A Theory of Colonial Governance*

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Abstract

This paper considers conditions of optimality in a co-optive strategy of colonial rule. It proposes a simple model of elite formation emanating from a coloniser's quest to maximise extracted rents from its colonies. The results of the model suggests multiple optimal solutions, depending on the specification of the production function, the governance technology chosen by the coloniser, the returns to human capital, as well as on the parameterisation of the productivity distance between elites and the population masses. For instance, the core results suggests that under both a technology of governance by numbers and quality, a better productivity enhancing technology always minimises power loses by the coloniser and vice versa. Whereas, under a composite governance technology and given an agrarian colonial economy, a coloniser maximises its objective function by trading-off elite size with the quality of human capital transfers, only when the productivity distance between the elites and masses is narrow. However, in an industrial economy that is using a composite governance technology, the better the productivity enhancing technology, the bigger the optimal elite size. The implication of these results is that, the optimal elite characteristics necessarily varried from one colony to another, notwithstanding the colonial experience. This insight is useful in understanding why the stock of human capital available in countries emerging from colonisation varied considerably across colonial experiences and from one country to another.

Keywords: Optimality Conditions, Governance technology, human capital, elite, productivity.

JEL Codes: F54, I20, 015, N47.

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1 Introduction

This paper examines optimality conditions in a co-optive strategy of colonial rule in both agrarian and industrial African economies. It assumes rationality on the part of all agents namely, the colonisers', the indigenous elites and general population. It assumes further that human capital transfers from the colonisers' to the elites occupy *centre-stage* in a co-optive governance strategy and the purpose of human capital transfers is to enhance the productivity of the elites', which in turn, increases the rents that accrue to the colonisers'. However, human capital transfers to the elite also raises their aspirations to greater wellbeing, which effectively reduces the rent flow to the colonisers'.

This suggests that in the transfer of human capital to the elite, the colonisers' face a choice tension between enhancing productivity gains for the economy on the one hand, and minimising power loses as a result of the rising aspirations of the elite on the other hand. How this choice tension is handled depends on a number of parameters namely, the choice of governance technology, the productivity distance between elites and masses, the returns to human capital and on the specification of the production function. The coloniser's choice of governance technology is assumed to be a function of its pattern of human capital transfers, which in turn depends on its colonial educational ideology. Our choice of focus in this paper is on the contrasting approaches to human capital transfers in the British and French sub-Saharan African empires in general although specific reference is made to West Africa. But first a brief historical introduction is necessary to set the stage for the subsequent sections of the paper.

1.1 Historical Background

The debate preceding the scramble for Africa suggests that colonies offered an expected return to the colonisers[1]. Once acquired, it became imperative for the colonisers' to choose the governance strategy that maximised their expected return. Historical evidence points to two major strategies of colonial governance namely, absolute subjugation[2] and co-optation in governance[3].

[1] Whilst on most occasions these payoffs could be expressed in economic terms, in other instances, they were cultural or geo-strategic.

[2] Absolute subjugation or military dictatorship generally entails the use of repression to appropriate the resources of the colonies and is assumed to involve minimal redistribution to the population of the colonies. For instance, it is popularly claimed that the poineer colonial governance strategy was by direct military rule.

[3] Co-optation in governance or better still, *indirect rule*, meant the retention of traditional authorities as agents of local government entrusted with power by the colonial administration and is based on the

It is believed that towards the late nineteenth century, orthodox colonial ideology in Africa had shifted from absolute subjugation to co-optation of elites[4]. Co-optation in governance, is presumably an idea first explored by Sir Arthur Gordon in Fiji (1874-80)[5], but it was not until Frederick Lugard governed in Nigeria during the first two decades of the twentieth century that it became orthodox colonial ideology, Bolton (1973:69). In its original conception, the British co-optation strategy aimed to provide western education to only the sons of chiefs, who would later inherit traditional authority as educated chiefs capable of intermediating between the British government and the indigenous population, Foster (1965), and McWilliam & Kwamena-Poh (1978).

The idea being that the newly educated chiefs were more likely to favourably appreciate British civilization and defend the interests of the Crown in the colony. As such, Article 9 of the treaty of 1817 signed by the Kings of Ashanti and Juaben required that:

> 'The kings agree to commit their children to the care of the Governor-in-Chief for education at Cape Coast Castle, in full confidence of the good intentions of the British Government and of the benefits to be derived therefrom'.

Just as the British established the Castle School for sons of chiefs at Cape Coast, the French also created the "Ecole des Hôtages" in 1854 in Senegal for the sons of chiefs[6]. This suggests that both the British and French colonial administrations pursued an "aristocratic" policy of recruitment into special institutions that trained elites for use in colonial administration. In addition, both British and French colonial masters maintained a relatively small administrative bureaucracy. This similarity naturally blurs the distinction

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philosophy that it was possible to utilise traditional political institutions in development. The envisaged administrative role of co-opted agents was to ensure law and order, collect taxes and supply labour.

[4]It can be argued that this shift was a rational decision on the part of the colonisers, owing to the increasing costs associated with military dictatorship. These costs were rather becoming convex as the presence of a military provoked resistance from the indigenous population, which necessitated the deployment of further resources to quell the rebellion. Furthermore, the lessons of the Indian revolt in 1857 made the option of military dictatorship even less appealing to the metropolitan powers. It is to be recalled that the 1857 Indian revolt was provoked by British attempt at taking over native Indian states whose rulers had left no heirs. This provoked sections of both the Hindu and Muslim communities into rebellion. Martin (2005), Piers Brendon (2005) and Maddison (1971:42) have argued that the Indian revolt in 1857, though unsuccessful, signalled to the British colonial power that the option of military intervention is not always optimal and the lessons of the revolt raised awareness that sparked off early nationalist activism in most parts of the British empire.

[5]Prior to this date, sources reveal that attempts were already made at training the to-be co-opted elites but the actual utilisation of these elites in governance was supposedly first experimented by Sir Arthur Gordon.

[6]See Foster (1965)

usually made between "indirect rule" as administered by the British and "direct rule" as administered by the French colonial powers in their respective colonies[7].

Furthermore, historical sources[8], claim that during the 1920's and 1930's, there was a trend towards convergence in both theory and practice in the British and French west African colonial empires and colonial administrators in both empires worked under similar material limitations. For instance, until very late in the colonial period, the colonies of both empires were expected to be financially self-sufficient, and the administrators had to manage their districts with meager resources in money and technical personnel.

In spite of the observed similarities in the practice of co-optation, there were nevertheless some marked differences between the British and French approaches. It has been argued that the British system of co-optation differed from that of the French mainly in the area of educational transfers. The British had initially relegated educational provision to missionary bodies, who trained without regard for placement, whereas, the French administered education through state-owned schools and thus had a more prudent management of educational turn-over than the British. Wallerstein (1959:59) notes that[9] :

> "British educational policy was haphazard and neglected placement, in part because it was largely in the hands of the missions, whereas the French educational policy, conducted largely in state-owned schools, was more systematic. The French trained only those for whom they were willing to find a position in the colonial structure. But the British trained without regard for this, and they did not expand the positions available for African placement to meet the expanded supply".

Because the British tolerated rival educational institutions, and emphasized village schools and the use of local vernacular languages as medium of instruction in their colonies, educational turn-over in British colonies was expected to be higher than in French colonies where primary pupils needed to be boarded to far away schools where they were taught by French teachers, using French textbooks and French language as medium of instruction.

