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Does Colonialism Exert A Long Term Economic Impact On Adult Literacy?

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Examining the reason for differences in adult literacy rates across countries, this study finds that colonialism exerts a long term negative economic impact on literacy rates of the colonised. Investigating in particular, the effects of the French and British colonisation policies, the results of this study indicate that the colonial legacy remained long after independence, slowing down improvements in literacy rates in the former colonies. In conclusion it is noted that the implementation of policies that will ensure equal access to education for all is important.

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* Corresponding author: Arusha Cooray, School of Economics, University of Wollongong, Northfields Avenue, NSW 2522, Australia, Tel: 61-2-4221-4017, Email: arusha@uow.edu.au. This is paper was written while I was a visiting research fellow at Queen Elizabeth House, Oxford. I owe a special acknowledgement to Zaki Wahhaj for the helpful discussions and insightful comments which influenced my thinking in the direction of the topic covered in this study. I also wish to thank Andrew Milner of the Bodleian Library for help with access to data sources and Leelananda de Silva for helpful comments. The funding provided to me by the Faculty of Commerce, University of Wollongong to undertake this research is gratefully acknowledged. I wish to thank in particular, Simon Ville and Shirely Leitch for their support.

1. Introduction

This study offers a new perspective on the reason as to why some countries have low literacy rates. It is argued that certain colonial experiences have a long term economic impact on literacy. This connection may seem surprising given that it is many years since colonial rule ended. This however, is consistent with the historical evidence of that era, in which the legacy of colonialism led to large metropolitan-rural differences in education. "…..in the colonial situation the school was detached from indigenous cultures in the languages and the social values they taught. Colonial schools were set up as alternatives rather than complements to the colonized's educational practices" (Altbach and Kelly 1978). Consequently this led to the polarization of the masses with a small educated elite. This in turn implied that the transfer of literacy by older generations to future generations was low, slowing down improvements in literacy.

A large literature on literacy has been undertaken by UNESCO which views literacy not only as a positive outcome of the development process but also as an instrument for achieving social progress. The growing emphasis on the Millennium Development Goals (MDGs) and the objective of achieving education for all, has called attention to the issue of literacy in the recent past. Among the studies undertaken on literacy are those by Sundaram and Vanneman (2008) – literacy and gender, Cascio, Clark and Gordon (2008) – literacy and assessment, Ortega and Rodriguez (2008) - literacy and government policy in Venezuela, Maddox (2008) – literacy and human development, Finnie and Meng (2005) – literacy and labour market outcomes.

This study contributes to the literature by examining adult literacy from a historical perspective. A literature has recently developed on the effects of colonialism on the subsequent economic progress of the developing nations. Acemoglu *et al*. (2001) and Bertocchi and Canova (2002) examine the effects of colonialism on economic growth, Engerman and Sokoloff (2002) and Angles (2007) the impact of colonialism on inequality in income, La Porta *et al*. (1999) emphasize the importance of colonial heritage as a determinant of the legal systems in countries, Grier (1999) shows that the identity and duration of the colonising power has a long term impact on economic growth. Alam (2000) examines the effects of sovereignty on literacy among other variables such as exports, industry, years of schooling and economic growth. He observes that colonialism had a negative impact on all of these variables including literacy. Examining the colonial legacies of Britain, France and Spain, Grier notes that a longer period of colonisation is better than a shorter period as it permits the colonizer to establish institutions, infrastructure and educational systems in the colony. Moreover, he shows that the level of education at the time of independence explains a large proportion of the divergence in development between the French and British colonies, with the British colonies performing better on the average. Acemoglu *et al*. show that different colonization policies pursued by the Europeans in different colonies have resulted in different institutions which have persisted to the present.

The line of reasoning provided by this study is analogous to that of Acemoglu *et al*. Grier and Alam. The present study also suggests that the colonial legacy persisted even after de-colonisation as in Acemoglu *et al*. and that different colonial experiences led to differences in education and literacy as in Grier and Alam. The

objective of the present study is, in addition, to identify the literacy challenges facing certain countries in the context of their colonial past and addresses the issue of how they can be overcome. Post-colonial countries face particular challenges in, on the one hand, restoring their indigenous languages and on the other, facilitating the development of the languages introduced to them by former colonizers. In achieving the objective of education for all, UNESCO has advocated an universal education policy for all countries. This study draws attention to the fact that education policy must be evaluated in the context of the colonial legacy and a 'one size fit all' approach is not sufficient. This study finds that colonialism had a negative impact on literacy. It should be noted that it is difficult to establish causal patterns in this type of analysis. Moreover, whether econometric cross-country estimation does justice to an issue as complex as colonialism is another question.

The paper is structured as follows. The following section presents the motivation for the study. Section 3 states the hypothesis and describes the colonial legacy. Section 4 describes the data. The model and empirical results are presented in Section 5. Section 6 provides a discussion of the results and conclusions are summarised in the last Section.

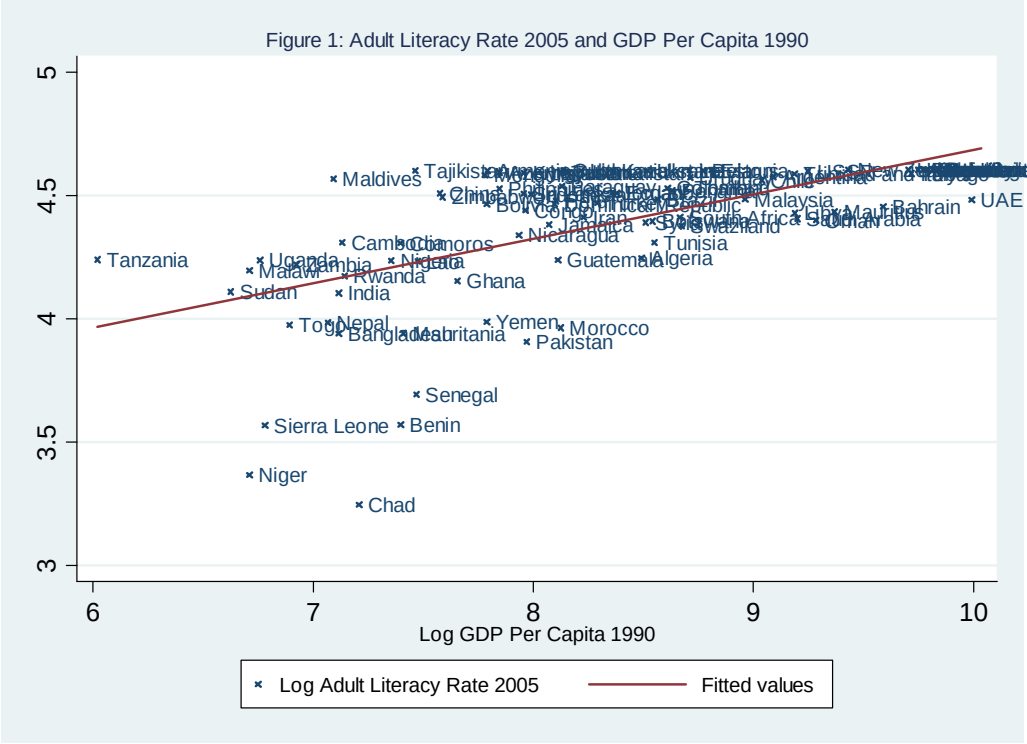
2. Motivation

Per Capita Income, Government Expenditure and Adult Literacy

Theory states that a high ALR should be associated with a high per capita income (UNESCO 1957, Verner 2005). In 1950, UNESCO found that of 16 countries with low illiteracy rates, all except for Japan had relatively high per capita incomes. Therefore, per capita income is included as an explanatory variable in the empirical analysis that follows. Figure 1 depicts the relationship between the ALR in 2005 and GDP per capita in 1990[1]. An examination of the data confirms the prediction that there exists a positive association between adult literacy and GDP per capita.

