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# *Resources, techniques, and strategies south of the Sahara: revising the factor endowments perspective on African economic development, 1500–2000*[1]

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This article seeks to revise and re-apply the factor endowments perspective on African history. The propositions that sub-Saharan Africa was characterized historically by land abundance and labour scarcity, and that the natural environment posed severe constraints on the exploitation of the land surplus, are broadly upheld. Important alterations are suggested, however, centred on the seasonality of labour supply, Ruf's concept of 'forest rent', and, for precolonial economies, the role of fixed capital. This revised endowments framework is then applied in order to explore the long-term dynamics of economic development in Africa, focusing on how the economic strategies of producers and political authorities created specific paths of change which shifted the production possibility frontiers of the economies concerned, and ultimately altered the very factor ratios to which the strategies had been responses.

This article highlights, critiques, revises, and re-applies the factor endowments approach to sub-Saharan economic history. Highlighting is appropriate because presentations of this conceptual framework have been embedded in broader arguments, creating a heuristic need to isolate it and examine its explanatory power before re-linking it with other approaches. It requires critique because it has been influential among economic historians and across several disciplines. It merits revision to realize more of its explanatory potential. The contention here is that a modified endowments approach illuminates key features of African economic history: the persistence of relatively low productivity, but also the existence—contrary to the currently widespread 'Afropessimism'—of dynamics and paths of long-term innovation and development. Thus the endowments framework, widely considered to be basically static, can elucidate change as well as continuity.

Factor endowments may have gone out of focus for a generation of economic historians more impressed by the importance of institutions and information problems in shaping economic behaviour. While the institutional agenda

[1] Earlier versions of this paper were presented to seminars in 2005–6 at LSE, Basel, Harvard, York (England), Stanford, Berkeley, Caltec, and UCLA, and at the African Studies Association conference in Washington. I am very grateful to the organizers and for all the contributions from participants, and for those from colleagues who commented separately: Ralph Austen, William Gervase Clarence-Smith, Nicholas Crafts, Bruce Fetter, Patrick Manning, Kaoru Sugihara, Chibuike Uche, and this journal's anonymous readers. Colin Lewis, John Lonsdale, David Newbury, and Chris Udry provided valuable references. Any mistakes are mine.

continues to be energetically pursued,[2] some recent papers have directed scholarly attention to the contribution of resource profiles to the different rates and forms of economic growth in the long term in east and west Eurasia, and in North and South America. This entails not only a revived emphasis on factor ratios but also, at a less aggregated level, attention to the specific properties of the endowment of individual factors in particular geographical and historical settings. Thus land may have been abundant relative to labour at the end of colonial rule in South as well as in North America, but Engerman and Sokoloff insist that the kind of crops that would grow in the different soil and climate zones influenced the production possibilities and social organization.[3] Sugihara underlines how the characteristic east Asian combination of factor ratio and crop choice—land scarcity and wet rice cultivation—resulted in a particularly disciplined labour force, which was advantageous for proto-industrial and later factory production.[4] This comparative context makes it particularly timely to reconsider the significance of resource endowments in African history; not in any mono-causal spirit, but as a fundamental part of any satisfactory explanation of economic structures and changes.

Indeed, the historiography of the factor endowments approach to African economic history is rich in predictions about institutions, from property to state formation. But for the purpose of this single article on an extended period and a vast and varied geographical area, the focus will be restricted to the premises of the approach, and its application to the analysis of strategies for directly reducing production costs. These strategies included labour coercion: so the discussion refers to slavery and related institutions. However, a general critique of the institutional dimension of the endowments framework—which bears indirectly on production costs, including via inheritance and aspects of state capacity—is outside the scope of this article.

Here, 'economic development' means expansion of the capacity to increase output per capita. It is considered over what, in African contexts, is an unusually long period, because the processes explored here spanned the conventional, politically-defined, tripartite periodization (precolonial, colonial, and postcolonial). The starting date of *c.* 1500 allows us to give due weight to two sides of the onset of transatlantic trade: the massive intensification of slave exports from Africa and the increased rate of importation of new cultigens.

The discussion is in two parts. Section I gives an exposition of the factor endowments approach in the existing literature on Africa, and then reviews the evidence on its basic propositions, and on the inferences that have been drawn from them for choice of technology. In all cases, revisions are proposed. Section II mobilizes the revised framework to emphasize and analyse the mechanisms of long-term change; specifically, to define and explain the strategies of decision-makers and to consider the outcomes of those decisions—not least in altering the very resource endowments to which they responded.

[2] Greif, *Institutions*; Acemoglu, Johnson, and Robinson, 'Institutions'.
[3] Engerman and Sokoloff, 'Factor endowments'.
[4] K. Sugihara, 'The east Asian path of economic development', discussion papers in economics and business, Graduate School of Economics, Osaka University (2000).

 

# I

## *I.1 The Factor Endowments Perspective on African Economic History*

The basic contention of those who consider factor endowments central to any understanding of African economic history is that, in most times and places, sub-Saharan Africa has been characterized by an abundance of land relative to labour, as well as to capital.[5] The terms 'labour scarcity' and 'land abundance' are used here in the standard sense: that the growth of output was constrained by the availability of labour, but not by that of land. Among specialists there is also a consensus on a key qualifying proposition: that relative resource-abundance did not mean that the region was generally 'resource-rich'.

The proposition of land abundance and labour scarcity has been very influential in related disciplines. It was put forward by the anthropologist Goody as a premise of his long-term Eurasian/sub-Saharan comparative studies in historical sociology, and it is the basis of the political scientist Herbst's analysis of the difficulties of sate building in African history.[6] The underlying empirical phenomenon was noted as a contemporary reality in the mid-twentieth century by such influential development economists as Lewis and Myint. The author of the model of 'economic development with unlimited supplies of labour' reported on Ghana in 1953 that 'There is an abundance of land, and an acute shortage of labour'.[7] Myint formulated his 'vent for surplus' model precisely to account for rapid growth of export agriculture in regions where the Lewis model would not apply, because of low population densities. The regions he specified were his own native south-east Asia and, for the late nineteenth and early twentieth centuries, West Africa.[8] Finally, in the most influential recent synthesis of general African history, Iliffe has emphasized the high land/population ratio as the defining existential condition of African history, portraying Africans as 'frontiersmen' who first established networks of settlements over most of the continent and then, in later centuries, struggled to maintain them and to fill in the gaps in the face of a resiliently hostile physical and disease environment.[9]

In the economic historiography of Africa, the land-surplus, labour-scarcity analysis was first—and, until this article was written, solely—developed systematically by Hopkins in 1973, for West Africa, as a core theme within the framework of a study focused upon the size, scope, and organization of markets. He argued that this factor ratio is crucial in explaining the choice of technology in precolonial (and later) economies (a preference for land-extensive methods of cultivation); the form and extent of factor markets and related property rights (the rarity of land sales, the predominance of slave and other forms of forced labour over wage labour well into the colonial period); and the form and extent of economic growth. While

[5] Hogendorn and Gemery, 'Assessing productivity', p. 32.

[6] Goody, esp. *Technology* and *Production and reproduction*; Herbst, *States*. Goody's stance is particularly interesting because he shares his discipline's occupational suspicion of 'economistic' explanations, as he demonstrated in a related context: criticizing the Nieboer hypothesis that slavery as a system of production was a response to land surplus, an argument on which more below (Goody, 'Slavery').