[7] Foster (1965:140-141) argues that, the British were never really consistent in their choice of "indirect rule". For instance, at inception of "indirect rule", the British emphasized the role of traditional African chieftaincy institutions in the administration of the colonies at the expense of the educated African elites. But when discontent starting mounting from the latter, the British reluctantly resorted to using the elites in administration, as the French originally did, and most of the elites utilised in the British colonies were not sons of Chiefs as was in the original plan.

[8] See for instance, Gann & Duignan (1970) and Gifford & Louis (1971).

[9] Hailey (1957:1197) also notes that the most characteristic features of French educational policy were - the universal use of French as the medium of instruction; a consistent policy of linking the provision of more advanced type of education to existing demand for it and its zero tolerance policy on vocational training.

Furthermore, it appears that the British were less stringent than the French in setting and pursuing their educational priorities. For instance, Foster (1965:60) and McWilliam & Kwamena-Poh (1978:23-24) document the first abortive British attempt at co-opting two Asante Princes (Ansa, the son of the former Asantehene and Inkwantabissa, son of the incumbent), who were sent to England for education in 1831 in order to become British agents on the Gold Coast. On return to the Gold Coast in 1841, neither of them agreed to stay in the court of the Asante chiefdom, choosing rather to settle permanently in Cape Coast on British government pensions. Hailey (1957:1197) argues that the French, on the contrary, were more purposeful than the British in both the provision of advanced education and in utilisation of their trained manpower.

One of the most acclaimed merits of co-optation in governance, is that it was inexpensive and less distortionary on pre-existing traditional political institutions. However, co-optation had a major *unanticipated* consequence on empires, by raising the aspirations to power of the indigenous elites, which partly contributed to the demise of colonisation. A possible reason for this is that, as Fedderke & Kuluratne (2008) have argued, educational transfers from the so-called rich (here denoted by the colonisers) to the poor in society (here denoted by the indigenous elite) raises the political aspirations of the latter, which in turn, erodes the power of the former.

1.2 Research Question

Having settled the idea that co-optive governance necessarily entailed the transfer of human capital from the colonisers' to the indigenous elites, and given the inherent trade-off between productivity gains for the colony and power loses by the colonisers', a fundamental question that needs to be addressed is what *degree* of human capital is to be transferred to the elite? In other words, what format of elite, in terms of size[10] and quality[11], maximises the coloniser's objective function?

This paper seeks to answer the above question by presenting a simple model of elite formation emanating from the colonisers' quest to maximise extracted rents from its colonies.

The paper is organised as follows. Section 2 presents the theoretical framework, the core predictions of the model and a discussion of the results. Section 3 presents some

[10] Refering to small or large elite dimension.

[11] Refering to the number of years of education to be given to a representative member of the elite population.

empirical data in support of the relevance of the model while section 4 concludes the paper.

2 Theoretical Framework

We now outline a simple model to formalise the ideas discussed in the preceding section, the hope being to determine the likely optimal combinations of elite size and quality that satisfy the coloniser's objective of simultaneously enhancing productivity gains and minimising power loses. But first a note of caution is in order. The model we describe below is a stylization and not intended as an accurate representation of historical events.

2.1 The Environment

The basic premise is that, acting as rational agents in pursuance of their own self-interest, the colonisers' need neccesarily to transfer human capital in the form of education to a select portion of the indigenous population of their colonies. The education received by this select group of individuals (whom we henceforth call the elite) distinguishes them from the rest of the population (henceforth referred to as the masses). The purpose of educational transfers to the elite is to raise their productivity and output, which in turn increases the size of the pie from which the coloniser appropriates. Because educational transfers to the elite raises their aspirations to greater wellbeing, which in turn erodes the power of the colonisers[12], there exists a threshold level of educational transfers that any coloniser would not allow.

The coloniser's aim is to appropriate the maximum possible proportion of output produced in the colony and this is a function of its power. We express this power of the coloniser to appropriate the colony's resources in terms of three different types of governance technologies depending on the specific characteristic of the elite (size, quality or both) that the coloniser emphasizes. These are namely, a technology of governance by numbers, a technology of governance by quality and a composite governance technology.

In a technology of governance by numbers, it is assumed that the coloniser's emphasis is on getting the "right" size of the elite population that will maximise output. It makes sense for the coloniser to control the elite size because the larger the latter, the more costly it is to the coloniser[13]. Accordingly, the concept of power is hereby defined solely

[12] The coloniser's power is defined in terms of its ability to appropriate the resources of the colony.

[13] More educated people could either mean a heavier payroll for the coloniser or a disgruntled and possibly subversive elite.

in terms of relative population proportions, that is, the ratio of the population aspiring to power in the total population.

In a technology of governance by quality, we assume that the emphasis of the coloniser is on transfering the requisite stock of human capital that the elites need in order to produce optimally. It makes sense to control the stock of human capital that the elite holds because the greater the latter, the smaller the power of the coloniser[14]. Thus, in this case the concept of power is characterised in terms of the total stock of human capital that the group aspiring to power holds relative to that held by the total population.

In a composite governance technology, the emphasis of the coloniser is on both the size of the elite and the stock of human capital that it holds. Increasing either of the latter or both of them decreases the power of the coloniser.

Finally, the model rests on the following assumptions namely, that all agents are rational, members of each population group (colonisers', indigenous elites' and masses) are homogenous, military dictatorship and co-optation strategies are mutually exclusive, and the colonisers' and elites monopolise power while masses hold no power[15]. The model also abstracts from remuneration of factors of production[16] and from the cost of human capital transfers to the elite.

2.2 The Model

Consider a society that has been colonised by a foreign power. Suppose that initially the society is comprised of mainly one group of individuals - the indigenous population masses (D); and members of this group are assumed to be homogenous. Assuming that there is no population growth, the total population in the society, L, is exactly equal to the indigenous population, L^d, that is:

$$L = L^d$$

After the coloniser arrives, he creates a new group of individuals called the elite (E), whose members are previous members of the indigenous population mass L^d, implying

[14] A more educated elite potentially has greater aspirations to wellbeing which in turn threatens the power of the coloniser.

[15] This is for simplification purposes, although from an analytical standpoint, it still makes sense to neglect the power of the population masses because, according to our assumptions, the masses hold a negligible amount of human capital implying that their associated political aspirations might equally be negligible.

[16] For instance, wages to the elite and subsistence wages paid to the agrarian population.

that the total population in the society is now given by:

$$L = L^d = L^e + L^p$$

and

$$L^p = \left(L^d - L^e\right) = (L - L^e)$$

where by definition:

$$0 < L^e < L^p < L$$

where L^e and L^p denotes the population of the elite group and the new size of the population mass group respectively. At any point in time, the size of the elite population, L^e is determined by the coloniser whereas, the total population is exogenously given.

Prior to the arrival of the coloniser, all members of the indigenous population mass group, L^d, are endowed with a baseline human capital of $\overline{h}$. This baseline human capital can be thought of in terms of a fixed stock of basic knowledge acquired through traditional learning methods by each member of the indigenous population.