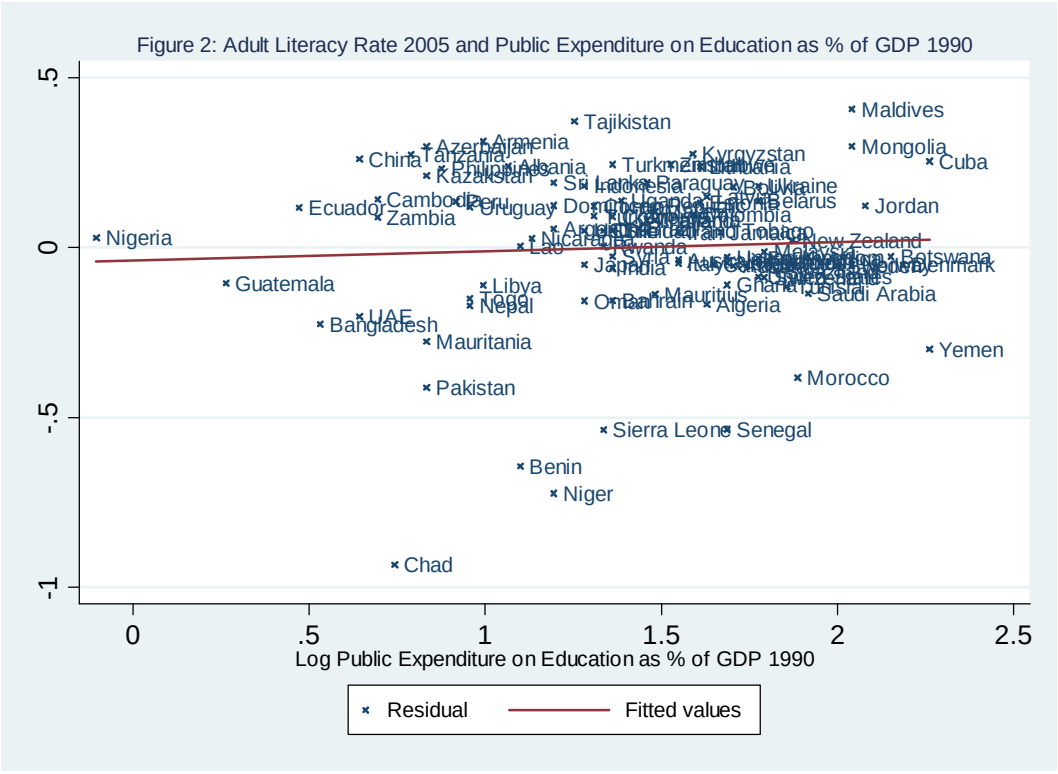
Although this preliminary analysis suggests that a high per capita income is associated with a high ALR, many of the South Asian, West African and some of the Middle Eastern economies fall below the regression represented by the fitted line in Figure 1.

[1] Note that GDP per capita in 1990 is used for the preliminary analysis as data for the countries that belonged to the former Soviet Union are not available for 1950.



Note: The regression represented by the fitted line reports a coefficient of 0.18 (Robust SE = 0.03), N = 93, $R^2 = 0.37$ from a regression of log ALR 2005 on log per capita income 1990.

Removing the influence of the level of GDP per capita, Figure 2 plots the error term from the above equation on government expenditure on education as a % of GDP. Cascio *et al*. (2008) show that the supply of education depends upon the degree of government involvement. According to them, the higher the proportion of expenditure by the government on education, the greater will be the supply leading to increases in literacy. An interesting observation emerges from this Figure. The results indicate that the residuals from the first equation are also not explained by government expenditure for the same group of countries. Of course, other factors in addition to per capita income and investment in education influence the adult literacy rate. These other factors appear to have played a relatively large role in South Asia, Africa and the Middle East.



Note: The regression represented by the fitted line reports a coefficient of 0.18 (Robust SE = 0.06), N = 97, R^2 = 0.09 from a regression of log ALR 2005 on log public expenditure on education as % GDP 1990.

As a step towards understanding the reason for this in a country specific context, the next section examines the effects of the colonial legacy.

3. The Hypothesis

This study hypothesises that different colonial experiences have led to differences in adult literacy rates across countries. It is useful at this stage to define the concept of colonialism as meant by this study. "Colonialism" is defined as those countries that, although independent of a former colonising power, are still bound by the political and social structures imposed on them by a ruling elite originating from the colonising power. Based upon Acemoglu *et al*. this theory relies on the assumptions that:

1) Different colonization policies led to differences in education systems across regions/ countries. For example, the British colonisation policies of Asia and Africa differed from the French colonisation policies of Africa and the Spanish and Russian colonisation policies (discussed below).

2) The colonial legacy remained long after independence.

'The result has been internal, indigenous colonialism, under which the Western-oriented, urban-centred, governmental and managerial class dominates and exploits the rural villagers, who lack Western education and, thus, political power to make themselves felt (Mugomba and Nyaggah 1977).

Historical Setting

This section provides historical evidence supporting the claim that low literacy rates in the present in certain countries are associated with colonialism. Prior to examining the differences in colonization policies, it is useful to examine dates of de-colonisation and illiteracy rates for the countries under study at or around the time of independence – see Table 1.

Table 1: Dates of De-Colonisation and Illiteracy Rates

Country	Colonial State [a]	Year of Independence [a]	Illiteracy Rate 1950[b] %
Africa			
Benin	France	1960	95-99
Botswana	Britain	1966	75-80
Chad	France	1960	95-99
Comoros	France	1975	75-80
Congo	France	1960	60-65
Djibouti	France	1977	95-99
Ghana	Britain	1957	90-95
Malawi	Britain	1963	90-95
Mauritania	France	1960	95-99
Mauritius	Britain	1968	45-50
Niger	France	1960	95-99
Nigeria	Britain	1960	85-90
Rwanda	Belgium	1962	90-95
Sierra Leone	Britain	1961	90-95
Senegal	France	1960	95-99
Somalia	Britain and Italy	1960	95-99
South Africa	Britain	1961	75-80
Sudan	Britain and Egypt	1956	90-95
Swaziland	Britain	1968	80-85
Tanzania	Britain	1961	90-95
Togo	France	1960	90-95
Uganda	Britain	1962	70-75
Zambia	Britain	1964	75-80
Zimbabwe	Britain	1965	75-80
South and South East Asia			
Bangladesh	Britain (part of British India)	1947	-
Cambodia	France	1953	80-85
India	Britain	1947	80.7
Indonesia	Dutch	1949	80-85
Lao	France	1953	80-85
Malaysia	Britain	1957	60-65
Maldives	British Protectorate	1965	25-30
Nepal	-	-	95-99
Pakistan	Britain (part of British India)	1947	86.2
Philippines	Spain	1946	35-40
Sri Lanka	Britain	1948	35-40
Thailand	-	-	45-50
Middle East			
Algeria	France	1962	93.8
Bahrain	British Protectorate	1971	85-90
Iran	-	-	85-90
Jordan	Under British Control from 1921	1946	80-85
Libya	Italy	1951	90-95
Morocco	France	1956	85-90
Oman	-	-	85-90
Saudi Arabia[c]	-	-	95-99
Syria	France	1946	70-75
Tunisia	France	1956	80-85
Turkey	-	-	65-70
UAE	-	-	