[7] Lewis, *Report*, p. 3.

[8] Myint, *Economics*, pp. 27–40.

[9] Iliffe, *Africans*.

the latter was facilitated by the land surpluses, it had been constrained by other effects of the prevailing factor ratio, on both the supply and demand sides: by shortages of labour and capital, and by low population as a brake on the expansion of markets, both directly and because low densities encouraged relatively high household self-sufficiency in food production.[10] Like Iliffe later, Hopkins coupled his emphasis on the relative abundance of cultivable land with an insistence on the difficulties in exploiting it, such as thin soils and animal diseases. The critique that follows has three sections, which examine the core propositions of the endowments approach to sub-Saharan economic history, and the derived 'prediction' about choice of production techniques.

### *I.2 The Basic Propositions: on the Land–Labour Ratio and the Quality of 'Land'*

So are these authors right about the historically characteristic factor ratios of sub-Saharan Africa, and in coupling this with an emphasis on the difficulties of the region's natural environment with respect to economic growth? In this section, it is argued that the basic propositions of the factor endowments approach have been strengthened as evidence has accumulated from further research; that they can be elaborated by reference to some of the newer work; but that the framework also requires significant revision.

#### From Population Density to Land–Labour Ratios: Land Abundance Confirmed

All aggregate figures for the population of precolonial sub-Saharan Africa, or its major sub- regions, are 'guestimates' based on backward projection from colonial census reports. The least misleading way to approach them is to highlight those authors who provide upper and lower band estimates reflecting what they consider to be the highest and lowest plausible assumptions about natural rates of increase, modified by what is known about the number and the age and gender composition of the Africans deported in the external slave trades. The year 1750 is an appropriate one on which to focus. More than one set of guestimates are available for it, and, while the Atlantic slave trade was in full flood, nearly two-thirds of the people it removed from the continent had yet to be deported.[11] So if the trade did produce an absolute fall in total population, this was probably later. Durand gave upper and lower band estimates of 54 and 135 million.[12] Manning's more recent estimates, informed by specialist regional knowledge, are for tropical Africa only: 63 and 48 million.[13] Durand's figures implied an average population density of anything from 2.3 to 5.8 per square kilometre. Manning's, excluding much of southern Africa, are at the bottom of that range: 2.3 to 3.0 per square kilometre.[14] The whole

[10] Hopkins, *Economic history*, esp. pp. 15, 24–7, 35–6, 39, 76–7, 294.
[11] Eltis, 'Volume', tab. 2, p. 144.
[12] Durand, 'Modern expansion', pp. 137–8, 152–3; idem, *Historical estimates*, p. 54.
[13] Manning, *Slavery*, fig. 4.21, p. 84. I am grateful to Professor Manning for kindly providing the figures (from his unpublished tables) that are represented by the graph cited here (personal communication, 23 April 2006). In this context, 'tropical' Africa means Africa south of the Sahara, including Mozambique, but excluding Zimbabwe and Namibia, and the territory to their south.
[14] Patrick Manning has informed me of forthcoming work in which he revises his figures for 1850 upwards (personal communication, 23 April 2006). A corresponding revision for 1750 would bring his figures from the lower to the upper end of Durand's range.

 

range contrasts with the 23–7 per square kilometre for Europe (excluding Russia) at the same time.[15] The one statistical study for a precolonial society that is based on contemporary sources, rather than on backward projection from early twentieth-century census reports, is Thornton's analysis for the kingdom of Kongo,[16] *c.* 1650–*c.* 1700, which used Catholic baptism records. Thornton estimates the population at just over half a million, rising slowly between those dates, implying an average density of 4.1 per square kilometre by the beginning of the eighteenth century.[17]

As of 1900, in the early years of colonial rule in most of Africa, the whole population south of the Sahara was of the order of 100 million, probably rather more; from which it seems to have approximately doubled by 1960, the conventional benchmark for the end of the colonial era.[18] Most pertinent for present purposes is a study using 1959 data that (albeit rather conservatively) put the average density per square kilometre of *agricultural* land as 27 for West Africa, and 21 for southern and eastern Africa (figures were largely lacking for central Africa, except 22 for Cameroon and six for what is now the Central African Republic).[19] That West Africa was more densely populated than the other major regions makes it more plausible that the economic analysis which Hopkins built on low population density for West Africa would apply at least as strongly in sub-Saharan Africa as a whole.

With such population densities, it is not surprising that the general diagnosis of land abundance is confirmed by regional, country, and local studies for the precolonial period.[20] Indeed, land abundance rather than population density as such is what matters for the present analysis. Consider an example from a relatively heavily populated area, early in the colonial period. Johnson modelled land use around Kumasi, the capital of the former kingdom of Asante (and now of the Ashanti Region of Ghana), for 1907, using the colonial survey maps of that year. She concluded that a substantial proportion of the forest was left outside the crop rotation altogether.[21] If this was the case around the major population centre, it is again not surprising that even the highest estimates of the nineteenth-century (precolonial) population of the forest heartland of Asante suggest that it was well within the limit of what could be supported, assuming food self-sufficiency and the prevailing practice of long fallows.[22]

Though the proposition of sub-Saharan land abundance works in general, there were exceptions, and there was change. There were unusual localities in which populations were confronted by either security-induced land shortage (where people had literally taken to the hills or swamps to avoid slave raids, as in the Mandara uplands on what became the Nigeria–Cameroon border, and on the Guinea-Bissau coast);[23] or by the opportunity to cultivate limited areas of

[15] The comparison with Europe is based on Munro, *Africa*, pp. 20, 23.
[16] Centred in what is now northern Angola.
[17] Thornton, 'Demography'. The density ratio here is calculated from Thornton's table on p. 526.
[18] Munro, *Africa*, p. 20; Maddison, *World economy*, p. 239; Tabutin and Schoumaker, 'Démographie', pp. 590–1.
[19] Singer, 'Demographic factors', tab. 11.1, pp. 253–4.
[20] For example, van Zwanenberg with King, *Economic history of Kenya and Uganda*, pp. 6, 25–8; Vansina, *Children of Woot*, p. 179; Feinstein, *Conquest*.
[21] Johnson, 'Elephants', pp. 317–18, 329–30.
[22] Austin, *Labour*, pp. 60–4.
[23] See, respectively, Hopkins, *Economic history*, pp. 35–6; Hawthorne, 'Nourishing a stateless society'; idem, *Planting rice*; also Klein, 'Slave trade', p. 55.