We assume that the primary objective of the coloniser is to maximise extraction of the colony's resources for the furtherance of its own empire[17]. We assume further that the coloniser prefers a strategy of elite co-optation over a strategy of absolute subjugation (which entails zero redistribution to the population). Under an elite co-optation extraction strategy, the coloniser selectively redistributes some of its own resources to the indigenous population with the dual intentions of raising the latter's productivity for optimal extraction, and also minimising its monitoring costs.

Thus in this model, the coloniser transfers human capital (δ) only to the elites who wind up with a higher endowment of human capital resources $(1 + \delta)\,\overline{h}$ relative to the general population masses who own $\overline{h}$. It is worth emphasizing that the distinction between the elite and the general population is made solely in terms of their relative endowments in human capital, which stems from the fact that the coloniser redistributes human capital, δ, to the elite group only. This is exemplified for instance, by the fact that the elite are offered the opportunity of formal schooling which is not available to the general population. However, human capital transfers made to the elite can be either of low quality (*low* δ), implying fewer years of formal schooling or of high quality (*high* δ), implying

[17] Many historical sources have argued that an important motive for empire is the extraction of raw materials for use in production in the imperial economy. See for instance, Rhoda (1973:19), Bolton (1973:24) and Douglas (1978:265).

comparatively higher number of years of formal schooling.

Co-optation of the elite has only one major cost to the coloniser, which is that it reduces the rents flow to the coloniser, as the elites effectively appropriates some of it. These rent loses translate into diminishing power of the coloniser which we internalised in the model.

In pursuing its extraction strategy, the coloniser factors in two main concerns. On the one hand, the returns from production in the colony which are a function of human capital transfers to the elite. And on the other hand, the coloniser's ability to appropriate output that is produced in the colony which is a function of it's power.

Firstly, the returns from productive activity in the colony. For simplicity, we start with an additively seperable production function and later consider a more general form of the production function.

2.2.1 Independent Production

Following Hirschleifer (1995) and Fedderke & Kularatne (2008), we assume a society with two differentiated sectors - an agrarian versus an industralised sector - wherein members of each sector do completely different things. Assuming a simple growth model with human capital as the only factor of production, output obtained from productive activity in an agrarian colonial economy is given as:

$$Y = A_e L^e \left[(1+\delta)\,\overline{h}\right]^{\theta} + A\left(L - L^e\right)\overline{h}^{\theta} \tag{1}$$

where A_e and A represents the technology that is available to the elite and mass sectors of the population respectively, and definitionally, $A_e > A$. Y denotes output[18]. Finally, θ represents returns to human capital; such that:

$$\theta = \left\{ \begin{array}{c} >1 \text{ represents increasing returns} \\ =1 \text{ represents constant returns} \\ <1 \text{ represents decreasing returns} \end{array} \right\}$$

One deduces from equation 1 above that a high return from production in the colony is obtained by giving a high number of years of formal schooling (*high* δ), to as many elite (L^e), as possible while fewer years of formal schooling produces low return[19].

[18] Observe that output under elite co-optation is higher than that obtained in the absence of human capital transfers, as long as the productivity of the elite is higher than that of the masses.

[19] See that as long as $A_e > A$, $\frac{\partial Y}{\partial L^e} > 0$ and $\frac{\partial Y}{\partial \delta} > 0$.

Secondly, the coloniser considers its ability to appropriate output produced in the colony.

Conceptualisation of the Notion of Power In this model, only the coloniser and elites hold power, while the general population is assumed to be passive. We characterise the power of the coloniser in terms of its ability to appropriate a proportion of the output produced in the colony. Correspondingly, the power of the elites is a function of its ability to effectively appropriate some of the rents that would have normally accrued to the coloniser[20].

We express these concepts of power in terms of three different types of governance technologies namely - technology by numbers, technology by quality and lastly as a composite technology which is a combination of numbers and quality.

Technology of Governance by Numbers Here the concept of power is defined solely in terms of relative population proportions, that is, the ratio of the population aspiring to power in the total population. Thus the power of the elites, r^e is given as:

$$r^e = \frac{L^e}{L^p + L^e} = \frac{L^e}{L - L^e + L^e} = \frac{L^e}{L} < 1$$

Correspondingly, the power of the coloniser as a function of the technology by numbers, $r^c(L^e)$ is given as:

$$r^c(L^e) = 1 - r^e = \frac{L - L^e}{L} < 1 \tag{2}$$

It is easy to see from equation 2 above that the coloniser's power is a decreasing function of the elite dimension, L^e whilst correspondingly, the elites' power is an increasing function of their numbers.

Given the output from productive activity in the colony as:

$$Y = \left[A_e L^e \left[(1+\delta)\,\overline{h}\right]^{\theta} + A\,(L - L^e)\,\overline{h}^{\theta}\right]$$

The coloniser uses its power, $r^c(L^e) = \frac{L-L^e}{L}$, to appropriate the maximum possible

[20] It therefore goes without saying that the power of the coloniser and that of the elites are mutually exclusive. We assume for simplicity that the two sum up to unity.

proportion of output. Formally, the extraction function of the coloniser is given as:

$$U\left(L^{e}\right)=\overline{h}^{\theta}\left(\frac{L-L^{e}}{L}\right)\left[A_{e}L^{e}\left(1+\delta\right)^{\theta}+A\left(L-L^{e}\right)\right] \tag{3}$$

where $A_e > A$.

The coloniser takes A_e, A, L, δ, θ and $\overline{h}$ as given[21] and selects L^e to maximise equation 3 above with the relevant first order condition being:

$$\frac{\overline{h}^{\theta}\left[2A\left(L^{e}-L\right)-A_{e}\left(1+\delta\right)^{\theta}\left(2L^{e}-L\right)\right]}{L}=0 \tag{4}$$

Solving equation 4 above gives the following relationship:

$$\frac{L^{e^*}}{L}=\frac{2A-A_{e}\left(1+\delta\right)^{\theta}}{2A-2A_{e}\left(1+\delta\right)^{\theta}}>0 \tag{5}$$

which after normalising $A = 1$ gives:

$$\frac{L^{e^*}}{L}=\frac{1-\frac{A_e}{2}\left(1+\delta\right)^{\theta}}{1-A_{e}\left(1+\delta\right)^{\theta}}>0,\quad A_e>1 \tag{6}$$

$$\frac{\partial\left(\frac{L^{e^*}}{L}\right)}{\partial A_e}=\frac{\left(1+\delta\right)^{\theta}}{2\left[A_{e}\left(1+\delta\right)^{\theta}-1\right]^{2}}>0 \text{ and } \frac{\partial^{2}\left(\frac{L^{e^*}}{L}\right)}{\partial A_e^{2}}<0 \tag{7}$$

$$\frac{\partial\left(\frac{L^{e^*}}{L}\right)}{\partial \delta}=\frac{A_{e}\theta\left(1+\delta\right)^{\theta-1}}{2\left[A_{e}\left(1+\delta\right)^{\theta}-1\right]^{2}}>0 \tag{8}$$

$$\frac{\partial\left(\frac{L^{e^*}}{L}\right)}{\partial \theta}=\frac{A_{e}\left(1+\delta\right)^{\theta}\log\left(1+\delta\right)}{2\left[A_{e}\left(1+\delta\right)^{\theta}-1\right]^{2}}>0 \tag{9}$$

Equation 7 suggests that at optimal conditions, an increase in the productivity distance between elites and masses $\left(\frac{A_e}{A}\right)$ necessarily entails an increase in the elite size $\left(\frac{L^e}{L}\right)$. Equation 7 further suggests that there is concavity in the relationship between elite size and productivity distance between the elite and the masses, implying in principle, that a large elite size is feasible whenever the ratio $\frac{A_e}{A}$ is large enough.