Yemen	British controlled South part of Yemen	1967	95.99
South America and the West Indies			
Argentina	Spain	1816	13.6
Bolivia	Spain	1825	67.9
Brazil	Portugal	1822	50.6
Chile	Spain	1818	19.9
Colombia	Spain	1819	45-50
Cuba	Spain	1898	20-25
Dominican Republic	Spain and Haiti	1821, 1844	55-60
Ecuador	Spain	1822	44.3
Guatemala	-	-	70.6
Nicaragua	Spain	1838	61.6
Panama	Spain	1811	30-35
Trinidad & Tobago	Britain	1962	26.2
Uruguay	Spain	1830	15-20
Eastern Europe			
Albania	-	-	
Belarus	Soviet Union	1991	
Bulgaria	-	-	20-25
Croatia	Yugoslavia	1991	27.2[f]
Estonia	Soviet Union	1991	
Latvia	Soviet Union	1991	
Lithuania	Soviet Union	1991	
Poland[d]	-	-	
USSR[e]	-	-	5-10
Slovania	Yugoslavia	1991	27.2[f]
Central Asia			
Armenia	Soviet Union	1991	
Azerbaijan	Soviet Union	1991	
China	-	-	50-55
Kazakstan	Soviet Union		
Kyrgyztan	Soviet Union	1991	
Mongolia	Soviet Union	1924	
Tajikistan	Soviet Union		
Turkmenistan	Soviet Union		
High Income OECD			
Australia	-	-	3.3
Austria	-	-	1-2
Belgium	-	-	3-4
Canada	-	-	2-3
Denmark	-	-	1-2
France	-	-	3.6
Germany	-	-	1-2
Italy	-	-	10-15
Japan	-	-	2-3
Netherlands	-	-	1-2
New Zealand	-	-	1-2
Norway	-	-	1-2
Sweden	-	-	1-2
Switzerland	-	-	1-2
United Kingdom	-	-	1-2
United States	-	-	3-4

Sources: a: Freedom House: http://www.freedomhouse.org/template.cfm?page=35&year=2005 (downloaded November 2008).
b: UNESCO (1957) World Illiteracy at Mid-Century: A Statistical Study, Geneva.
Note Ghana formerly called Togoland, Congo – Belgian Congo, Malawi - Nyasaland, Rwanda - Ruanda, Somalia – Somaliland, Djbouti – French Somaliland, Togo – Togoland, Tanzania – Tanganyika, , and Mauritania, Senegal, Niger Benin part of former French West Africa . Bangladesh part of East Pakistan until 1972.
c: Saudi Arabia's foreign policy was under the control of the British until 1971
d: A Soviet satellite state until 1989.
e: Figure for 20 countries.
f: Figure for Yugoslavia

The evidence presented in Table 1 suggests that it is not unreasonable to infer that colonialism had some effect on the education systems and literacy rates of the Asian, African and Middle Eastern countries. The figures in the last column depict the extent of illiteracy at independence or immediately prior to independence in Africa, the Middle East and South and South East Asia. The countries that were British and French colonies, and Rwanda which was a Belgian colony exhibit very high rates of illiteracy compared to the Spanish colonies. The countries that were part of the former Soviet Union and Yugoslavia perform well.

The British and French Education Policies

Both colonial powers were driven by economic gain. However, historical evidence suggests that under French colonialism the requirement for teaching French was articulated very differently to the need for teaching English under British colonialism. According to Grier, " Very few Africans received the benefits of a colonial education and those that did were isolated and alienated from their original cultures….Students were required to speak French and all vernacular languages were forbidden, which resulted in large numbers of the population receiving any kind of literacy." Corbett (1972), further states that by the end of the 1960s, over 95% of the population in Frances former African colonies were illiterate. This is evidenced by the statistics presented in Table 1. Taking the case of Algeria for example, at the time of independence only 3% of Algerians were literate in Literary Arabic due to the gradual phasing out of Arabic teaching schools in the first forty years of the French rule and replacing them with French teaching schools (Gallagher 1968, Khanna 2008). The French were more rigid with regard to the establishment and expansion of schools in contrast to the British who adopted a more *laissez faire* policy.

The British were concerned with educating a minority who could mediate between the British ruling class and the natives. In British India for example, Chaudhary (2007) shows that while the British recognized the need to improve the levels of schooling, it was aimed at a small minority (the Brahmans or higher castes) and hence failed to increase literacy among the overall population. Chaudhary further notes that according to the census of 1911 in India, almost 30 percent of Brahmans were able to read and write as compared to less than 2 percent of lower castes and aboriginal tribes. This gap in literacy between the Brahmans and lower castes has persisted to date with the literacy estimates from the census of 1991, showing that the average literacy rate in India for the former lower castes and aboriginal tribes being well below the national average, 37 percent and 30 percent respectively as compared to the average literacy rate in India of 52 percent.

Under the French rule, schools were controlled and run by the government, whereas under the British rule Christian missionaries were responsible for the establishment and expansion of schools. Not only were there fewer schools, they were also of lower quality in terms of trained teachers in the French colonies than in the British colonies. "In 1934 in French West Africa there were 265 government village schools and 13 urban schools, usually with only one teacher….." (Crowder 1970). Crowder further notes that there were less than six hundred pupils at government secondary and post-secondary schools in French West Africa in 1934. British West Africa had a better record comparatively, however, the numbers at school were also very small. In Gambia only 0.5% of children of school going age attended school in 1938 and in

Sierra Leone only 9,828 children attended school out of a school going age cohort of 9,828. These statistics show how low the priority given to education was by the colonial governments.

Colonial Legacy

These policies had opposing effects on the subsequent development of indigenous languages, for example, the Yoruba language spoken by those in Nigeria and Benin (formerly Dahomey). In Benin which was a French colony, Yoruba names were cast in French spellings which changed both the pronunciation of the words and their meanings[2]. In Nigeria which was a British colony Yoruba was officially recognised. Consequently, the elite in Benin were literate only in French while their Nigerian counterparts spoke in both Yoruba and English. This created problems for the Yoruba community on the Benin-Nigeria boundary as they could not communicate with one another. This problem assumed greater proportions after independence (Asiwaju 2001).

In British India, the English language continues to be viewed as the path to employment and upward mobility. Educational policy continues to reflect the objectives of the elite with rural-urban disparities and geographic inequality of access to education.

Other Colonial Policies

Latin America like Africa and Asia was subject to European colonialism. The de-colonisation of the Latin American countries occurred in the early 19th century (see Table 1) and by the mid 19th century illiteracy was still above 90%. The last column of Table 1 provides figures for illiteracy rates in 1950. Except in the case of Argentina, Cuba and Uruguay, the numbers for the rest of the countries remain very high even 100-130 years after independence. As pointed out by Grier and Acemoglu *et al.*the Spanish colonisation policy was extractive as well. Despite the fact that these countries have been marred by political instability and violence since independence, education has been acknowledged as necessary for the overall development of the region in the past 100 years or so. These countries in accordance with the UNESCO Charter have introduced a compulsory universal primary education programme under which primary education is provided free of charge. Twelve of the nineteen Latin American republics devoted over half of total public expenditure to primary education in the years up to 1960 which has led to large increases in primary school enrolments (Gale 1969).