 

exceptional fertility or the need to stabilize loose soils on rocky hillsides (both cases could be found among the highlands of Ethiopia and the interlacustrine region of East Africa); and/or to establish irrigation in order to create neighbourhoods of well-watered land amid generally arid surroundings, as in parts of the Rift Valley.[24] In these cases, farmers created 'islands' of intensive agriculture, using irrigation, terracing, and manuring, or making dams for paddy rice, as appropriate. However, these necessities or opportunities were rare: as the geographer Adams has emphasized, agricultural intensification in Africa 'should be seen as a process that is only worthwhile under certain conditions, and historically these have not been widespread'.[25] Again, Kano, the largest city in the relatively densely-populated Kano emirate of the Sokoto Caliphate (1804–1903),[26] was surrounded by a ring of permanent cultivation many miles wide before its further expansion in the colonial era.[27] Kano appears to have been unique in this respect in late nineteenth-century West Africa, however, in terms of scale. Moving south, it has been argued that the formation of the Zulu state, in the 1820s–30s, represented (among other things) a military solution to a resources crisis: a regional shortage of pasturage in relation to population.[28] But in African precolonial history such crises were often resolved by relatively peaceful out-migration and resettlement on lands whose owners were eager to acquire more population.[29]

Though export agriculture and population growth greatly diminished the land surplus in colonial and postcolonial West Africa, they did not exhaust it. Richards reported in 1983 that 'farming systems surveys confirm that on the whole, shortage of labour is a greater constraint on production in West Africa than shortage of land'.[30] Even by the early 1990s, in south-western Nigeria, a relatively densely populated area heavily involved in farming for export and domestic markets, there remained localities in which the supply of cultivable land was not a constraint on expansion of output.[31] On the other hand, demographic pressure on land has existed and intensified for decades in certain rural areas, notably in East Africa. The most acute cases of this are in high-rainfall hills (as in Rwanda)[32] and/or in those areas of former settler colonies designated by the colonial administrations as 'native reserves' (as in parts of Kenya).[33] Overall, the proposition of land abundance south of the Sahara works for most places at most times until the twentieth century; and even to (and beyond) its last decade in some, such as in parts of the Congo Democratic Republic and Sudan.[34] In sub-Saharan Africa, overall, the rapid popu-

[24] Widgren and Sutton, eds., *Islands*; McCann, *People*, pp. 59–61; Sutton, 'Irrigation and soil-conservation', pp. 28, 32, 40.
[25] Adams, 'When islands expand', p. 136.
[26] Centred on what is now north-eastern and north-central Nigeria.
[27] See generally Mahadi and Inikori, 'Population', pp. 62–73; further, Hill, *Population*, pp. 57–60.
[28] Guy, 'Ecological factors'; Gump, 'Ecological change'.
[29] Kopytoff, 'Internal African frontier'.
[30] Richards, 'Farming systems', p. 19.
[31] Akinola, 'State', pp. 165–73.
[32] André and Platteau, 'Land relations'.
[33] For a variety of perspectives on this, see Collier and Lal, 'Why poor people get rich'; Orvis, 'Kenyan agrarian debate'; Tiffen and Mortimore, 'Malthus controverted'.
[34] Cf. Iliffe, *Africans*, pp. 266–7. Platteau, emphasizing the growth of land scarcity, conceded that a third of the continent was still land-abundant as of the mid-1980s (Platteau, 'Food crisis', p. 482).

 

lation growth of *c*. 1945–*c*. 1990 was exceeded by the growth of the towns; and mean population density had reached only 24 per square kilometre by the mid-1990s.[35]

One objection to the land surplus argument is that it is too aggregative. Land quality is a key issue which we will now consider, but the basic claim about land abundance is justified: whatever the specific characteristics of particular lands, farmers rarely found that the availability of land—physically, or even institutionally—was a constraint on their plans to expand output, at least before the twentieth century.

## The Environmental Constraints on Exploiting the Land Surplus

That land was usually relatively abundant does not imply that sub-Saharan Africa was 'resource rich'. The prevalence of the animal form of the tsetse-fly-borne disease trypanosomiasis (sleeping sickness) in the forest zones, and in shifting but wide belts of the savannahs, restricted greatly the territory in which animal-drawn ploughs were an option.[36] An even more widespread constraint, affecting most of the potentially cultivable area, was thin soils which, once cleared of forest or bush cover, were easily eroded by the alternate pressures of tropical sun and downpour. Consider one of the more favoured settings for agriculture in Africa, the forest zone of Ghana. Almost by definition, forest zones receive considerably more rain than the savannah areas which comprise the majority of tropical Africa. In this case the most widespread and fertile category of soils are the forest ochrosols, which are authoritatively described as 'easily tilled' and 'relatively well-drained'.[37] They were the foundation of Ghana's status, for much of the twentieth century, as the world's largest producer of cocoa beans, in itself probably the most lucrative cash-crop for African farmers in that century. But most of these soils' nutrients are concentrated within the humus topsoil, which comprises only the top 30–40 centimetres. Hence fertility is easily depleted if the soil is exposed directly to rain, wind, and sun, or is ploughed.[38] Thus even a comparatively favoured agricultural area is very vulnerable to soil erosion. It would be incorrect to describe such land as 'poor'; but the quality is fragile. Again, while most of South Africa is sub-tropical, this is no guarantee of benign conditions for agriculture. Much of south-western Africa suffers low and unreliable rainfall. The overall implication is that the general 'wealth' of cultivable land as a resource in most of Africa applied only so long as the methods of cultivation were not intensive.[39]

Where and when land had to be replanted without sufficient fallowing to restore its fertility—and suppress weed infestation[40]—it was often expensive to use. This was even more so where trypanosomiasis prevented stock-rearing and thereby the provision of animal manure as a cheap (low opportunity cost) fertilizer. The problem is highlighted by the analysis of cocoa, a classic tropical crop in which

[35] Calculated from Bloom and Sachs, 'Geography', p. 238.

[36] Hopkins, *Economic history*; Austen and Headrick, 'Role'. On typanosomiasis, the classic investigation is Ford, *Role*.

[37] Brammer, 'Soils', pp. 92–5; cf. Allan, *African husbandman*, p. 225.

[38] Ibid.

[39] In the context of land-extensive agriculture, African farmers have tended to manage soil fertility through fallowing, crop rotation, and intercropping, as Richards discusses for West Africa (Richards, *Indigenous agricutural revolution*, pp. 55–6, 70); further, Fairhead and Leach, *Misreading the African landscape*, pp. 167–8.

[40] De Rouw, 'Fallow period'.

 

certain African countries enjoyed a comparative advantage throughout the twentieth century, by the agricultural economist Ruf. He found that cocoa has yet to be profitably replanted anywhere; that the largest cocoa producing-country in the world at any given time has enjoyed the advantage of being able to plant on lands newly-cleared from forest.[41] The frequently high cost of intensification on African soils again helps to explain why intensive agriculture has so long been confined to 'islands'—and, as we will see later, often impermanently.

Another constraint on the productivity of African land has been biological incongruity. Diamond noted that species tended to diffuse much more successfully along latitudes than across them. Because tropical regions, including Africa, tend to be aligned along longitudes rather than latitudes, when they entered agriculture they did so with a poorer crop repertoire than that enjoyed by the latitudinally-aligned Eurasia.[42] Subsequently, when tropical African farmers have successfully adopted cultigens from other continents, they have usually come from other tropical regions.[43] Insofar as the biggest advances in agricultural productivity have occurred in temperate climates, however, this has been a disadvantage, and is another qualification to the 'wealth' of Africa's natural resources.

Thus Hopkins and Iliffe's insistence on the high costs of economic exploitation of the abundance of land is justified, and the general theme can be said to have been further elaborated in the relatively recent work of Ruf and Diamond. Another limitation to the proposition of abundant land is perhaps the most important of all. It arises if one considers the supply of land not as a stock but as a potential flow of service (productive access to natural resources) over the year. In most of Africa, cultivable land was largely inaccessible to all useful productive purposes during the middle of the dry season. Conversely, other natural resources were at their most accessible to human extraction at that time: hunters found their prey more likely to be concentrated at waterholes, and miners could dig deep and clamber below the surface without risking being drowned when the rain fell. The endowments framework needs to take explicit account of this seasonal constraint on asset use. We will return to this when we discuss labour. Before doing so, however, we need to consider a topic which received insufficient attention in the Africanist literature.