[21] δ is not a choice dimension here because we assume that the quality of education, whether low (for instance, village schools) or high (for instance, *Grandes Ecoles*) is an exogenous decision of the colonisers'.

Equation 8 above suggests that at optimal conditions, an increase in schooling years (δ) would necessitate an increase in the elite size as well, implying that a large elite size and high quality transfers are both feasible.

Finally, equation 9 suggests that it is always feasible to increase the optimal elite size whenever the returns to human capital (θ) are rising, implying that a large elite size and high returns to human capital are both feasible.

These results convey one message, which is that, the optimal elite size depends solely on the productivity distance between the elites and the masses. In particular, the better the productivity enhancing technology, the bigger the elite size that maximises the coloniser's extraction function. This suggests that productivity gains will always dominate power loss under a technology of governance by numbers.

Technology of Governance by Quality Here the concept of power is characterised solely in terms of the total stock of human capital that the group aspiring to power holds relative to that held by the total population. The elites' power in this case is defined as:

$$r^e = \frac{\delta}{1+\delta} \text{ and } \quad r^c(\delta) = 1 - r^e = \frac{1}{1+\delta} < 1 \tag{10}$$

Observe from equation 10 above that the coloniser's power is a decreasing function of the quality of human capital that it transfers to the elite and correspondingly, the elites' power is an increasing function of the quality of human capital that it receives. In particular, more years of schooling given to the elites enhances their ability to appropriate some of the rents that would have normally accrued to the coloniser.

The coloniser uses its power, $r^c(\delta) = \frac{1}{1+\delta}$, to appropriate the maximum possible proportion of output produced in the colony. Formally, the extraction function of the coloniser under a technology of governance by quality is given as:

$$U(\delta) = \overline{h}^{\theta} \left(\frac{1}{1+\delta}\right) \left[A_e L^e (1+\delta)^{\theta} + A(L - L^e)\right] \tag{11}$$

where all the parameters are the same as defined in equation 3 above.

The coloniser takes A_e, A, L, L^e, θ and $\overline{h}$ as given[22] and selects δ to maximise equation 11 above with the relevant first order condition being:

[22] L^e is not a choice dimension here because it might be limited by simple appartenance to ethnic groups.

$$\frac{\overline{h}^{\theta}\left[A\left(L^{e}-L\right)+A_{e}\left(1+\delta\right)^{\theta}L^{e}\left(\theta-1\right)\right]}{\left(1+\delta\right)^{2}}=0 \tag{12}$$

Solving equation 12 above gives the following relationship:

$$\frac{L^{e^*}}{L}=\frac{1}{1+\left(\theta-1\right)\frac{A_e}{A}\left(1+\delta\right)^{\theta}}>0 \tag{13}$$

which after normalising $A=1$ as before gives:

$$\frac{L^{e^*}}{L}=\frac{1}{1+\left(\theta-1\right)A_e\left(1+\delta\right)^{\theta}}>0 \tag{14}$$

$$\frac{\partial\frac{L^{e^*}}{L}}{\partial A_e}=-\frac{\left(\theta-1\right)\left(1+\delta\right)^{\theta}}{\left[1+A_e\left(1+\delta\right)^{\theta}\left(\theta-1\right)\right]^{2}}=\left\{\begin{array}{l}<0,\ iff\ \ \theta>1\\ =0,\ iff\ \ \theta=1\\ >0,\ iff\ \ \theta<1\end{array}\right\} \tag{15}$$

$$\frac{\partial\frac{L^{e^*}}{L}}{\partial \delta}=-\frac{\left(\theta-1\right)A_e\theta\left(1+\delta\right)^{\theta-1}}{\left[1+A_e\left(1+\delta\right)^{\theta}\left(\theta-1\right)\right]^{2}}=\left\{\begin{array}{l}<0,\ iff\ \ \theta>1\\ =0,\ iff\ \ \theta=1\\ >0,\ iff\ \ \theta<1\end{array}\right\} \tag{16}$$

$$\frac{\partial\frac{L^{e^*}}{L}}{\partial \theta}=-\frac{A_e\left(1+\delta\right)^{\theta}\left\{1+\left(\theta-1\right)\log\left(1+\delta\right)\right\}}{\left[1+A_e\left(1+\delta\right)^{\theta}\left(\theta-1\right)\right]^{2}}=\left\{\begin{array}{l}<0,\ iff\ \ \theta>1-\frac{1}{\log(1+\delta)}\\ =0,\ iff\ \ \theta=1-\frac{1}{\log(1+\delta)}\\ >0,\ iff\ \ \theta<1-\frac{1}{\log(1+\delta)}\end{array}\right\} \tag{17}$$

Equation 15 yields the following set of optimality conditions depending on the returns to human capital viz.

■ **Scenario One:** *Under decreasing returns to human capital, the better the productivity enhancing technology, the bigger the elite size that maximises the coloniser's objective function.*

■ **Scenario Two:** *Under increasing returns to human capital, the better the productivity enhancing technology, the smaller the elite size that maximises the coloniser's objective function.*

■ **Scenario Three:** *Under constant returns, a better productivity enhancing technology has no affect on the optimal elite size.*

Also, equation 16 yields the following set of optimality conditions depending on the returns to human capital namely:

■ **Scenario One:** *Under decreasing returns to human capital, the better the quality of human capital transferred to the elite, the bigger the elite size that maximises the coloniser's objective function.*

■ **Scenario Two:** *Under increasing returns to human capital, the better the quality of human capital transferred to the elite, the smaller the elite size that maximises the coloniser's objective function.*

■ **Scenario Three:** *Under constant returns, increasing or decreasing the quality of human capital transferred to the elite has no affect on the optimal elite size.*

Finally, equation 17 suggests that it is always feasible to increase the optimal elite size whenever the returns to human capital (θ) are rising, conditional on $\theta < 1 - \frac{1}{\log(1+\delta)}$ and vice versa.

These results tell us that, the optimal elite size now depends on both the returns to human capital and on the productivity distance between the elites and the masses. In particular, high productivity minimises power loses while low productivity implies that forgone output due to power loses is insignificant.

Composite Technology of Governance Finally, under a composite technology of governance, both the size of the elite and the quality of human capital given to them matters in the power structure. The power of the elite is expressed as a function of both their numbers and the quality of human capital that they have. Here, r^e is defined as:

$$r^e = \frac{L^e \overline{h}\,(1+\delta)}{\overline{h}\,(L+\delta L^e)} = \frac{L^e\,(1+\delta)}{L+\delta L^e} < 1$$

Correspondingly, the power of the coloniser as a function of a composite governance technology, $r^c\,(\delta,\, L^e)$ is defined as:

$$r^c\,(\delta,\, L^e) = 1 - r^e = \frac{L - L^e}{L + \delta L^e} < 1 \tag{18}$$

Equation 18 above shows that $\frac{\partial r^c}{\partial L^e} < 0$ and $\frac{\partial r^c}{\partial \delta} < 0$ and:

$$\frac{\partial^2 r^c}{\partial L^e \partial \delta} = \frac{2LL^e\,(1+\delta) - L\,(L+\delta L^e)}{(L+\delta L^e)^3} = \left\{ \begin{array}{l} <0,\; iff \;\; \delta + 2 < \frac{L}{L^e} \\ =0,\; iff \;\; \delta + 2 = \frac{L}{L^e} \\ >0,\; iff \;\; \delta + 2 > \frac{L}{L^e} \end{array} \right\}$$

implying that the rate of change in the coloniser's power due to the change in elite size increases at high levels of transfer, δ, and decreases otherwise.