As opposed to other colonizers, the Soviet Union provided universal primary education to all children irrespective of income or region. High priority was placed by the government to investment in education. Unfortunately many of the Soviet break away states are finding it difficult to maintain these standards amid growing economic hardship. For example investment in education has dropped in Tajikistan from 9.7% in 1990 to 3.5% in 2005 and Khazakstan from3.2% to 2.3% in the same period (UNESCO 2008).

[2] Words such as *Sabe, Ketu, Ohori* came to be known as *Save, Ketou, Holli* respectively. Personal names were similarly transformed (Asiwaju 2001).

The focus of this analysis however, is on the countries that currently face low literacy rates. These are countries that were former colonies of the British and French.

4. Data

Data sources are provided in the data appendix. The sample comprises 100 countries covering South and East Asia, South America, Central Asia and Eastern Europe, Africa and Western Europe. The model is tested by using data for 1950, 1990, and 2005. The ALR in 2005 is the dependent variable. The change in ALR 1950-2005 is also considered. Given the arguments above, per capita income and government expenditure on education are included as explanatory variables. Per capita income is PPP adjusted. Government expenditure on education is not available for many countries for 1950. Therefore the 1990 value is used (as it is available in this year for the countries of the former Soviet Union). Overseas development aid, the enrolment ratio, employment in industry as a percentage of total employment and a democracy index are used as control variables. Given that the increase in bi-lateral aid to education almost trebled between 1998 and 2003 (UNESCO 2005), overseas development aid for 1998 is added as an explanatory variable. The primary enrolment ratio has been found to positively affect the literacy rate and is therefore included as a control variable (UNESCO 1957, Verner 2005). Kim and Park (2008) show that South Koreas rapid industrialisation under the Japanese colonial regime led to its economic progress. Moreover, UNESCO (1957) shows that countries that are more industrialised have higher rates of literacy and Alam (2000) finds a positive relation between sovereignty and industrialisation. Therefore employment in industry as a % of total employment is also included in the regression analysis. Recently a literature has developed on democracy and economic growth (Acemoglu *et al*. 2008, Barro 1999, Easterly and Levine 2003). Therefore the democracy index from the Polity IV Project for 2005 is also considered as an explanatory variable. This index takes on a value of 0-10 with 0 representing a zero level of democracy and 10 representing the highest level of democracy.

Table 2 reports summary statistics for the main variables used in the study.

Table 2: Summary Descriptive Statistics

Variable	Obs.	Mean	Standard Deviation	Minimum	Maximum
Full Sample					
GDP per capita (in $) 1950	65	804.97	1,871.15	67.2	15,161
GDP per capita (in $) 2005	99	10,813.1	11,070.12	667	41,890
Adult Literacy Rate (% aged 15 years and older) 1950	90	47.05	35.50	2.5	98.5
Adult Literacy Rate (% aged 15 years and older) 2005	100	82.80	19.72	25.7	99.9
Government Spending on Education (as percent of GDP) 1990	81	4.25	1.94	1	10.6
Government Spending on Education (as percent of GDP) 2005	98	4.49	1.89	0.9	9.6

a: Includes Africa, South and South East Asia, Central Asia and Eastern Europe, Latin America. All countries listed as colonies in Table 1.

Sources: See Appendix

Figures 3-8 plot the Adult literacy rate for all countries in the sample by region for 2005. An initial examination of the data shows that the Western European, Central Asian and Eastern European countries have adult literacy rates (ALR) of almost 100%. Many of the South American countries have adult literacy rates of over 80% except for Nicaragua and Guatemala. Africa has the lowest literacy rates followed by Asia and the Middle East. In the Middle East, Algeria, Morocco, Tunisia and Yemen all of which were former colonies, have literacy rates below 80%. In South and East Asia, Cambodia, Lao, Bangladesh, India, Nepal and Pakistan have literacy rates below 80% while only Congo, Zimbabwe, Mauritius, Botswana and South Africa have literacy rates above 80% in Africa.