## Capital: the Vanishing Factor?

Capital, especially fixed capital, often appears in danger of disappearing in discussions of African economic history, particularly precolonial. This impression arises from two sources. First, the paucity of stocks of capital goods in relation even to labour supplies has often been taken as literally too obvious to be worth discussing, to judge from the absence of general examinations of capital formation in the synthesizing studies of precolonial economies, including the endowments literature.[44] Second, the creation of fixed capital was essentially a function of inputs of labour. Let us consider these issues, before moving to the scarcity of domestic liquid capital, and finally relating the supply of capital to the environmental

[41] Ruf, *Booms*; idem, 'From forest rent'.
[42] Diamond, *Guns*, esp. pp. 186–7, 399–400.
[43] Examples are given below, section II.1.
[44] As distinct from references to capital formation in specific sectors such as long-distance trade or pastoralism.

 

constraints and relative factor scarcities mentioned above, which together posed practical obstacles to the productive embodiment of imported capital.

The generally low level of fixed capital formation in precolonial Africa is exemplified by the widespread absence of the plough and the common reliance on human porterage for transport. Yet this observation underestimates the complexity of precolonial production methods, because fixed capital formation was an integral part of precolonial economic activity. Clearly this was true of pastoral economies, of ox-ploughs in Ethiopia, of donkey and horse transport where the tsetse fly permitted (as in the West African savannah),[45] and of the canoes used in fishing and trading (on Lake Victoria and other inland waterways, and exploiting the chain of lagoons on the West African coast).[46] But the point also applies in more pervasive and important ways than is usually recognized. It is true of craft and extractive activities: weavers required looms, iron-makers required smelters (some of which did not outlive the season, but others were used for 'a century or more'),[47] and miners frequently dug deep pits which could be reused in later dry seasons, once they had dried out after the intervening rains. It applied also to farming, whether for 'subsistence' and/or the market, and not only in the obvious but exceptional cases of intensive agriculture. Crop-bearing trees were capital assets: the planting of a banana tree was 'an investment for life'.[48] Even with annual crops, production was facilitated by investment in land clearance in preceding years. Both the investment and the returns on it, in absolute terms at least, were particularly large in the forest zones. In southern Ghana, for instance, the moist weight of vegetation in mature (40–50-year-old) forest is estimated to average 300 tonnes per acre. In contrast, when replanting land previously cleared, even after 20 years of regrowth (fallowing), the moist weight is just 100 tonnes per acre.[49] Thus a *dadaso*, a farm cleared and cultivated in a previous year, may be regarded as a capital asset, which increased the returns on the labour now put into replanting and weeding it during the current year.[50]

While the importance of fixed capital formation in precolonial economies requires explicit recognition, the supply of fixed capital was indeed largely a function of inputs of labour, using simple tools (in some cases, with much skill). Because gold pits and handlooms were relatively enduring, their supply in any one year depended largely on how many existed at the end of the previous year. Apart from the addition of new pits or looms, the stock was little affected by the allocation of labour within the current year. Thus it is necessary to make a distinction based on time. The short-term production functions of precolonial (and many colonial) economies were two-factor ones.[51] Over the span of a year or less, the quantity of output was a function of the amounts of both current labour inputs and of the level of fixed capital. The longer-term production function, however, was a single-factor one.[52] For as the stock of fixed capital comprised the

[45] See, for example, Bates, 'Capital', pp. 155–6; McCann, *People*, p. 49; Law, *Horse*, pp. 161–2.
[46] Smith, 'Canoe'; Law, 'Trade and politics'; Reid, *Political power*, pp. 140–1, 159, 234–5, 237.
[47] Curtin, *Economic change*, p. 207.
[48] Reid, *Political power*, p. 23.
[49] Phillips, *Agriculture*, pp. 160–1.
[50] Austin, *Labour*, p. 74.
[51] For a colonial example, see Szereszewski, *Structural changes*.
[52] This argument is detailed for one case in Austin, *Labour*, pp. 73–4.

 

net accumulation of past labour inputs specifically directed to the creation of capital goods, over any term longer than a year the quantity of output was overwhelmingly a function only of the level of labour inputs (using simple tools).

In principle, domestic scarcity of capital could be remedied by foreign investment. In practice, such inflows have been low (per head of the sub-Saharan population) right up to the present. Host government economic policies, fears for the security of investments, and high transactions costs have all been important deterrents in many cases. Yet even when most of Africa was actually ruled by the European states that were then the major (or among the major) exporters of capital worldwide, the shortage was alleviated rather than resolved. The most important exceptions were public investments in ports and railways, and private ones in gold and other forms of mining. Frankel's study (1938) remains the only attempt at a comprehensive count of foreign investment in colonial sub-Saharan Africa. He put the grand total (in gross and nominal terms) for 1870–1936 as £1,221.7 million; 42.8 per cent of it in South Africa. Per head, this represented less than £12.7 overall: £55.8 in South Africa, £3.3 in the French colonies, and only £4.8 in the category representing the more prosperous 'peasant' colonies, British West Africa.[53] Such low ratios are partly attributable, even with colonial regimes, to institutional deterrents to certain forms of foreign investment. For example, lending by banks to African farmers was discouraged by the absence of registered individual title to land: something which colonial administrations ultimately (after considerable internal controversy) considered economically unnecessary and socially and politically undesirable.[54]

But a more general constraint on European investment in tropical agriculture was the difficulty of embodying it in capital goods that would be efficient under local conditions. Attempts to transfer agricultural techniques, equipment, and species from temperate to tropical latitudes often struggled, typically because the intensive approach they expressed ran foul of the natural environment and scarcity of labour. The costs of securing sufficient labour at a price that it was profitable to pay go a long way towards explaining the failure of European cocoa plantations in competition with African farms in Ghana (where European investment in agriculture was initially facilitated by the colonial administration, though not to the extent of providing cheap labour), while the costs of servicing and repairing machinery and maintaining soil fertility help to account for losses that forced the abandonment of the late-colonial Tanganyika Groundnut Scheme.[55] There was a problem of biological and 'technological incongruity' which made it harder for Europeans to achieve high returns on investment in agriculture in Africa.[56]

The physical gap was exacerbated by a cultural one, in a kind of path dependence. European planters in Ghana, for instance, seem to have been unable to bring themselves to exchange the intensive template through which they viewed the problem of raising agricultural productivity with the 'extensive' one required by the conditions they found.[57] If they were unwilling to operate their own plantations like Africans, it is not surprising that they do not appear to have

[53] Frankel, *Capital*, pp. 158–60, 169–70.
[54] Cowen and Shenton, 'Bankers'; Phillips, *Enigma*, pp. 59–84, 111–35; Austin, *Labour*, pp. 339–48.
[55] Austin, 'Mode'; Hogendorn and Scott, 'Very large-scale agricultural projects'.
[56] The latter concept comes from Abramovitz and David, 'Convergence', p. 32.
[57] Austin, 'Mode'.

 

considered a suggestion that an abstract economist might make: that (transaction cost complications aside) the best way of bringing capital and land profitably together in this context might be to put their money into African-owned farms.