The coloniser uses its power, $r^c(\delta,\, L^e) = \frac{L-L^e}{L+\delta L^e}$, to appropriate the maximum possible proportion of output produced in the colony. The extraction function of the coloniser under a composite governance technology is given as:

$$U(\delta, L^e) = \overline{h}^{\theta} \left(\frac{L - L^e}{L + \delta L^e}\right) \left[A_e L^e (1+\delta)^{\theta} + A(L - L^e)\right] \tag{19}$$

The coloniser takes A^e, A, L, θ and $\overline{h}$ as given and selects δ and L^e to maximise equation 19 above with the relevant first order conditions being:
With respect to δ :

$$-\left\{\frac{\overline{h}^{\theta} L^e (L - L^e) \left\{A(L-L^e) + A_e (1+\delta)^{\theta} L^e\right\}}{(L+\delta L^e)^2}\right\} + \frac{\overline{h}^{\theta} A_e \theta (1+\delta)^{\theta - 1} (L - L^e) L^e}{L + \delta L^e} = 0 \tag{20}$$

and with respect to L^e :

$$\frac{\overline{h}^{\theta} (L - L^e) \left\{-A + A_e (1+\delta)^{\theta}\right\}}{L + \delta L^e} - \frac{\overline{h}^{\theta} \delta (L - L^e) \left\{A(L-L^e) + A_e (1+\delta)^{\theta} L^e\right\}}{(L+\delta L^e)^2} -$$

$$-\frac{\overline{h}^{\theta} \left\{A(L-L^e) + A_e (1+\delta)^{\theta} L^e\right\}}{L + \delta L^e} = 0 \tag{21}$$

Solving equations 20 and 21 for the optimal δ^* and L^{e^*} gives the following relationship:

$$\frac{L^{e^*}}{L} = \frac{1 - \frac{\delta^* \theta}{1+\delta^*} - \frac{2}{(1+\delta^*)^{\theta}} \left(\frac{A_e}{A}\right)^{-1}}{2 - \frac{\delta^* \theta}{1+\delta^*} - \frac{2}{(1+\delta^*)^{\theta}} \left(\frac{A_e}{A}\right)^{-1}} > 0 \tag{22}$$

where

$$\frac{\partial \left(\frac{L^{e^*}}{L}\right)}{\partial \left(\frac{A_e}{A}\right)} = \frac{2}{(1+\delta^*)^{\theta} \left(\frac{A_e}{A}\right)^2 \left[2 - \frac{\delta^* \theta}{1+\delta^*} - \frac{2}{(1+\delta^*)^{\theta}} \left(\frac{A_e}{A}\right)^{-1}\right]^2} > 0 \tag{23}$$

and

$$\frac{\partial^2 \left(\frac{L^{e^*}}{L}\right)}{\partial \left(\frac{A_e}{A}\right)^2} < 0 \tag{24}$$

Also

$$\frac{\partial \left(\frac{L^{e^*}}{L}\right)}{\partial \delta^*} = -\frac{\frac{A_e}{A}\theta \left(1+\delta^*\right)^{\theta} \left[\frac{A_e}{A}\left(1+\delta^*\right)^{\theta} - 2 - 2\delta\right]}{\left[2\left(1+\delta^*\right) + \frac{A_e}{A}\left(1+\delta^*\right)^{\theta}\left[\delta^*\left(\theta-2\right)-2\right]\right]^2} = \left\{ \begin{array}{l} <0, \ iff \ \ \frac{A_e}{A} > \frac{2(1+\delta)}{(1+\delta)^{\theta}} \\ >0, \ iff \ \ \frac{A_e}{A} < \frac{2(1+\delta)}{(1+\delta)^{\theta}} \end{array} \right\} \tag{25}$$

$$\frac{\partial \left(\frac{L^{e^*}}{L}\right)}{\partial \theta} = \frac{\frac{A_e}{A}\left(1+\delta^*\right)^{\theta+1}\left[2\left(1+\delta^*\right)\log\left(1+\delta\right) - \frac{A_e}{A}\delta\left(1+\delta\right)^{\theta}\right]}{\left[2\left(1+\delta^*\right) + \frac{A_e}{A}\left(1+\delta^*\right)^{\theta}\left[\delta^*\left(\theta-2\right)-2\right]\right]^2} = \left\{ \begin{array}{l} <0, \ iff \ \ \frac{A_e}{A} > \frac{2(1+\delta)\log(1+\delta)}{\delta(1+\delta)^{\theta}} \\ >0, \ iff \ \ \frac{A_e}{A} < \frac{2(1+\delta)\log(1+\delta)}{\delta(1+\delta)^{\theta}} \end{array} \right\} \tag{26}$$

Equation 22 has two unknowns which necessitates a numerical solution to determine both the optimal elite size, L^{e^*} and the quality of human capital transfers, δ^*. We thus simulate the behaviour of elite size $\frac{L^{e^*}}{L}$ in equation 22 above, the results of which are presented in Figure 2 in the appendix. Figure 2 suggests the following likely feasible range of elite size that maximises the coloniser's objective function: $0.006 \leq \frac{L^{e^*}}{L} \leq 0.44$

Considering the above feasible range of the elite size under the defined conditions of $\frac{A_e}{A}$ and θ, and normalising $A = 1$, $L = 10$, and $\overline{h} = 5$, we simulate equation 19 above for the optimal combination of elite size and human capital transfers (δ), that maximises the coloniser's objective function. The simulated results are summarised below.

The results suggests multiple optimal solutions depending on the parameterisation of θ and $\frac{A_e}{A}$.

■ When the productivity distance between elites and masses, $\frac{A_e}{A}$, is small, we distinguish two optimal solutions viz.

Scenario One: High human capital transfers to a fairly large elite. The first optimal solution suggests that the coloniser's objective function is maximised by transfering high human capital to a fairly large elite population, under constant or increasing returns to human capital. This outcome is presented in Figure 3 in the appendix.

Scenario Two: High human capital transfers to a small elite. The second optimal solution suggests that the coloniser's objective function is maximised by transfering high human capital to a small elite population under decreasing returns. This outcome is presented in Figure 4 in the appendix.

■ When the productivity distance between elites and masses is wide, high human capital transfers to a fairly large elite population emerges as the unique optimal solution, irrespective of the returns to human capital.

The simulated results also suggests that in an agrarian colonial economy which is using a composite governance technology, returns to human capital matter for optimal elite size only when the productivity distance between elites and masses is narrow.

It can be observed that these simulated results are in conformity with the analytical results shown by equations 23, 24, 25 and 26 above. For instance, equations 23 and 24 tell us that there is concavity in the relationship between elite size and productivity distance between the elites and the masses, implying in principle, that a large elite size is feasible whenever the productivity distance between elites and masses is large enough.