Figure 3: Adult Literacy Rate 2005 Middle East

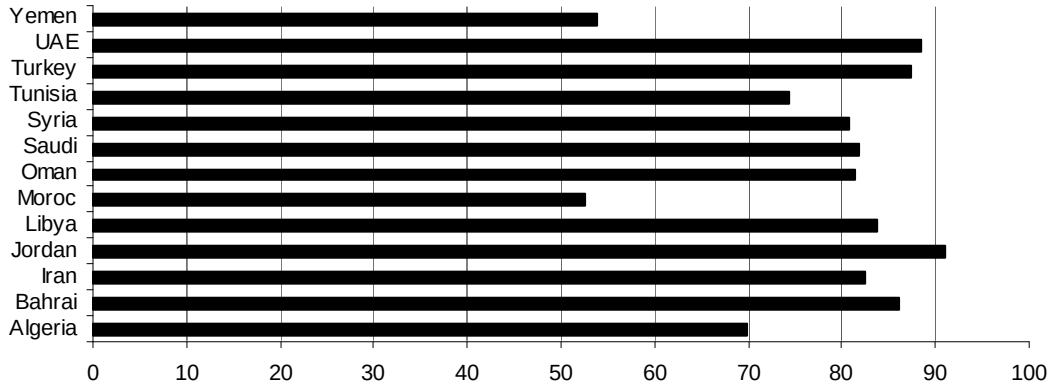


Figure 4: Adult Literacy Rate 2005 Eastern Europe and Central Asia

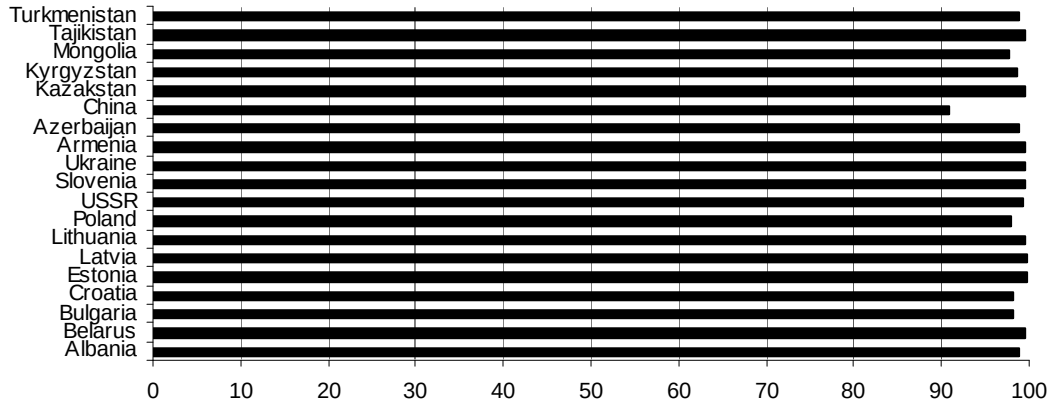


Figure 5: Adult Literacy Rate 2005 South and East Asia

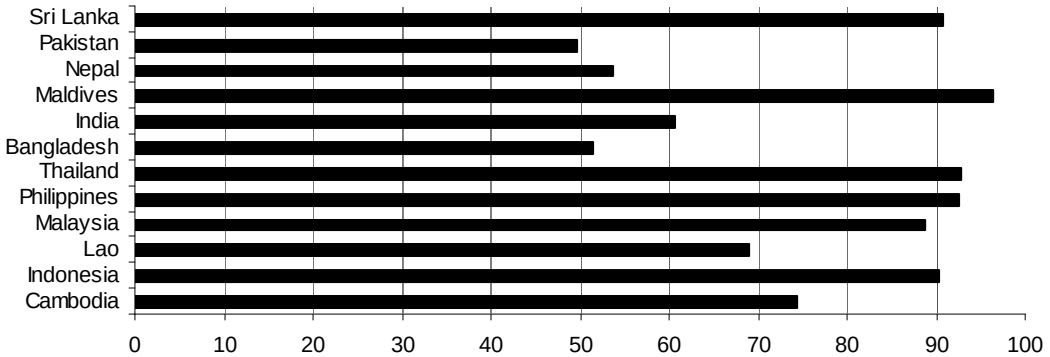


Figure 6: Adult Literacy Rate 2005 Africa

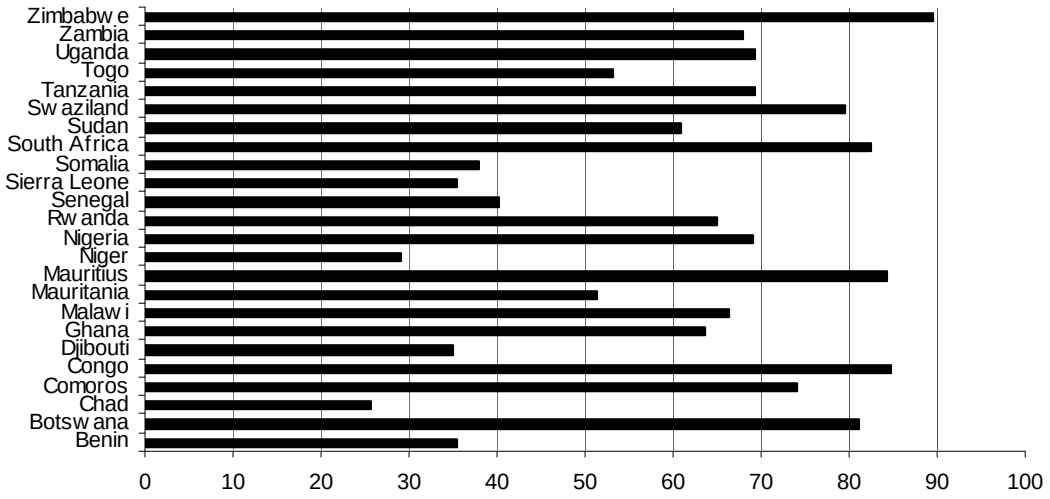
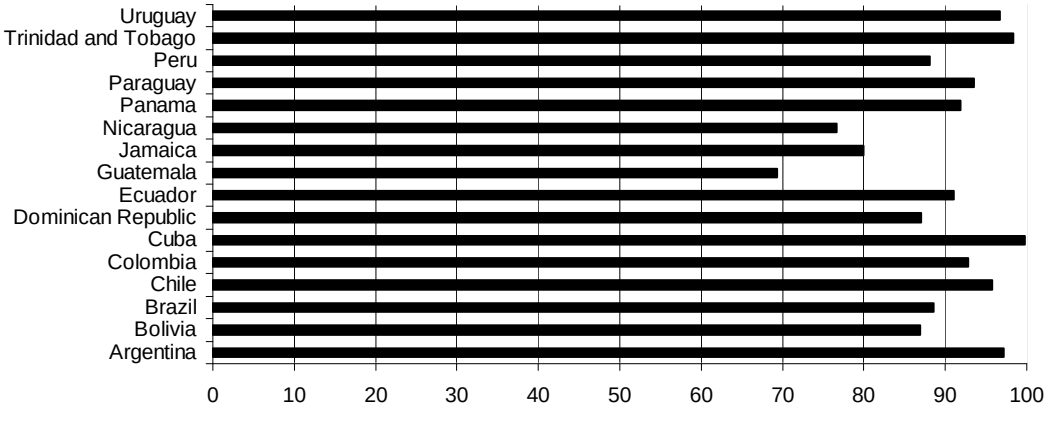
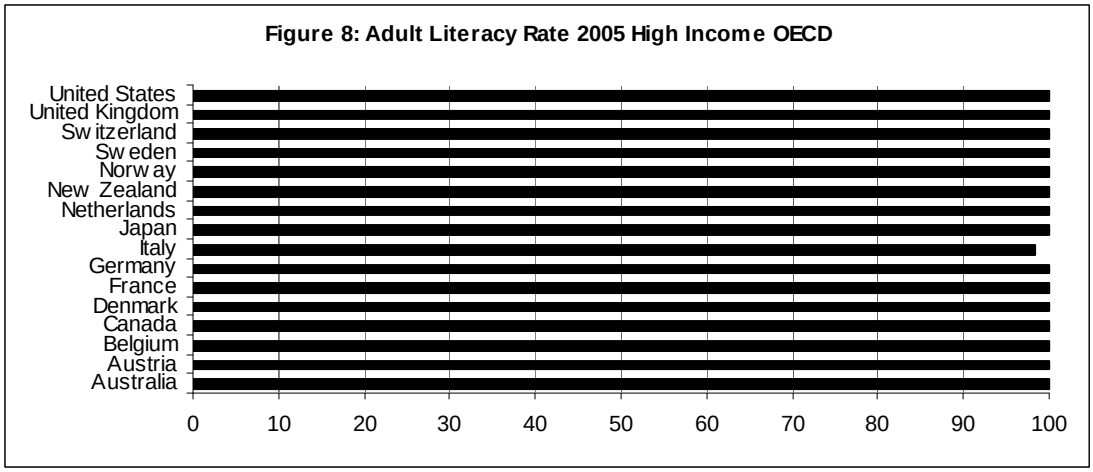


Figure 7: Adult Literacy Rate 2005 Latin America





Source: UNESCO: http://stats.uis.unesco.org/unesco/ReportFolders/ReportFolders.aspx (downloaded November 2008).

5. Empirical Estimation

Having provided the justification for the use of certain variables in the estimation in Section 4, the following model will be the basis of this study:

$$log\ ALR_{it} = \alpha + \eta log\ ALR_{it-1} + \gamma log\ Y_{it-1} + \phi log\ G_{it-1} + \boldsymbol{x}_{i-1t}\boldsymbol{\beta} + \delta d + \varepsilon \quad (1)$$

where ALR_{it} is the adult literacy rate (ALR) in country i in period t. The adult literacy rate in 2005 is the measure of economic outcome. The lagged value of the ALR in 1950, is included as an explanatory variable to test the degree of persistence in adult literacy (see Acemoglu *et al*. 2008)[3]. This variable would help to identify if the ALR in 1950 explains the ALR in 2005. Y_{i-1} denotes the lagged value of GDP per capita. G_{it-1} represents government expenditure on education as a % of GDP. All other control variables are captured by the vector $\boldsymbol{x}_{i-1t}$. These variables include, overseas development aid (ODA), the primary enrolment ratio, employment in industry as a percentage of total employment and a democracy index. The variable of interest is the colonial dummy variable, *d*. Two colonial dummies are defined for Britain and France with the rest of the countries, "other", as the benchmark group. The model is also estimated in first differences.