In sum, fixed capital formation requires more attention than it has traditionally received in the economic historiography of Africa. This is especially pertinent when comparing different precolonial economies, but it is true that in many precolonial contexts such investment was essentially a function of labour inputs. Meanwhile, the environmental constraints part of the factor endowments framework does much to explain why the general shortage of capital in African economies was inadequately remedied by capital imports, even under colonial rule.

## Labour Scarcity? A Critical Seasonal Distinction

The proposition that labour was relatively scarce needs amendment to take explicit and systematic account of the contrast between the demands on rural labour over the year in most of sub-Saharan Africa. Labour scarcity was indeed acute during the wet season, when planting had to be done and weeds had to be quelled. Except in the equatorial forest, however, the dry season was long enough to include months during which little farming was possible, and in which the opportunity cost of labour was therefore low.

Tosh highlighted the economic consequences of the rainy season labour bottleneck in the context of the 'cash-crop revolution': the massive expansion of export agriculture in several non-settler colonies in the 1890s–1920s. He argued that the supply response to the export demand was inversely related to food security, and that the latter turned on the length and scheduling of the labour inputs required by the export crop. Specifically, he suggested that because the rainy season, and therefore the opportunity to plant, was shorter in the savannahs than in the forest zones, savannah farmers were less responsive to export markets than were forest-based producers.[58] The inter-zonal contrast he drew may have been too sharp,[59] but the general point about labour is convincing. Cotton was the crop that all the European governments, and their textile manufacturers at home, were most keen to see exported from African colonies. Yet, though it was already grown for local consumption, farmers proved generally very unwilling to expand output: precisely because this inedible crop had to be planted at the same time of year as the staple food crops.[60] Buganda was the major exception: exports of cotton grew relatively rapidly there in the early years of colonial rule. But this was an exception that 'proves the rule': Buganda's banana groves required much less labour to secure the food supply than did the crops grown in other potential cotton-growing areas. Lango district, in western Uganda, provided a further exception. There, farmers initially declined to grow cotton for export, instead continuing to produce sesame, which they sold in regional markets and which they could eat themselves if necessary. However, a shift of relative producer prices in favour of cotton, and a

[58] Tosh, 'Cash-crop revolution'.
[59] Richards, 'Farming systems', pp. 14–17.
[60] Isaacman and Roberts, eds., *Cotton*; Tosh, 'Cash-crop revolution'.

reduction in famine risk (partly because of the introduction of communal granaries by the colonial administration), persuaded them to change their minds.[61]

In precolonial tropical Africa, where people grew most of their own food (except in predominantly pastoral or hunter-gatherer societies), usually demand for labour in agriculture was slack during the heart of the dry season. Thus the opportunity cost of labour was low for a few months each year. In that period, far from being scarce, labour was relatively abundant in relation to currently usable natural resources. Mungo Park provided an eyewitness description, from the Manding kingdom in what is now Mali, in which he stayed in 1796–7.

> Few people work harder, when occasion requires, than the Mandingoes; but not having many opportunities of turning to advantage the superfluous produce of their labour, they are content with cultivating as much ground only as is necessary for their own support. The labours of the field give them pretty full employment during the rains; and in the dry season, the people who live in the vicinity of large rivers employ themselves chiefly in fishing . . . Others of the natives employ themselves in hunting . . . While the men are occupied in these pursuits, the women are very diligent in manufacturing cotton cloth . . . A woman with common diligence will spin from six to nine garments of this cloth in one year, which, according to its fineness, will sell for a minkalli and a half or two minkallies each. [Park footnote: 'A minkalli is a quantity of gold nearly equal in value to ten shillings sterling'.] The weaving is performed by the men.[62]

Park's account captures the contrast between the labour required by the exigencies of the agricultural year, and the more discretionary activities with which men and women put their time to productive use during the remainder of the year. This issue was neatly expressed by Curtin, arguing that gold mining in the Bambuk area of Mali was profitable only as long as labour was very cheap; which it was before colonial rule, because of the low opportunity cost of this dry-season activity. Curtin was careful to avoid generalizing.[63] However, the pattern can be documented elsewhere and was probably widespread in tropical Africa, for some handicraft as well as extractive activities, into the twentieth century.[64] An exception was the equatorial forest of central and west-central Africa, where the dry season could be as brief as two months, during which there was hunting and fishing to be done, and fields to be cleared before the onset of the rains signalled the time to plant.[65] In general, however, the endowments framework needs to be modified in systematic recognition of the fact that the lightly-populated economies of precolonial Africa were usually not short of labour outside the agricultural year.

## Conclusions on Factor Endowments: Revisions and Implications for Economic Growth

This section has upheld the basic propositions of the endowments approach, that cultivable land was abundant in relation to labour, but also that in most places it was difficult to exploit intensively. The implications of this for economic growth are double-edged. The availability of land which could be brought into

[61] Tosh, 'Lango agriculture'.
[62] Park, *Travels*, p. 215.
[63] Curtin, 'Lure of Bambuk'.
[64] Austin, *Labour*, p. 77.
[65] Vansina, *Paths*, p. 86; Kriger, *Pride*, p. 69.

 

cultivation provided opportunities for rapid economic growth: notably the cash-crop expansion of the colonial period in much of West Africa, and the great postcolonial cocoa and coffee-planting boom in Ivory Coast.[66] However, the environmental constraints made agricultural intensification difficult and costly, reducing and delaying the prospects of permanent, 'Boserupian' transitions to intensive techniques.[67]

Both aspects are united in a concept which Ruf has coined for the case of cocoa growing,[68] and which has been considered in detail in relation to colonial Ghana.[69] This is 'forest rent', defined as the difference in the cost of producing a unit of beans on a farm that has been replanted with cocoa, compared to one freshly cleared from forest. The forest rent of Ghana and Ivory Coast was massively depleted during their respective phases of rapid expansion of cocoa output: making rapid growth both possible and hard to sustain.[70] The idea of forest rent is, it may be suggested, of much wider application. It captures a feature of African agricultural history: the one-off fertility bounty, available because of the combination of land abundance and fragile soil fertility.

Forest rent is one of three specific revisions to the factor endowments approach which emerge from this section. The others are recognition that fixed capital formation was a key part of all economic activities (before colonial rule as well as later), though its volume was essentially a function of labour inputs; and the need to take systematic account of the fact that, while in most of tropical Africa labour was scarce for agriculture, it was relatively abundant for off-farm, dry-season activities.

### *I.3 'Prediction' on Choice of Techniques: a Labour-Saving Bias?*

For African history it makes sense to employ the 'classical' three-factor framework, as opposed to the capital-labour duality commonly used in neoclassical economics, because in this context, as was implicit above, capital cannot generally be regarded as a substitute for natural resources. Indeed, some neoclassical economic historians have treated the role of cultivable land and other natural resources as central to understanding divergence and convergence in technology and economic growth between industrializing economies; this position is taken here, in mostly quite different contexts.[71] Some readers will be very familiar with the argument that, in principle, factor ratios can never explain choice of technique, because whichever method happens to reduce unit costs will be preferred, irrespective of relative factor prices. However, we will see that in sub-Saharan history, in practical terms the opportunities to minimize costs by choice of

[66] From a large literature see, for example, the introduction and geographically-pertinent chapters in Clarence-Smith, ed., *Cocoa pioneer fronts*.

