000 (GDF&WDI)

OPEN: Annual levels of the combined share of exports and imports in GDP during 1960-2000 (Africa Research Program datasets).

INFL: Annual % changes in consumer prices during 1960-2000 (GDF & WDI)

LIFE: Annual levels of the average life expectancy during 1960-2000 (Africa Research Program datasets).

DNRES: A dummy variable taking the value of 1 for natural resource-rich (oil, cocoa & diamonds) countries, and zero otherwise. Countries included are Gabon, Equatoria Guinea, Ghana, Ivory Coast, Angola, DRC, Nigeria and Botswana.

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Figure 1: Summary Descriptive Statistics

PANEL A - DESCRIPTIVE STATISTICS FOR FULL SAMPLE OF 38 FORMER SSA COLONIES					
Variable	Obs.	Mean	Std. Dev.	Min	Max
Natural Logarithm of GDP PPP, 1960-2000	880	22.59	1.07	19.68	25.31
Real per Capita GDP in 1960 (log)	1394	7.05	0.61	5.95	8.09
Black Market Premium at Independence	1271	51.49	167.18	-0.49	857.41
Openness at Independence	1435	72.45	64.47	4.48	291.06
Secondary enrolment at Independence	1517	4.74	7.76	1	43.8
Average Schooling years at Independence	861	1.54	1.05	0.22	3.92
Export/GDP share at Independence	1435	25.42	18.85	4.86	78.92
Dummy Natural Resource Rich Countries	1558	0.26	0.44	0	1
Population Growth, 1960-2000	1520	2.59	1.07	-6.1	11.03
Ethno-linguistic Fractionalisation	1394	65.15	24.18	0	93
Inflation Growth Rate, 1960-2000	986	36.82	233.14	-13.05	4145.11
Black Market Premium, 1960-2000	1170	61.01	274.54	-89.16	4806.89
Secondary enrolment rates, 1960-2000	865	19	16.16	1	93.12
Openness to Trade, 1960-2000	1425	76.07	47.28	2.64	440.56
Export share in GDP, 1960-2000	1341	28.04	17.53	1.94	92.37
Investment share in GDP, 1960-2000	1490	10.83	9.6	2.81	72.41
Average Schooling years, 1960-2000	705	2.02	1.21	0.22	5.57
Dummy Landlockedness	1558	0.37	0.48	0	1
Duration of Colonisation (in years)	1558	70.26	14.74	55	111

PANEL B - MEANS BY COLONIAL ORIGIN			
Variable	French Former SSA Colonies	British Former SSA Colonies	Other Former SSA Colonies
Natural Logarithm of GDP PPP, 1960-2000	22.5	22.80***	22.19***
Real per capita GDP in 1960 (Log)	7.19	6.86***	7.07***
Black Market Premium at Independence	5.37	13.27***	272.35***
Openness at Independence	54.63	99.04***	54.96
Secondary enrolment at Independence	1.93	7.91***	3.14***
Average Schooling years at Independence	0.23	2.19***	0.07***
Export/GDP share at Independence	18.17	33.67***	23.43***
Black Market Premium during 1960-2000	17.82	75.18***	155.61***
Openness to Trade, 1960-2000	66.1	90.85***	54.96
Export share in GDP, 1960-2000	26.78	32.21***	20.39***
Secondary enrolment rates, 1960-2000	15.72	24.57***	9.9***
Average Schooling years, 1960-2000	1.83	3.06***	1.26**
Dummy Landlockedness	0.33	0.44*	0.28
Dummy natural resources	0.2	0.25	0.43**
Investment share in GDP, 1960-2000	8.57	13.61***	9.53
Population Growth, 1960-2000	2.58	2.64	2.30*
Ethno-linguistic Fractionalisation	66.27	69.71	49***
Inflation Growth Rate, 1960-2000	15.02	15.54	113.8***
Duration of Colonisation (in years)	59.27	81.44***	68.28***

Notes: Asterisks indicate results of t-tests. The null hypothesis is that the mean is the same as the mean for former French SSA colonies.

* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Figure 2: Stage One Results using Pooled OLS

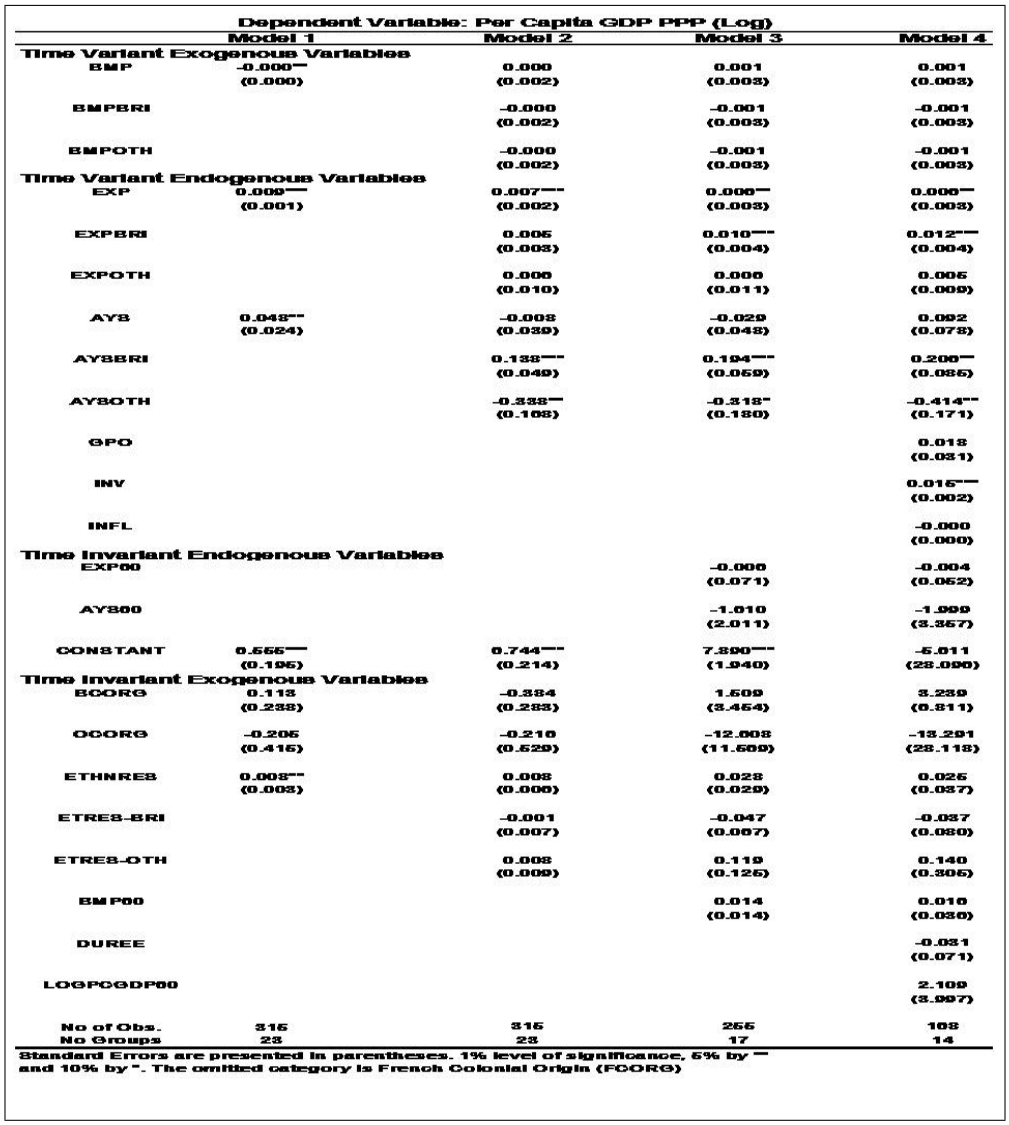
Dependent Variable: Per Capita GDP PPP (Log)																				
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15	Model 16	Model 17	Model 18	Model 19	Model 20
BCORG	0.178***	0.071	-0.078	0.110**	0.114**	-0.121	0.145***	0.043	0.045	-0.292***	-0.233**	0.008	-0.087*	-0.010	-0.652***	-0.637***	-0.007	0.176***	-0.641***	0.322**
	(0.049)	(0.053)	(0.092)	(0.052)	(0.055)	(0.113)	(0.056)	(0.077)	(0.049)	(0.109)	(0.123)	(0.039)	(0.052)	(0.054)	(0.061)	(0.059)	(0.045)	(0.049)	(0.085)	(0.149)
OCORG	-0.187***	-0.003	(1)	-0.234***	-0.227***	(1)	-0.187***	-0.167**	-0.198***	-0.281***	0.053	-0.135***	-0.399***	-0.016	-0.685***	-0.873***	-0.396***	-0.434***	-0.021	0.751***
	(0.057)	(0.081)		(0.083)	(0.085)		(0.057)	(0.088)	(0.049)	(0.101)	(0.109)	(0.050)	(0.079	(0.054)	(0.078)	(0.079)	(0.043)	(0.031)	(0.089)	(0.133)
BMP60		-0.000***	-0.005			0.014													-0.000**	-0.001**
		(0.000)	(0.015)			(0.020)													(0.000)	(0.000)
BMP60-BRI			0.013			-0.004														
			(0.015)			(0.020)														
BMP60-OTH			0.004			-0.015														
			(0.015)			(0.020)														
BMP				-0.000***	0.000	0.000													0.002***	0.000
				(0.000)	(0.000)	(0.000)													(0.000)	(0.001)
BMP-BRI					-0.000	-0.000													-0.002***	-0.001
					(0.000)	(0.000)													(0.000)	(0.001)
BMP-OTH					-0.000	-0.000													-0.002***	-0.001
					(0.000)	(0.000)													(0.000)	(0.001)
OPEN60							-0.000	-0.000***			-0.003***								-0.002***	-0.004***
							(0.000)	(0.000)			(0.000)								(0.000)	(0.000)
OPEN60-BRI								0.001***			0.004***									
								(0.000)			(0.001)									
OPEN60-OTH								-0.000			-0.002									
								(0.001)			(0.001)									
OPEN									0.007***	0.005***	0.009***								0.001	0.005***
									(0.001)	(0.001)	(0.001)								(0.001)	(0.001)
OPEN-BRI										0.004***	-0.000								0.001	-0.004***
										(0.002)	(0.002)								(0.001)	(0.001)
OPEN-OTH										0.001	-0.002								-0.003	-0.008***
										(0.001)	(0.002)								(0.002)	(0.001)