Furthermore, equation 25 suggests that there is a range of feasible values of the elite size over which an increase in the quality of human capital transfers necessitates an increase in the elite size and another range over which it reduces the elite size. Also, equation 26 suggests that there is a range of feasible values of the elite size over which an increase in the returns to human capital necessitates an increase in the elite size and another range over which it reduces the elite size.

The implications of these statements is that a coloniser trades-off optimal elite size with the quality of human capital transfers to the elite under a composite governance technology in an agrarian economy, only under defined conditions of returns to human capital and productivity distance between elites and masses.

2.2.2 Interdependent Production

Continuing to use a simple growth model with human capital as the only factor of production, we now assume that the elites and general population are dependent on each other, represented by the interaction of their respective productions[23]. This feature is obtained by using a general form of the production function wherein output produced in the colony is given as:

$$Y = \left[A_e L^e (1+\delta)\, \overline{h}\right]^{\alpha} \left[A\,(L - L^e)\, \overline{h}\right]^{\beta} \tag{27}$$

[23] This might depict an industrial colonial economy.

which after simplification gives:

$$Y = \overline{h}^{\alpha+\beta} A^* \left\{ \left[L^e (1+\delta) \right]^\alpha \left[L - L^e \right]^\beta \right\} \qquad \text{where} \quad A^* = A_e^\alpha A^\beta \tag{28}$$

where also, A_e and A represents the technology that is available to the elite and mass sectors of the population respectively, and definitionally, $A_e > A$, and Y denotes total output. Finally, α and β represents returns to human capital in the elite and mass sectors of society respectively; such that:

$$\alpha + \beta = \left\{ \begin{array}{c} > 1 \text{ represents increasing returns} \\ = 1 \text{ represents constant returns} \\ < 1 \text{ represents decreasing returns} \end{array} \right\}$$

We assume as before that the power of the coloniser (or elites) is a function of three different types of governance technologies.

Technology of Governance by Numbers Under this technology, the coloniser maximises the following extraction function:

$$Max\ U(L^e) = \left(\frac{L - L^e}{L} \right) \left\{ \overline{h}^{\alpha+\beta} A^* \left[L^e (1+\delta) \right]^\alpha \left[L - L^e \right]^\beta \right\} \tag{29}$$

Solving equation 29 above gives the following relationship:

$$\frac{L^{e^*}}{L} = \frac{1}{2+\beta} > 0 \tag{30}$$

Equation 30 above suggests that the optimal elite size depends solely on the *returns to human capital* in the mass sector of society and does not depend on the technological parameters of the model. *In particular, a rise in the returns to human capital in the mass sector necessitates a reduction in the size of the optimal elite population and vice versa. In other words, the productivity gains from the elite sector are smaller when the returns to human capital in the mass sector are rising.*

Technology of Governance by Quality Here the extraction function of the coloniser is given as:

$$Max\ \ U(\delta) = \left(\frac{1}{1+\delta} \right) \left\{ \overline{h}^{\alpha+\beta} A^* \left[L^e (1+\delta) \right]^\alpha \left[L - L^e \right]^\beta \ \right\} \tag{31}$$

with the relevant first order condition with respect to δ being:

$$\frac{(\alpha-1)\,A^{*}\overline{h}^{\alpha+\beta}\left[L^{e}\left(1+\delta^{*}\right)\right]^{\alpha}\left[L-L^{e}\right]^{\beta}}{\left(1+\delta\right)^{2}}=0 \tag{32}$$

which simplifies to:

$$\frac{L^{e^{*}}}{L}=1 \tag{33}$$

Equation 33 above suggests that the optimal elite size is as large as the total population and does not depend on any of the technological parameters of the model, implying in principle that, *a large elite always maximises the coloniser's objective function, irrespective of its quality.*

The intuition for this result could be that the colonisers' instead choose to appoint members of the general population into elite roles without giving them any formal education. Examples could be the co-optation of unlearned traditional chiefs into the colonial administration - an approach that was extensively utilised by both the British and French colonial powers in Africa during the late nineteenth century.

Composite Technology of Governance The extraction function of the coloniser under a composite governance technology is given as:

$$U\left(\delta,L^{e}\right)=\left(\frac{L-L^{e}}{L+\delta L^{e}}\right)\left\{\overline{h}^{\alpha+\beta}A^{*}\left[L^{e}\left(1+\delta\right)\right]^{\alpha}\left[L-L^{e}\right]^{\beta}\right\} \tag{34}$$

with the relevant first order condition being with respect to L^{e}:

$$\frac{\left\{A^{*}\left(1+\delta^{*}\right)^{\alpha}\overline{h}^{\alpha+\beta}\left(L-L^{e}\right)^{\beta}\left[\delta^{*}L^{e*^{2}}\left(1+\beta\right)+L\left\{L^{e*}\left(2+\beta\right)-L\right\}\right]\right\}}{\left(L+\delta^{*}L^{e*}\right)^{2}}=0 \tag{35}$$

and with respect to δ:

$$\frac{A^{*}L^{e*}\overline{h}^{\alpha+\beta}\left(L-L^{e}\right)^{1+\beta}\left(1+\delta^{*}\right)^{\alpha-1}\left\{L^{e*}\left[\delta^{*}\left(\alpha-1\right)-1\right]+\alpha L\right\}}{\left(L+\delta^{*}L^{e*}\right)^{2}}=0$$

Solving the first order conditions results in the following relationship:

$$\frac{L^{e^*}}{L} = \frac{1}{\left[(1+\beta)\,\delta^* + \frac{(2+\beta)[1+(1-\alpha)\delta^*]}{\alpha} \right]^{\frac{1}{2}}} > 0 \tag{36}$$

which is defined for:

$$\left[(1+\beta)\,\delta^* + \frac{(2+\beta)\,[1+(1-\alpha)\,\delta^*]}{\alpha} \right] > 0 \quad \text{or} \quad \delta^* > \frac{2+\beta}{\alpha-\beta-2}$$

where,

$$\frac{\partial\left(\frac{L^{e^*}}{L}\right)}{\partial\,(\delta^*)} = \frac{\frac{1}{2}(\alpha-\beta)-1}{\alpha\left[\frac{2+\beta+\delta^*(2+\beta-\alpha)}{\alpha}\right]^{\frac{3}{2}}} = \left\{ \begin{array}{l} <0,\ iff \quad \alpha > 2+\beta \ \ and \ \ \delta^* < \frac{2+\beta}{\alpha-\beta-2} \\ >0,\ iff \quad \alpha < 2+\beta \ \ and \ \ \delta^* > \frac{2+\beta}{\alpha-\beta-2} \end{array} \right\} \tag{37}$$

Also

$$\frac{\partial\left(\frac{L^{e^*}}{L}\right)}{\partial\alpha} = \frac{1+\delta^*\left(1+\frac{\beta}{2}\right)+\frac{\beta}{2}}{\alpha^2\left[\frac{2+\beta+\delta(2+\beta-\alpha)}{\alpha}\right]^{\frac{3}{2}}} = \left\{ \begin{array}{l} <0,\ iff \quad \delta^* < \frac{2+\beta}{\alpha-\beta-2} \\ >0,\ iff \quad \delta^* > \frac{2+\beta}{\alpha-\beta-2} \end{array} \right\} \tag{38}$$

and

$$\frac{\partial\left(\frac{L^{e^*}}{L}\right)}{\partial\beta} = -\frac{\frac{1}{2}(1+\delta)}{\alpha\left[\frac{2+\beta+\delta(2+\beta-\alpha)}{\alpha}\right]^{\frac{3}{2}}} = \left\{ \begin{array}{l} <0,\ iff \quad \delta > \frac{2+\beta}{\alpha-\beta-2} \\ >0,\ iff \quad \delta < \frac{2+\beta}{\alpha-\beta-2} \end{array} \right\} \tag{39}$$