[67] Cf. Boserup, *Conditions*.

[68] Ruf, *Booms*; idem, 'From forest rent'.

[69] Austin, *Labour*, pp. 65–6, 325–36, 348–50, 437–8.

[70] On the transformation of land use in Ivory Coast, see Weiskel, 'Archaeology'.

[71] David, *Technical choice*; A. M. Taylor, 'Convergence and international factor flows in theory and history', NBER working paper 5798 (1996).

 

technique have been highly constrained by factor ratios, partly because of environmental obstacles to intensification in agriculture and indeed in handicraft manufacturing.[72]

This section reviews the evidence on Hopkins's argument (made for West Africa, though here the issue is considered for the region as a whole) that the prevailing factor ratios created a labour-saving bias in choice of technique. We will consider agriculture and manufacturing in turn, endorsing Hopkins's conclusion for agriculture, but arguing that labour was relatively abundant outside agriculture, and drawing on recent work to emphasize that the natural environment restricted severely the opportunities to improve labour productivity even in manufacturing.

## Agriculture: the Historic Predominance of Land-Extensive Techniques

The methods used in African farming varied greatly and subtly with local conditions. We have seen, however, that intensive techniques (those involving high labour—and capital—inputs in relation to land area) were adopted for various reasons and remained limited to exceptional localities—an overall pattern which fits Hopkins's argument. Five comments should be made on the restricted dynamics of islands of intensive agriculture within predominantly land-abundant economies. First, they were not always as prosperous as their extensive-farming neighbours; reflecting, presumably, intensification by local necessity.[73] Second, where they were prosperous, they were often stuck. Hawthorne shows that when the Balanta farmers in Guinea-Bissau moved from growing yams in fields to rice in mangrove paddies in the seventeenth century, they reorganized their social arrangements (introducing an age-grade system) to provide concentrations of labour for such tasks as constructing dams, and were rewarded with much higher yields per unit area.[74] However, the area under such cultivation was restricted by the location. Third, intensification often turned out to be ultimately temporary, as with other specializations. At Engaruka in the Rift Valley, in northern Tanzania, Sutton examined the visible remains of 'a *system* of ancient fields with carefully engineered irrigation works' covering at least 2,000 hectares.[75] Built and operated from the fourteenth to the seventeenth centuries, it was then abandoned, primarily because of a decline in the water supplies essential for the irrigation. This suggests that it was a case of 'over-specialization', especially as the community could not reproduce itself in recognizable form elsewhere.[76] Anderson's account of the Il Chamus economy shows a different aspect of the impermanence of permanent cultivation. In the nineteenth century the Il Chamus cultivated irrigated plantations at the southern end of Lake Baringo in Kenya; by the 1920s, responding to changing local pressures and opportunities, they had abandoned them in favour of

[72] Cf. David's contribution (ibid.) to the debate over Habbakuk's argument that differences in factor endowments affected the respective choices of technique in Britain and the United States respectively, in the nineteenth century (Habakkuk, *American and British technology*).

[73] Hopkins, *Economic history*, pp. 35–6; Widgren, 'Historical geography', p. 11.

[74] Hawthorne, 'Nourishing a stateless society'; idem, *Planting rice*.

[75] Sutton, 'Irrigation agriculture'; Sutton, 'Engaruka', pp. 114–24. The quotation (emphasis in original) is from the former, p. 1.

[76] Sutton, 'Irrigation and soil-conservation'; also idem, 'Irrigation agriculture', pp. 34–5; idem, 'Engaruka', pp. 124–8.

 

pastoralism; though again, not permanently.[77] Fourth, intensive 'islands' have often been integral parts of regional economies otherwise based on extensive production; best viewed as part of a broader pattern of specialization within such economies.[78] For example, the Il Chamus plantations fed the Swahili trade caravans of the nineteenth century, and they and other Maasai-speaking cultivating communities 'acted as a safety net for Maasai pastoralists, absorbing destitute herders during periods of hardship . . . and releasing population back into pastoralism when individuals had accumulated sufficient livestock and environmental conditions had recovered'.[79] Finally, intensive agriculture generally showed no tendency to spread, whether by emulation or through growth from within. Whether this has begun to change, from the twentieth century, will be discussed later. The general point is that in African agricultural history it is necessary to disabuse oneself of the assumption that intensification necessarily meant greater efficiency.[80] It also required increased inputs of the usually scarce factor of labour, to create capital goods by improving soil quality (collecting stones, for a start) and establishing and maintaining terracing or irrigation.[81]

The general pattern among African farmers in the precolonial era and often since was a consistent, long-term insistence on adopting those available methods which saved labour while using relatively large proportions of land.[82] These methods also spared capital. 'Land-extensive' cultivation was apparent in the use of various forms of shifting cultivation and land rotation (that is, respectively, periodically moving the farm, and cultivating successive plots within the same farm area) rather than mere crop rotation. Even with land rotation, before the twentieth century fallow periods tended to be long, any given plot being fallowed for several times as long as it was cultivated.[83] The same principle applied in the cash-crop era, as in colonial Ghana, where the techniques used in cocoa cultivation by indigenous farmers differed in several major ways from those advocated by the colonial Department of Agriculture and practised by the—ultimately unprofitable—European plantations. For instance, African farmers planted trees relatively close together, reducing returns per unit of land, but increasing returns per unit of labour because it saved weeding (it meant that the trees formed a shade canopy more quickly, starving weeds of light). Again, European planters put capital and labour into spraying against capsid infestation; African farmers temporarily abandoned the farms (and replanted elsewhere, access to land being cheap), returning when nature had done the work for them (capsid disappeared when the cocoa plants became overgrown with other vegetation).[84] A further

[77] Anderson, 'Cultivating pastoralists'.

[78] Hopkins, *Economic history*, p. 36; Sutton, 'Irrigation and soil-conservation', p. 30.

[79] Anderson, 'Cultivating pastoralists', p. 242; cf. Spear and Waller, eds., *Being Maasai*.

[80] Hopkins, *Economic history*, pp. 36–7; Sutton, 'Irrigation and soil-conservation', pp. 25–41.

[81] See above, sections I.2 and I.3; this still applies today, as Platteau has emphasized (Platteau, 'Food crisis', pp. 503–4).

[82] For example, Hopkins, *Economic history*, pp. 35–7; van Zwanenberg with King, *Economic history of Kenya and Uganda*, p. 26; Austen and Headrick, 'Role', p. 171; Thornton, *Kingdom of Kongo*, p. 36; Sutton, 'Irrigation and soil-conservation', pp. 30, 41. The banana-based economies of Buganda and some other Great Lakes societies were fortunate in that their staple required relatively low labour inputs while delivering high yields per unit area (see, for example, Schoenbrun, *Green place*, pp. 79–80; Reid, *Political power*, pp. 22–5).

[83] For a detailed case study, see Wilks, 'Land'. On the meaning of land-extensive cultivation in a more arid context, the southern edge of the Kalahari, see Jacobs, *Environment*, pp. 49–52.

[84] Austin, 'Mode'.