Some simple regressions are estimated to confirm the idea that colonialism contributed significantly to lower adult literacy rates in the French and British colonies. A common problem encountered in this type of model is endogeneity. This could occur if the exogenous variables were also a function of adult literacy, giving rise to OLS estimates that are biased and inconsistent. In order to correct for any endogeneity bias that may be present in the models, the equations are also estimated using the General Method of Moments (GMM). OLS and GMM estimates for the sample are presented in Table 3. The dependent variable is the ALR in 2005.

[3] Using the same analogy as Acemoglu et al. (2008) who include the lagged value of the democracy score of a country on the right hand side of the equation to capture the degree of persistence in democracy and mean reversion.

Equations (1) and (2) estimate the current ALR on the ALR in 1950 and the colonial dummies. The results are interesting with the coefficients on the French and British colonial dummies taking on a negative value. The coefficient on the British Colonial Dummy Variable in equation (1) for example suggests that if a country was a British colony its ALR is $[100(e^{-0.10} - 1)] \approx 10.5\%$ lower than in the benchmark group and if a country was a French colony it is 13.9% lower than in the benchmark group. The colonial dummies in all equations are negative and statistically significant suggesting that colonialism has a negative impact on adult literacy. The results confirm that the initial level of adult literacy is important for subsequent levels of literacy. In equations (3)-(4) per capita income is added to the equations, and in equations (5) – (6) government expenditure on education is added to the model. Both have a positive significant impact on literacy. Next a regional dummy is created for Africa with the rest of the countries as the benchmark group. The African regional dummy is interacted with the French colonial dummy to examine the differential impact of French colonialism on Africa. Equations (7) and (8) report these results. The interaction term in equation (7) indicates that a country that is an African French colony is 8 log points worse off than a country that is not an African French colony. The explanatory power of the models are high with the independent variables explaining 69-82 percent of the ALR. Adding the interaction term improves the explanatory power of the model. Two diagnostic tests are carried out on the GMM estimates. A Durbin-Wu-Hausman test (1954, 1973, 1978) and the J statistic of Hansen *et al.* (1996). The Durbin-Wu-Hausman test statistics indicate that the null hypothesis of exogeneity is not rejected. According to the J statistic, the null hypothesis that the model is correctly specified is not rejected.

Table 3: OLS and GMM Regressions Based on Adult Literacy

Dependent Variable ALR 2005

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	GMM	OLS	GMM	OLS	GMM	OLS	GMM
ALR_{50}	0.17 (0.02)***	0.15 (0.02)***	0.14 (0.02)***	0.17 (0.03)***	0.13 (0.03)***	0.14 (0.02)***	0.17 (0.03)***	0.13 (0.02)***
GDP Per $Capita_{50}$	-	-	0.06 (0.02)***	0.04 (0.01)***	0.05 (0.02)*	0.05 (0.02)*	0.04 (0.02)*	0.03 (0.01)**
Govt. Exp_{90}	-	-	-	-	0.12 (0.06)*	0.05 (0.02)*	0.12 (0.05)**	0.10 (0.05)*
British Colonial Dummy	-0.10 (0.04)**	-0.08 (0.04)*	-0.06 (0.03)*	-0.08 (0.03)**	-0.10 (0.04)**	-0.08 (0.03)**	-0.09 (0.04)**	-0.10 (0.04)**
French Colonial Dummy	-0.15 (0.05)***	-0.14 (0.06)**	-0.10 (0.04)**	-0.10 (0.04)**	-0.13 (0.07)**	-0.10 (0.04)**	-0.12 (0.07)**	-0.12 (0.07)**
French Colony*Africa	-	-	-	-	-	-	-0.08 (0.04)*	-0.09 (0.05)**
R^2	0.74	0.77	0.75	0.76	0.77	0.69	0.85	0.82
p value: Durbin-Wu-Hausman	-	0.35	-	0.20	-	0.28	-	0.25
p value: Hansen's J Statistic	-	0.29	-	0.28	-	0.69	-	0.34

Notes: Robust standard errors reported in parenthesis. *, **, *** Significant at the 10%, 5% and 1% levels respectively. Instruments used for the GMM estimation are the secondary enrolment ratio and the % of labour force with primary education.

Table 4 reports results for the change in adult literacy rate over the 1950 to 2005 period. The initial level of adult literacy is negative and statistically significant in all equations suggesting that countries starting off with lower levels of literacy are improving at a faster rate. As before, the colonial dummies are negative and significant. The coefficients on the colonial dummy variables in equation (2) for example indicate that the ALR in a country that was a British colony is $[100(e^{-0.09} - 1)] \approx 8.6\%$ lower than in the benchmark group and the ALR in a French colony is 13.01% lower. Both the change in income and government expenditure have a positive effect on the change in adult literacy. The explanatory power of the models are 0.97. The results strongly support the argument that colonialism exerts a negative effect on adult literacy.

Table 4: OLS and GMM Regressions Based on the Change in Adult Literacy

Dependent Variable ΔALR 1990-2005

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	GMM	OLS	GMM	OLS	GMM	OLS	GMM
ALR_{50}	-0.83 (0.10)***	-0.84 (0.02)***	-0.80 (0.02)***	-0.82 (0.02)***	-0.81 (0.02)***	-0.83 (0.02)***	-0.80 (0.02)***	-0.84 (0.02)***
ΔGDP Per $Capita_{50-05}$	-	-	0.02 (0.02)	0.04 (0.04)	0.03 (0.02)	0.04 (0.02)*	0.02 (0.02)	0.03 (0.01)**
$\Delta Govt.\ Exp_{90-05}$	-	-	-	-	0.05 (0.03)*	0.06 (0.05)	0.02 (0.01)*	0.04 (0.04)
British Colonial Dummy	-0.10 (0.04)**	-0.09 (0.04)*	-0.04 (0.01)***	-0.07 (0.04)*	-0.05 (0.02)**	-0.09 (0.04)**	-0.09 (0.04)**	-0.08 (0.02)***
French Colonial Dummy	-0.14 (0.03)***	-0.14 (0.06)**	-0.14 (0.04)***	-0.11 (0.07)*	-0.12 (0.04)***	-0.08 (0.03)**	-0.07 (0.03)**	-0.14 (0.05)***
Africa *French Colony	-	-	-	-	-	-	-0.13 (0.04)***	-0.12 (0.04)***
p Value: Joint St. Significance for Region	-	-	-	-	-	-	-	-
R^2	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
p value: Durbin-Wu-Hausman	-	0.23	-	0.15	-	0.14	-	0.16
p value: Hansen's J Statistic	-	0.34	-	0.25	-	0.22	-	0.19

Notes: Robust standard errors reported in parenthesis. *, **, *** Significant at the 10%, 5% and 1% levels respectively. Instruments used for the GMM estimation are the secondary enrolment ratio and the % of labour force with primary education.

Robustness Checks

A number of tests are carried out to check if the results obtained above are robust to the estimation procedure and use of alternative variables.

<u>GMM Estimation</u>

The study has been carried out using GMM estimation in addition to OLS to correct for any potential endogenity bias (explained above) – see Tables 3 and 4. It can be argued that the results are robust to the estimation technique. The Durbin-Wu-

Hausman test suggests the absence of any statistically significant difference between the OLS and GMM estimates and the J statistic of Hansen suggests that the instruments used are valid.