SEC60												0.052***	0.001			-0.009			0.089***	0.077***
												(0.002)	(0.016)			(0.023)			(0.021)	(0.015)
SEC60-BRI													0.051***			0.032				
													(0.016)			(0.023)				
SEC60-OTH													0.103***			0.082***				
													(0.018)			(0.028)				
SEC														0.025***	0.005**	0.004*			0.004	0.019***
														(0.002)	(0.002)	(0.002)			(0.002)	(0.003)
SEC-BRI															0.030***	0.024***			0.023***	-0.005*
															(0.003)	(0.003)			(0.003)	(0.003)
SEC-OTH															0.048***	0.044***			-0.013	-0.023**
															(0.007)	(0.008)			(0.013)	(0.009)
ETHNRES																	0.007***	0.011***	0.007***	-0.027***
																	(0.001)	(0.001)	(0.000)	(0.003)
ETRES-BRI																		-0.009***	-0.006***	-0.009***
																		(0.001)	(0.001)	(0.001)
ETRES-OTH																		-0.001	0.002	0.003
																		(0.001)	(0.002)	(0.002)
DUREE																				0.000
																				(0.004)
INV																				0.016***
																				(0.003)
GPO																				0.053**
																				(0.027)
INFL																				-0.000***
																				(0.000)
DNRES																				2.626***
																				(0.231)
ETHNIC																				0.000
																				(0.002)
LOGPCGDP60																				0.429***
																				(0.053)
CONSTANT	7.117***	7.107***	7.132***	7.136***	7.131***	7.043***	7.136***	7.167***	6.622***	6.762***	6.664***	6.898***	6.997***	6.612***	6.956***	6.983***	6.995***	6.929***	6.681***	3.086***
	(0.029)	(0.029)	(0.076)	(0.033)	(0.036)	(0.102)	(0.032)	(0.034)	(0.042)	(0.074)	(0.069)	(0.020)	(0.037)	(0.030)	(0.042)	(0.043)	(0.021)	(0.018)	(0.052)	(0.279)
No of Obs.	895	755	755	699	699	597	843	843	834	834	828	869	869	699	699	696	806	806	464	355
R-Squared	0.04	0.01	0.05	0.03	0.03	0.09	0.03	0.03	0.19	0.21	0.24	0.39	0.39	0.42	0.55	0.62	0.18	0.24	0.57	0.88
Standard Errors are presented in parentheses. 1% level of significance, 5% by ** and 10% by *. The omitted category is French Colonial Origin (FCORG).																				
(1) Variable dropped due to multicollinearity																				