 

aspect of the extensive approach, before and during colonial rule—again, in contrast to colonial agricultural advice and, in colonial Zimbabwe, even instruction—was the apparently quite common practice of leaving (or in some cases planting) large trees in cultivated fields. This saved labour, made fallowing more effective (by accelerating reversion to bush) and provided workers with shade.[85]

## Outside Agriculture: Labour-Intensive Just by Default? The Paradox of the Narrow Loom

In transport, mining, and manufacturing (handicrafts), by contrast, labour-intensive methods prevailed. To a large extent this was dictated by environmental constraints and limits in technical knowledge. Where trypanosomiasis was present, animals could not be used in transport.[86] Though donkeys and horses were used outside the tsetse-fly belts, notably in much of the West African sahel and Sahara, for much of the continent it took the advent of mechanical power, not animal power, literally to take the burdens of long-distance trade off people's backs and heads. In mining (whether for gold, iron ore, or salt) and manufacturing, know-how constraints would have restricted the opportunities to substitute capital for labour, even if that had been economically desirable.[87] Thus in trying to establish the significance of factor ratios as an influence on choice of technique, we face a problem of 'over-determination': the technique can be accounted for, apparently sufficiently, by other explanations. Labour saving was typically not an option.

However, we can take the enquiry further by noting that there was one major handicraft, cotton weaving, in which the choice of technique was exactly that, in that it was not determined by ignorance of alternatives. The issue is how to explain the most distinctive characteristic of African, especially West African, handlooms: their narrowness.[88] Park commented of the weaving he observed during a several-month-long stay in Kamalia, a small Manding town just west of Bamako, in 1796–7: 'The loom is made upon exactly the same principle as in Europe; but so small and narrow that the web is seldom more than four inches broad'.[89] The result was to *restrict* labour productivity. One estimate, from 1930s Nigeria, was that the narrow loom produced about 20 square feet of cotton per day, compared to 36 for a European broadloom.[90] How can this choice, apparently so perverse in relation to the general factor ratio, be explained?

The answer is partly cultural: West African consumers tended to have an aesthetic preference for cloth composed of multiple, narrow strips rather than cut from a single, broad one. Therefore in the case of the most specialized weavers, producing the highest-quality cloth, the narrow loom was probably used because customers made an aesthetic choice in favour of its product. This is one of the

[85] Wilson, 'Trees'.
[86] Austen and Headrick, 'Role', pp. 170–1.
[87] For example, Lovejoy, *Salt*, pp. 112–14.
[88] Picton and Mack, *African textiles*, p. 96. Some precolonial West African societies, such as the Yoruba, had a relatively broad as well as a relatively narrow loom (Thornton, 'Precolonial African industry', pp. 9–10). This confirms that the general predominance of narrow looms was not dictated by lack of knowledge.
[89] Park, *Travels*, p. 215.
[90] Johnson, 'Technology', pp. 260, 378.

 

reasons why West African handloom weavers, increasingly serving a niche, quality market, have continued to favour the narrow loom and to reject the broad loom up to the present.[91] But this cannot explain the use of the handloom in the eighteenth century and earlier, when much of the output was for relatively poor consumers, for whom it should have been more efficient to produce a larger volume of cloth at lower prices.

A second level of explanation, at least for the precolonial era, relates to the seasonal constraints on the use of labour, which meant that non-agricultural activities were concentrated largely outside the busy parts of the agricultural year. In tropical Africa (outside the equatorial forest), this meant the middle of the dry season, between the end of harvest and the start of land-clearance. For long-distance trade, mining, and hunting, this seasonality was strongly favoured by direct environmental constraints on the activities concerned: in the wet season, trade routes became impassable, mine holes were flooded, and wild animals dispersed instead of converging on waterholes. Smelting too was usually confined to the dry months when wood could be charred for fuel and fire sustained.[92] However, generally, as commonly in other pre-industrial economies, it was because of the constraints on the timing of productive work in agriculture that most artisanal work—some specialists apart—took the form of by-employment during the agricultural slack season. In this context, we can assume that the dominance of the narrow loom in West Africa was at least greatly facilitated by the low opportunity cost of dry-season labour.[93] It was that condition, as we saw, which was essential to the profitability of indigenous gold-mining in Mali. In this non-agricultural, dry-season setting, labour intensity was rational where it was not anyway inevitable.

However, there is a third level of explanation. Could not output have been expanded further, lowering the price of cloth to meet the demand of poorer purchasers, by using broader looms?[94] The wet-season bottleneck in agricultural labour is relevant here. We have seen for the early colonial period that farmers in most parts of Africa could not increase their raw cotton production without imperilling their food security. Applying this to earlier periods, the implication is that the supply of raw material for the dry-season cloth production was fairly inelastic. In that context, only a limited quantity of cloth could be produced. This amount could have been woven with much less labour had broader looms been used; but the extremely low opportunity cost of dry-season labour made it worthwhile to choose extra labour in return for the preferred quality, in competing even at the cheap end of the market. This laboriously achieved qualitative edge helps to explain how indigenous textile production continued to thrive in the eighteenth and nineteenth centuries, despite the increasing inflows of Indian and then Manchester cloths. Eventually, West African weavers resolved their raw material

[91] Browne, 'Rural industry'.

[92] Kriger, *Pride*, p. 69. For an eyewitness account of a smelt, at which the fire was maintained for at least three days, in what is now Mali in 1796–7, see Park, *Travels*, pp. 217–18.

[93] For a case study, see Austin, *Labour*, pp. 75–7.

[94] I am grateful to Peter Temin (M.I.T.) for pressing this question when an earlier version of the paper was presented at the economic history seminar at Harvard, Oct. 2005. He is not responsible for the answer offered here.

 

bottleneck by switching to imported (machine-spun yarn), and concentrating on selling quality cloth to farmers whose purchasing power was boosted by participation in export agriculture.[95]

## Environmental Constraints on the Intensification of Handicraft Production

The supply constraint on domestic production of spun yarn stemmed from the seasonal restrictions which the natural environment imposed on agriculture. We noted that trypanosomiasis condemned the transport system of much of Africa to reliance on head-loading, until the possibility of mechanization arrived from outside. The argument can be extended to iron smelting. Although the high labour intensity of African smelting was not a choice, the natural environment hindered producers from moving on to more labour-saving methods. The quality of African iron goods was such as to give indigenous smelters a competitive advantage over imports, at least in West Africa, well into the twentieth century.[96] The industry dwindled because of progressive exhaustion of energy supplies, in the form of the kinds of trees required for charcoal.[97] When Britain ran short of charcoal, a switch to coal was possible; in West Africa, it was not. Worse, even in the heyday of African iron smelting, it seems that iron goods were perpetually in short supply. V. L. Cameron's eyewitness description of iron smelting and working in what is now north-eastern Congo (Congo Democratic Republic) in 1874 noted that the anvils and larger hammers used by the smiths were themselves made of stone; only the 'smaller hammers are of iron'.[98] Thus the low elasticity of the domestic supply of iron, primarily attributable to the dependence on scattered supplies of potential charcoal, limited the opportunity to improve labour productivity in iron smelting itself.[99]

## Conclusions on Techniques: Revision and Implications for Economic Growth

Hopkins's argument that agricultural techniques were characteristically land-extensive and labour-saving stands up well, and far beyond the west of Africa. Two revisions are suggested here. First, it is necessary to strengthen the emphasis on the environmental constraints on manufacturing. The brevity of the planting season imposed a trade-off between food security and cotton growing which, in turn, seriously limited the supply elasticity of the raw material to the most widespread handicraft industry on the continent, cotton weaving. The resolution of this constraint, in the form of imported machine-spun yarn, only came simultaneously

[95] Johnson, 'Technology'; cf. Byfield, *Bluest hands*.
[96] Goucher, 'Iron is iron'; Pole, 'Iron production'; de Barros, 'Bassar'; Schmidt, *Culture*.
[97] Goucher, 'Iron is iron'; cf. Pole, 'Iron production', and de Barros, 'Bassar'.
[98] Cameron, *Across Africa*, vol. I, p. 372.
[99] For west-central Africa, Kriger's pioneering study, *Pride*, pp. 70–3, attributes it rather to entry barriers imposed by the smelt-masters. But this seems unlikely as a long-term and Africa-wide explanation, especially as she also documents local or regional trade in iron ore (p. 67): competitive pressures might be expected to have undermined any cartel. Indeed, she shows dissemination of techniques across geographical and social barriers (pp. 73–80). Furthermore, her map of the distribution of smelters and towns shows no correlation between the two (pp. 60–1). This suggests a supply-side explanation of the former, which would be consistent with fuel constraints (which she notes elsewhere, pp. 67–8), as well as with physical insecurity which she highlights.