Because equation 36 has two unknowns and the analytical results expressed by equations 37, 38 and 39 do not allow a clear interpretation of optimality conditions, we proceed by a numerical solution to determine both the optimal elite size, L^{e^*} and the quality of human capital transfers, δ^*. Taking values of α in the range, $0.1 \leq \alpha \leq 1.5$ and the range of human capital transfers, $\delta = \{0,\ 0.5,\ 1,\ 2,\ 5,\}$, we simulate the behaviour of elite size $\frac{L^{e^*}}{L}$ in equation 36 above, and obtained the range of feasible elite size that maximises the coloniser's objective function as: $0.07 \leq \frac{L^{e^*}}{L} \leq 0.71$.

Considering the above feasible range of the elite size under the defined conditions of $\frac{A_e}{A}$, α, and β, and after normalising $A = 1$, $L = 10$, and $\overline{h} = 5$ as before, we simulate equation 34 above for the optimal combination of elite size and human capital transfers (δ^*), that maximises the coloniser's objective function. The simulated results suggests two optimal solutions depending solely on the returns to human capital namely:

■ **Scenario One:** *Under constant* $(\alpha + \beta = 1)$ *and decreasing returns to human capi-*

tal ($\alpha + \beta < 1$), the better the quality of human capital transferred to the elite, the smaller the elite size that maximises the coloniser's objective function.

■ **Scenario Two:** *Under increasing returns to human capital ($\alpha + \beta > 1$), the better the quality of human capital transferred to the elite, the bigger the elite size that maximises the coloniser's objective function.*

The simulated results suggests further that the optimal elite size tends to increase as the returns to human capital in the elite sector, α, rises relative to the returns in the mass sector of society, β.

In summary, the simulated results suggests that in an industrial colonial economy that is using a composite governance technology, the better the productivity enhancing technology, the bigger the optimal elite size. In other words, productivity gains always dominate power loses.

3 Empirical Data and Relevance of the Model

The results from the model suggests that the optimal elite characteristics that maximise the coloniser's objective function depends on a number of parameters namely, the choice of governance technology, the productivity distance between elites and masses, the returns to human capital and on the specification of the production function. In particular, depending on whether the colonial economy is specialised in agrarian or industrial type production, the optimal elite characteristics are bound to varry also.

The implication of these is that, the optimal elite characteristics necessarily varried from one colony to another, notwithstanding the colonial experience. For instance, the British and French were probably not consistent in their choice of optimal elite characteristics across all their different SSA empires, and the way that the British governed Southern Rhodesia might have been quite similar to the way the French ruled Algeria. Similarly, the British co-optive strategy in say Uganda or Sierra Leone might have been similar to the French strategy in Senegal.

A quick review of the historical evidence suggests that the colonisers' generally tended to make use of differing sizes and quality of elite in the administration of their colonies. For instance, the British colonial power governed the whole of British tropical Africa where some 43 million people lived with a staff of only 1,200 administrators[24] (about 0.03% of the population). In India, the ratios were even more dramatic. In 1805, India was at least 200 million people but the British Raj was operated by 24,000 British (of

[24]See Martin (2005:5).

which 22,000 were in the military and 2000 in civil government). This number was only raised after the mutiny in 1857 but it was never more than 0.05% of the population[25].

A similar situation was observed in French West Africa, where in 1958 the French administered a territory comprising of a total estimated population of 173 million inhabitants with a staff of about 10,600 (roughly 0.06% of the population). The Ivorian case was also dramatic with a colonial civil service of less than 0.03% of the population in 1958[26].

The above statistics refer mainly to the size of the colonial bureaucracy but a more approximate indicator of the size of the total productive elite force in the former colonies is perhaps the percentage gross secondary enrolment rate (SEC ENRO) or the percentage of secondary school attained in the total population aged 15 and above (SEC15). Likewise, an indication of the quality of the elite population might be the average schooling years in the total population over the age of 15 (TYR15).

These data, presented in Figure 1 in the appendix, suggests that across most former SSA colonies, the colonisers' generally tended to choose differing sizes of the elite population though never really attaining 20% of the population, and also the quality of education transferred to the elite varied considerably across former colonies and from one metropolitan power to the other.

The evidence in Panel A of Figure 1 suggests that the British probably opened access to education to a greater proportion of the population in their colonies than did the French[27]. However, the data also suggests that the education given to the elite in British former colonies might well have been of lower quality than that given in French former colonies. Finally, Panel A reveals even more dramatic proxies for elite size and quality in the Portuguese and Belgian former SSA colonies. These historical evidence provides independent support for the relevance of our model.

4 Conclusion

In this paper, we examined the conditions of optimality in a co-optive strategy of colonial rule. The central premise of the paper is that, as rational agents, the colonisers' often had

[25] See Maddison (1971:44).

[26] Source: 'Etat Nominatif des Fonctionnaires du Haut Commissariat, par territoire en 1958' available at the *Afrique Oriental Francaise* Office in Dakar.

[27] This concords with the historical evidence which suggests that British colonial education system emphasized village schools while French colonial education emphasized the 'Grandes Ecoles' which assimilated elites into French lifestyle.

to make decisive choices from amongst conflicting options. One of these, is the optimal size and quality of the indigenous elite with whom they govern the colonies together. This is due to the fact that human capital transfers to the elite engender both productivity gains and power loses to the colonisers'.

We have thus proposed a simple model of elite formation emanating from a coloniser's quest to simultaneously enhance productivity gains and minimise power loses. The results of the model suggests multiple optimal solutions, depending on the specification of the production function, the governance technology chosen by the coloniser, the returns to human capital, as well as on the parameterisation of the productivity distance between elites and the population masses.

In general, we have shown that under a governance technology by numbers or quality, a better productivity enhancing technology minimises power loses by the coloniser and vice versa. However, under a composite governance technology and given an agrarian colonial economy, a coloniser maximises its objective function by trading-off elite size with the quality of human capital transfers, only when the productivity distance between the elites and masses is narrow. Specifically, when the productivity distance between the elites and masses is narrow, the coloniser maximises its objective function either by transferring high human capital to a small or large elite population, depending on the returns to human capital. Whereas, when the productivity distance is wide, the objective function is always maximised by transfering high human capital to a large elite population, irrespective of the returns to human capital.

We obtain a similar set of results using a composite governance technology in an industrial colonial economy. Specifically, the results suggests that the coloniser's objective function is always maximised by transferring high human capital to a varrying size of the elite population, depending on the returns to human capital and independently of the productivity distance between elites and the masses.

The implication of these results is that, the optimal elite characteristics necessarily varried from one colony to another, notwithstanding the colonial experience. This insight is useful in understanding why the stock of human capital available in countries emerging from colonisation varied considerably across colonial experiences and from one country to another.