Robust Regression

According to Temple (1998), outliers that arise from measurement error, omitted variables or parameter heterogeneity can bias the results of parameter estimates. Therefore in order to address the issue of omitted variables and influential outliers, the equations are re-estimated using the robust regression technique which gives minimum weight to outlying observations. The results are reported in Table 5. The estimates are consistent with the OLS and GMM estimates suggesting that the estimates are not unduly influenced by influential outliers. The colonial dummy which is the variable of interest continues to take a negative value.

Table 5: Robust Regression

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent Variable ALR_{2005}			Dependent Variable $\Delta ALR19_{1950\text{-}2005}$		
ALR_{50}	0.16 (0.004)***	0.16 (0.004)***	0.15 (0.004)***	-0.83 (0.003)***	-0.83 (0.003)***	-0.83 (0.003)***
GDP Per $Capita_{50}$	-	0.04 (0.02)*	0.06 (0.03)*	-	-	
Govt. Exp_{90}	-	-	0.01 (0.01)	-	-	-
ΔGDP Per $Capita_{50\text{-}05}$	-	-	-	-	0.008 (0.004)*	0.006 (0.005)
ΔGovt. $Exp_{90\text{-}05}$	-	-	-	-	-	0.005 (0.004)
British Colonial Dummy	-0.10 (0.02)***	-0.05 (0.03)*	-0.03 (0.009)***	-0.04 (0.01)	-0.02 (0.007)***	-0.02 (0.007)***
French Colonial Dummy	-0.15 (0.03)***	-0.09 (0.04)*	0.12 (0.03)***	-0.11 (0.02)***	-0.12 (0.02)***	-0.10 (0.02)***
R^2	0.95	0.95	0.97	0.97	0.97	0.97

Notes: Standard errors reported in parenthesis. *, **, *** Significant at the 10%, 5% and 1% levels respectively.

Alternative Regressors

The models are re-estimated with a number of different control variables described above to ensure that the results are robust to alternative regressors - overseas development aid, the primary enrolment ratio, employment in industry as a % of total employment and a democracy index. The results are reported in Table 6.

Table 6: Regressions with Control Variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Dependent Variable ALR_{2005}					Dependent Variable $\Delta ALR19_{1950\text{-}2005}$				
ALR_{50}	0.17 (0.02)***	0.18 (0.03)***	0.20 (0.03)***	0.11 (0.02)***	0.11 (0.02)***	-0.82 (0.02)***	-0.80 (0.04)***	-0.77 (0.03)***	-0.76 (0.03)***	-0.80 (0.04)***
GDP Per $Capita_{50}$	0.05 (0.02)*	0.04 (0.01)***	0.04 (0.01)***	-0.03 (0.01)**	0.001 (0.02)**	-	-	-	-	-
Govt. Exp_{90}	0.14 (0.04)**	0.13 (0.06)*	0.09 (0.06)	0.03 (0.03)	0.07 (0.04)	-	-	-	-	-
ΔGDP Per $Capita_{50\text{-}05}$	-	-	-	-	-	0.02 (0.02)	0.06 (0.05)	0.02 (0.03)	0.03 (0.02)	0.03 (0.03)
ΔGovt. $Exp_{90\text{-}05}$	-	-	-	-	-	0.01 (0.04)	0.001 (0.06)	0.02 (0.05)	0.02 (0.01)*	0.02 (0.01)*
British Colonial Dummy	-0.04 (0.01)***	-0.10 (0.04)**	-0.09 (0.03)***	-0.08 (0.03)**	-0.05 (0.01)***	-0.05 (0.02)**	-0.04 (0.01)***	-0.05 (0.02)**	-0.05 (0.02)**	-0.04 (0.01)***
French Colonial Dummy	-0.10 (0.03)***	-0.11 (0.05)**	-0.12 (0.05)**	-0.10 (0.04)**	-0.11 (0.05)**	-0.12 (0.05)**	-0.06 (0.02)***	-0.10 (0.07)*	-0.10 (0.04)**	-0.08 (0.03)**
Primary Enrolment $Ratio_{90}$	0.42 (0.06)***	-	-	-	0.33 (0.11)***	-	-	-	-	-
ODA_{98}		-0.001 (0.001)	-	-	0.01 (0.01)	-	-		-	-
Employment in $Industry_{90}$				0.08 (0.03)**	0.16 (0.05)**				-	-
ΔPrimary Enrolment $Ratio_{90\text{-}05}$	-	-	-	-	-	0.01 (0.02)	-	-	-	0.02 (0.01)
Δ $ODA_{98\text{-}05}$	-	-	-	-	-	-	0.04 (0.03)	-	-	0.04 (0.03)
Democracy $Index_{05}$	-	-	0.03 (0.02)	-	-	-	-	0.03 (0.01)*	-	0.01 (0.01)
Δ Employ-ment in $Industry_{90\text{-}05}$									0.07 (0.03)**	0.05 (0.02)**
R^2	0.88	0.65	0.74	0.78	0.83	0.97	0.95	0.96	0.96	0.96

Notes: Robust standard errors reported in parenthesis. *, **, *** Significant at the 10%, 5% and 1% levels respectively.

Again, the initial level of ALR is statistically significant suggesting that the initial level of literacy is important for subsequent levels of literacy. The initial level of GDP per capita is significant, however, the growth in GDP per capita is not significant. The primary enrolment ratio is significant in the levels equations however, not significant in the first difference equations. This variable is significant at the 1% level in equation (1) suggesting that primary enrolment is important for adult literacy. The coefficient on Overseas Development Aid is not statistically significant. The democracy index is significant only in equations (4) and (7) at the 10% level. The coefficient on employment in industry is significant in all equations suggesting that increased industrialisation leads to higher literacy rates. The addition of these variables to the models however, do not change the overall results suggesting that the results are robust to the choice of regressors.

6. Discussion

Challenges

The question that arises next is, why these economies have not advanced rapidly after de-colonisation? The evidence presented in this study suggests that although de-colonisation has led to improvements in literacy, the rates are still below average in many of the former colonies. It can be argued that the lack of mass education programmes during the colonial era made it difficult for these countries to establish such structures after de-colonisation. It can be speculated that the initial preoccupation of these countries would have been on teacher training and setting up the necessary infrastructure to re-instate their own native languages rather than on teaching the language itself. Students would then have been confronted with the dual task of re-learning their own native language which was "foreign" to them. Achieving the necessary literacy standards under such circumstances is not an easy task. In Tunisia, Algeria and Morocco for example, nationalising a system that was designed to teach in French proved to be a major challenge. Many teachers were trained only to teach in French and the necessary Arabic textbooks were not available in the period immediately following de-colonisation. By the 1980s the shift to Arabic still remained incomplete and some instruction was still being given in French[4]. Moreover, education at the secondary level in the Arab states with the exception of Lebanon is controlled and administered by a central ministry. These ministries are often subject to administrative inefficiencies. The position in Africa and Asia were much the same. Asiwaju (2001) observes that, "African states and their leaders are evidently aware of the need to change the structure of the educational system bequeathed by former colonial masters as this is increasingly discovered to be inadequate for the purposes of the new societies. However, the hold of establishment, in this case, the colonial heritage, remains very stubborn."

How do these Countries Compare Against Countries that were not Colonised?