Figure 3: Stage Two Results using HT Estimator

Dependent Variable: Per Capita GDP PPP (Log)				
	Model 1	Model 2	Model 3	Model 4
Time Variant Exogenous Variables				
BMP	-0.000***	-0.000	-0.000	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)
BMPBRI		0.000	0.000	0.000
		(0.000)	(0.000)	(0.000)
BMPOTH		0.000	0.000	0.000
		(0.000)	(0.000)	(0.000)
Time Variant Endogenous Variables				
OPEN	0.002***	0.001**	0.001*	0.001
	(0.000)	(0.001)	(0.001)	(0.001)
OPENBRI		0.002**	0.002**	0.000
		(0.001)	(0.001)	(0.001)
OPENOTH		-0.002	-0.002	-0.003**
		(0.002)	(0.002)	(0.002)
SEC	0.007***	-0.002	-0.002	-0.004
	(0.001)	(0.002)	(0.002)	(0.003)
SECBRI		0.013***	0.011***	0.014***
		(0.002)	(0.003)	(0.003)
SECOTH		-0.003	-0.004	0.001
		(0.010)	(0.011)	(0.009)
GPO				0.034*
				(0.021)
INV				0.014***
				(0.002)
INFL				-0.000
				(0.000)
Time Invariant Endogenous Variables				
OPEN60			-0.003	-0.008
			(0.003)	(0.018)
SEC60			0.188	-0.046
			(0.120)	(0.368)
CONSTANT	6.786***	6.983***	6.666***	3.078
	(0.140)	(0.161)	(0.321)	(10.393)
Time Invariant Exogenous Variables				
BCORG	-0.038	-0.320	-0.661*	-0.671
	(0.198)	(0.221)	(0.367)	(1.618)
CCORG	-0.313	-0.348	-0.079	-0.216
	(0.331)	(0.383)	(0.606)	(1.980)
ETHNRES	0.006*	0.008**	0.007	0.006
	(0.003)	(0.004)	(0.006)	(0.014)
ETRES-BRI		-0.007	-0.003	-0.003
		(0.006)	(0.008)	(0.021)
ETRES-OTH		0.002	-0.001	0.004
		(0.008)	(0.010)	(0.026)
BMP60			-0.003	-0.001
			(0.003)	(0.003)
DUREE				0.033
				(0.066)
LOGPCGDP60				0.303
				(1.600)
No of Obs.	528	528	404	366
No Groups	31	31	26	24

Standard Errors are presented in parentheses. 1% level of significance, 5% by ** and 10% by *. The omitted category is French Colonial Origin (FCORG)

Figure 4: Robustness Checks using Alternative Proxies for Human Capital & Trade Openness



Dependent Variable: Per Capita GDP PPP (Log)				
	Model 1	Model 2	Model 3	Model 4
Time Variant Exogenous Variables				
BMP	-0.000***	0.000	0.001	0.001
	(0.000)	(0.002)	(0.003)	(0.003)
BMPBRI		-0.000	-0.001	-0.001
		(0.002)	(0.003)	(0.003)
BMPOTH		-0.000	-0.001	-0.001
		(0.002)	(0.003)	(0.003)
Time Variant Endogenous Variables				
EXP	0.009***	0.007***	0.006**	0.006**
	(0.001)	(0.002)	(0.003)	(0.003)
EXPBRI		0.005	0.010***	0.012***
		(0.003)	(0.004)	(0.004)
EXPOTH		0.000	0.000	0.005
		(0.010)	(0.011)	(0.009)
AYB	0.048**	-0.008	-0.029	0.092
	(0.024)	(0.039)	(0.048)	(0.078)
AYBBRI		0.138***	0.194***	0.200**
		(0.049)	(0.059)	(0.085)
AYBOTH		-0.338**	-0.318*	-0.414**
		(0.168)	(0.180)	(0.171)
GPO				0.018
				(0.031)
INV				0.015***
				(0.002)
INFL				-0.000
				(0.000)
Time Invariant Endogenous Variables				
EXP00			-0.000	-0.004
			(0.071)	(0.052)
AYB00			-1.010	-1.999
			(2.011)	(3.357)
CONSTANT	0.555***	0.744***	7.890***	-5.011
	(0.195)	(0.214)	(1.940)	(28.090)
Time Invariant Exogenous Variables				
BCORG	0.113	-0.384	1.509	3.239
	(0.238)	(0.283)	(3.464)	(6.811)
OCORG	-0.205	-0.216	-12.008	-13.291
	(0.416)	(0.529)	(11.609)	(28.118)
ETHNREB	0.008**	0.008	0.028	0.026
	(0.003)	(0.006)	(0.029)	(0.037)
ETREB-BRI		-0.001	-0.047	-0.037
		(0.007)	(0.067)	(0.080)
ETREB-OTH		0.008	0.119	0.140
		(0.009)	(0.125)	(0.305)
BMP00			0.014	0.010
			(0.014)	(0.030)
DUREE				-0.031
				(0.071)
LOGPCGDP00				2.109
				(3.997)
No of Obs.	316	316	255	108
No Groups	23	23	17	14

Standard Errors are presented in parentheses. 1% level of significance, 5% by *** and 10% by *. The omitted category is French Colonial Origin (FCORG)