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Figure 1: Comparative Statistics on Human Capital Transfers at Independence for selected SSA Countries by Colonial Experience

PANEL A - DESCRIPTIVE STATISTICS

British Former Colonies in SSA

COUNTRY	Ind Date	SEC Enro	SEC15	TYR15
Botswana	1966	3.8	3.02	1.68
Gambia	1965	6	5.3	
Ghana	1957	0.2	1.6	0.97
Kenya	1963	3.2	2.42	1.61
Lesotho	1966	4.6	1.6	2.99
Malawi	1964	1.8	0.78	1.98
Mauritius	1968		19.5	3.92
Nigeria	1960	4		
Sierra Leone	1961	2.6	2.64	0.67
Sudan	1956	2.2	1.5	0.41
Swaziland	1968	14	6.96	2.36
Tanzania	1961	2	1.2	3.26
Uganda	1962	3.4	3.8	1.17
Zambia	1964	6	5.9	2.81
Zimbabwe	1980	8	4.9	2.13
Average		**4.41**	**4.36**	**1.99**

French Former Colonies in SSA

COUNTRY	Ind Date	SEC Enro	SEC15	TYR15
Benin	1960	2	1.3	
Cameroon	1960	2	9.7	1.74
Cape Verte	1960	2		
Cen Africa Rep.	1960	1	3.6	0.57
Congo, Rep.	1960	4		
Cote d'Ivoire	1960	2		
Madagascar	1960	4		
Mali	1960	1	0.1	0.36
Niger	1960	1	0.6	0.28
Senegal	1960	3	4.4	1.74
Togo	1960	2		0.22
Average		**2.18**	**3.28**	**0.82**

Portuguese Former Colonies in SSA

COUNTRY	Ind Date	SEC Enro	SEC15	TYR15
Guinea Bissau	1975	3	0.4	
Mozambique	1975	3	1.6	0.64
Average		**3**	**1**	**0.64**

Belgian Former Colonies in S

COUNTRY	Ind Date	SEC Enro	SEC15
Rwanda	1962	2	4.86
Zaire	1960	3	1.4
Average		**2.5**	**3.13**

Sources: World Development Indicators for % Gross Secondary Enrolments (SEC Enro); The Africa Research Program dataset for % Secondary School Attainment in the total Pop aged 15 and a (SEC15), Average Schooling Years in the total Pop aged 15years and above (TYR15).

PANEL B - MEANS BY COLONIAL BACKGROUND

	FRENCH SSA	BRITISH SSA	PORTUGUESE SSA	BELGIAN SSA
SEC ENRO	2.18	4.41*	3	2.5
SEC15	3.28	4.36	1	3.13
TYR15	0.82	1.99**		

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

* Denotes significance at 10%, ** denotes significance at 5% and ***denotes significance at 1%.

Figure 2: Simulated behaviour of Optimal Elite Size under a Composite Governance Technology

	Delta = 0			
Ae/A	**2**	**5**	**8**	**10**
Theta				
0.1	0	0.4	0.4	0.4
0.5	0	0.4	0.4	0.4
1	0	0.4	0.4	0.4
1.5	0	0.4	0.4	0.4

NF: Not Feasible (or taking negative values)

	Delta = 0.5			
Ae/A	**2**	**5**	**8**	**10**
Theta				
0.1	0.006	0.37	0.42	0.44
0.5	0.02	0.34	0.38	0.4
1	NF	0.28	0.33	0.35
1.5	NF	0.22	0.27	0.28

NF: Not Feasible (or taking negative values)

	Delta = 1			
Ae/A	**2**	**5**	**8**	**10**
Theta				
0.1	0.02	0.36	0.42	0.43
0.5	0.04	0.32	0.36	0.38
1	0	0.23	0.27	0.28
1.5	NF	0.09	0.14	0.15

NF: Not Feasible (or taking negative values)

	Delta = 2			
Ae/A	**2**	**5**	**8**	**10**
Theta				
0.1	0.04	0.36	0.41	0.44
0.5	0.08	0.3	0.34	0.35
1	NF	0.17	0.2	0.21
1.5	NF	NF	NF	NF

NF: Not Feasible (or taking negative values)

	Delta = 5			
Ae/A	**2**	**5**	**8**	**10**
Theta				
0.1	0.07	0.37	0.41	0.43
0.5	0.15	0.29	0.32	0.33
1	NF	0.09	0.11	0.12
1.5	NF	NF	NF	NF

NF: Not Feasible (or taking negative values)

	Delta = 10			
Ae/A	**2**	**5**	**8**	**10**
Theta				
0.1	0.11	0.37	0.42	0.43
0.5	0.19	0.29	0.32	0.33
1	NF	NF	0.06	0.07
1.5	NF	NF	NF	NF

NF: Not Feasible (or taking negative values)

Figure 3: Optimality conditions under Composite Governance Technology with increasing returns (High Human Capital transferred to a fairly large elite)

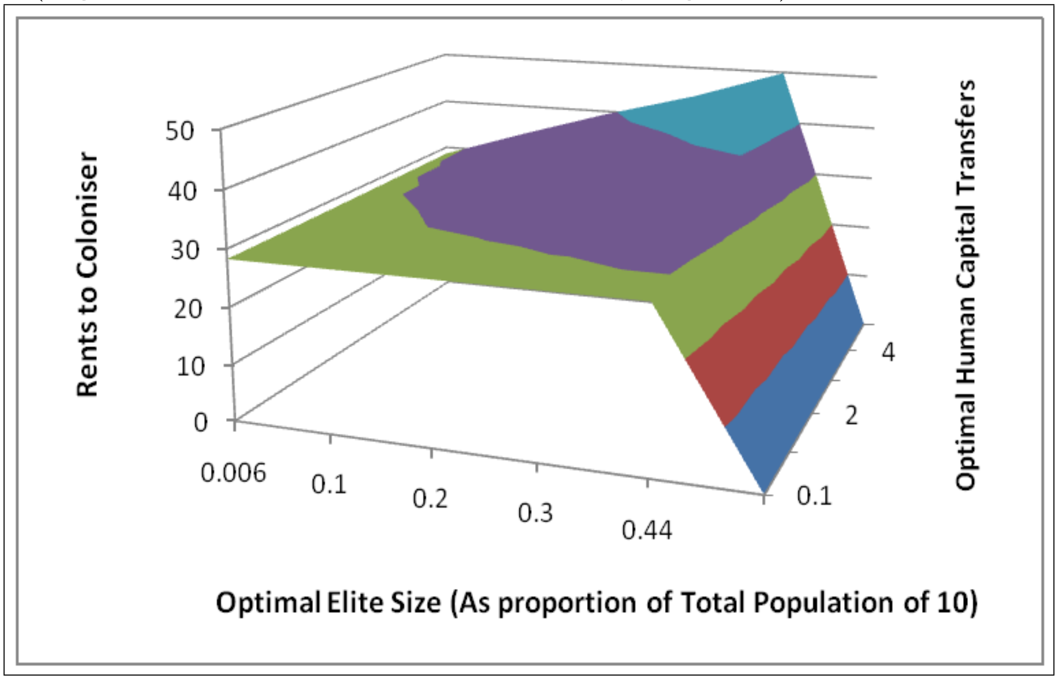

Figure 4: Optimality conditions under Composite Governance Technology with decreasing / constant returns (High Human Capital transferred to a small elite)