Table 7 presents literacy rates for selected countries that were not colonised.

Table 7: Adult Literacy in Selected Countries

Country	Adult Literacy Rate 2005
China	90.8
Iran	82.4
Thailand	92.7
Turkey	87.4

Note: Not taking into account countries that had high literacy rates in 1950.
Source: UNESCO: : UNESCO: http://stats.uis.unesco.org/unesco/ReportFolders/ReportFolders.aspx

The above Table shows that these countries that were not colonised, have made rapid strides in the area of literacy as opposed to the countries that were colonised (see Table 1). Education was not confined to a minority so that educational opportunity was equal. Nor were these societies confronted with the additional challenge of having to learn a foreign language or face the subsequent problems of having to re-

[4] Education (200) In Encyclopedia Britannica
http://www.britannica.com/EBchecked/topci/179408/education (downloaded November 2008).

instate and learn their own native languages. Therefore their trajectory has been upward. Many of these countries have introduced literacy programmes targeted at eliminating illiteracy in the rural areas, for example the Iranian programme of 1962, the Compulsory Education Law of 1986 in China. These programmes are not without their own problems however, these countries have been able to invest in education for the masses without having to face the additional problems of the colonized.

Outliers

How have some countries that were colonised succeeded in improving their literacy rates? African countries such as Congo, South Africa, Botswana and Zimbabwe have made significant advances in literacy since 1950. According to Fieldhouse (1981) Congo had several factors that made it unique, contributing to its industrialisation – a large population, the mining industry, communication infrastructure and it engaged in free trade. The result was the growth and increase in productivity in the industrial sector. Unlike other Asian and West African countries which relied heavily on the plantation sector, Congo was not constrained by the lack of industrial capital. The empirical results above support the argument that there exists a positive relation between industrialisation and literacy. It is possible that industrialisation paved the way for Congo to develop the necessary infrastructure for education. While Botswana, South Africa and Zimbabwe were also endowed with some of these factors, these countries were also settler colonies. Settler colonies enjoyed considerable internal self government (Alam 2000). It is possible that education was more de-centralised in these countries than in those that were not settler colonies.

The experience of Singapore and Malaysia for example (formerly Malaya), demonstrates that countries with strong nationalist leaders have been more successful in carrying out educational reforms. The percentage that was illiterate in Malaya (including Singapore) was 60.3% in 1950[5]. After 1963 education policy in Malaysia has successfully established Malay as the medium of instruction and English is taught only as a second language. In Singapore on the contrary, English is the medium of instruction and all are required to learn a second language. These two countries have thereby been able to centralise education and build a national consciousness among the different ethnic groups.

In Sri Lanka and Mauritius (see Table 1) on the other hand, literacy rates were relatively high at the time of independence. Sri Lanka, India and Mauritius obtained a certain degree of self government prior to independence. In Sri Lanka, the colonial government introduced the Donoughmore Constitution in 1931 which gave the responsibility of certain areas including education to the State Council. In 1939 the State Council passed The Education Ordinance No. 31 under which the education system was re-structured and in 1945 a Free Education System was introduced from Kindergarten to university level. The free education system in Sri Lanka is operative to date which explains the reason for the high literacy rates in Sri Lanka from the time of independence. Similarly, in Mauritius a law was passed in 1944 providing free education at the primary level which can be attributed to the high literacy levels. While Sri Lanka and Mauritius were able to use the self government given to them to their advantage, India was not. Given the size of India, literacy was not a central

[5] UNESCO (1957) World Illiteracy at Mid-Century: A Statistical Study, Geneva.

government subject. This has led to differences in literacy rates among the different states.

A key implication of this is that there can be no simple separation between colonialism and de-colonisation. It is evident from Table 1 that the effects of colonialism on the education systems of the Latin American countries were felt 100-120 years after de-colonisation. It is possible to speculate from the experience of Latin America that these countries too would achieve literacy rates above 80% fifty years hence.

7. Conclusion

This study examines the reason for differences in adult literacy rates across countries. Colonialism is shown to slow down improvements in literacy in the former colonies with these countries still lagging behind. The results are consistent with the historical evidence which shows that the education systems of countries under the colonial rule were alien and irrelevant to the masses catering to the needs of a small elite.

The next question is, what should these countries do to overcome the literacy challenges imposed on them by the colonial rule? Many of these countries have been marred by political unrest since independence which is often cited as a reason for the lack of progress. Education should be used as an instrument for achieving the goals of social unity, political stability and equality of employment. In order to achieve this, there is a need for an educational system that is deeply entrenched in the cultural life of the community and one that is relevant to the masses. Centralising education can only be done by policy makers together with other national institutions. Many countries have realised the importance of investing in education. Government expenditure should initially be channelled towards primary education as a means towards improving literacy.

Progress has been made in the area of primary enrolments in Asia, Africa and the Middle East. An universal primary education for all framework modelled along the lines of the South American experience or a free education system as in Sri Lanka would enable these countries to progress more rapidly.

A well targeted non-formal education programme for primary school leavers can be provided through village polytechnics comparable to those in Kenya. These polytechnics would offer skills not offered at the school level for those planning to undertake agriculture and other skill related activities.

In conclusion, it should be noted that achieving increases in literacy is not an objective that can be achieved within a short space of time. It is a challenging task that requires the implementation of policies that will ensure equal access to education for all.

Appendix

The data used in the empirical estimation come from the following sources:

- Adult Literacy Rate 1990, 2005: UNESCO Literacy statistics http://stats.uis.unesco.org/unesco/ReportFolders/ReportFolders.aspx and Human Development Reports.
- Adult Literacy Rate 1950 – Calculated as 100% less Illiteracy Rate 1950 (Where a data range is given for the illiteracy rate, the mid point is taken): UNESCO (1957) World Illiteracy at Mid-Century: A Statistical Study. Geneva.
- GDP per Capita 1990, 2005 (PPP adjusted): World Development Indicators and World Development Reports.
- GDP per Capita 1950 (PPP adjusted): Heston A, Summers R and Aten B (2002). Penn World Tables Version 6.1. Philadelphia: Centre for International Comparisons at the University of Pennsylvania.
  The 1950 figures were unavailable for all countries. Figures for China, Chile, Colombia, Dominican Republic, Ecuador, Ghana, Jamaica, Jordan, Malaysia, Panama, Sri Lanka, Zambia are 1955 figures. Those for Algeria, Benin, Chad, Comoros, Congo, Indonesia, Nepal, Niger, Syria, Tanzania and Tunisia are 1960 figures.
- Public on Education as % of GDP 1990, 2005: UNESCO and Human Development Reports. Barro R and Lee J (2000). International Data on Educational Attainment: Updates and Implications. Centre for International Development Working Paper 42-2000.
- Primary Enrolment Ratio 1990 and 2005: UNESCO and Human Development Reports.
- Secondary Enrolment Ratio 1990, 2005 (used as instrument in the GMM estimation): UNESCO and Human Development Reports.
- Percentage of Labour Force with Primary Education 2005 (used as instruments in the GMM estimation): World Development Indicators and World Bank Education Statistics.
- Employment in industry as a % of total employment 1990 and 2005: Human Development Reports.
- Overseas Development Aid 1998 and 2005: Human Development Reports.
- Democracy Index: Marshall M and Jaggers K (2006). Polity IV Country Reports 2006. http://www.systemicpeace.org/polity/polity06.htm#nam (downloaded December 2008)

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