 

with competition from machine-woven cloth. Again, the shortage of charcoal (let alone coal) restricted the availability of labour-enhancing metal tools, even to the makers of metal themselves.

Second, the fact that labour was not scarce during the agricultural off-season needs to be promoted from the status of being acknowledged to being incorporated systematically into the factor endowments framework. For it is important in explaining what is otherwise an unlikely combination of features of precolonial economies: that they were relatively diverse and had relatively low labour productivity. On one hand, the low opportunity cost of dry-season labour helps to explain why West Africa could be a major exporter of gold to medieval Europe, and why, in the early Atlantic trade (as of 1650, for example), 'Europe offered nothing to Africa that Africa did not already produce': notably cloth, and iron and copper in raw and worked forms.[100] On the other hand, despite the high quality of much African cloth and iron, the labour productivity of African manufacturing was low.[101] Recognition of the latter is essential to a convincing explanation of how it was even privately profitable to sell slaves out of Africa, given that there was also a market for slaves within these (generally) labour-scarce economies.[102]

Finally in this section, after emphasizing the constraints on technological change, it is appropriate to underline the possibilities for economic growth. The choices discussed above—where they were choices—in agriculture and beyond may all be regarded as plausibly optimizing responses to the local conditions faced, respectively, by the producers concerned. In the short term, there is no guarantee that the aggregate effect of all these micro-level decisions would have been a growth in output per head in the societies or localities concerned, or in sub-Saharan Africa as a whole. But it would be a mistake to conclude that this implies simply static allocative efficiency. On the contrary, even within the narrow context of these choices themselves, assuming everything else was unchanged, one would expect to see some long-term improvement in efficiency, leading to higher output: as a result of learning from trial and error, nudging the technical choices gradually closer to the optimum for the particular local circumstances. If these conditions were stable, one might expect that practice might eventually come very close to the optimum, albeit one defined not in purely marginalist terms but allowing for food security as local conditions dictated.[103] However, growth from this source is by its nature finite. A second source of change was potentially more important. With a stable population and unchanging demand from both domestic and external markets, land-extensive agriculture might well not erode the land surplus. However, in the context of either population growth or enlarged external demand (external to the community concerned but not necessarily from overseas), land-extensive agriculture would bring ever larger areas into cultivation, albeit still on long cycles. The cumulative external effects of a multitude of individual choices could be the gradual elimination of land abundance, the very condition which made the extensive strategy optimal.

[100] Thornton, *Africa*, pp. 44–6 (quotation at p. 44).

[101] Thornton, 'Precolonial African industry'; idem, 'Historian'; idem, *Africa*; Goucher, 'Iron is iron'.

[102] Here I disagree with an important argument of Thornton's: see his 'Precolonial African industry', 'Historian', and *Africa*. Rather, I share the view of Fenoaltea, 'Europe in the African mirror', though in a modified fashion and drawing on new evidence. I am preparing a separate discussion of this.

[103] Cf. the classic exchange about peasant rationality in (especially south) Asian agriculture: Schultz, *Transforming*; Lipton, 'Theory'; Ball and Pounder, ' "Efficient but poor" revisited'.

 

This possibility will be considered in section II, when we shift our attention to the strategies open to African producers seeking not merely to optimize with a fixed set of resources, but to find ways of raising the rate of return on them.

## II

Section I of this paper revised the factor endowments framework to sub-Saharan economic history; the purpose of section II is to mobilize it. A major criticism levelled at earlier formulations of the framework, and at Africanist economic historiography generally, was that the picture they present of the history of production is 'essentially static'.[104] Hopkins himself, writing at the beginning of the 1970s, noted that 'Possessing only a bare patchwork of data, it is hard to avoid presenting a composite picture of the "traditional" economy. Lacking a coherent chronology, it is harder still to escape a static timeless account of the local economy in the centuries before' European rule.[105] Hopkins highlighted variety and change where possible, identified constraints on economic growth, and explored the interactions between domestic resources and changing patterns of foreign trade. More than 30 years after the publication of Hopkins's classic work, the constraints remain but have been ameliorated. We have more evidence on changing products and techniques, the scale of slave labour, and changing responses to the opportunities and constraints of soil fertility and seasonality. The intention here is to take advantage of this to shift the focus from 'structure and function' (the subtitle of Hopkins's chapter on 'The domestic economy' of West Africa) to patterns of change, in West Africa and beyond. Accordingly, section II.1 identifies three basic strategies which African principals—producers and traders, and in some contexts political authorities—adopted to raising the rate of return on their use of resources, ultimately with implications for the growth and structural change of their economies. Section II.2 considers the paths of development that resulted from these strategies. Section II.3 discusses how the factor ratios to which the strategies had responded were gradually changed, to a large extent as a direct result of the pursuit of the strategies themselves; and asks whether a transition from extensive to intensive growth is now underway.

### *II.1 Three Approaches to Raising the Rate of Return*

In this context of land-extensiveness in agriculture and labour intensity in crafts, mining, and transport, in principle there were various ways in which higher output might be achieved. Given that in precolonial African economies land was generally abundant and capital formation largely a function of labour inputs, it makes sense to express these possibilities in terms of labour, rather than of factors of production as a whole. Three specific strategies may be distinguished, though they were not mutually exclusive: raising labour productivity in agriculture; raising it in the traditional agricultural off-season; and using coercion to reduce the cost of labour.

[104] Phiri, 'African history', p. 40; cf. Zeleza, *Modern economic history*, vol. I, p. 3.
[105] Hopkins, *Economic history*, p. 8.

 

## Raising Labour Productivity in Agriculture

The productivity of farm labour could be improved, both in physical terms (raising the volume of output in relation to labour inputs) and in value (by obtaining higher real prices, implicit or explicit). This could be done by increasing the ratio of capital to labour, and/or by improving what was planted, and/or by access to additional or expanded markets. We have seen, however, that the natural environment imposed major constraints on intensification of land use. While ecological variation was the basis of much precolonial long-distance trade,[106] the usually low population densities favoured self-sufficiency and raised the per capita cost of supplying markets.[107]

The greatest long-term source of higher productivity—and increased food security—in African agriculture was surely the adoption of new crops and crop varieties. Learning from experience and diffusion within Africa were parts of the story, though the hardest to document.[108] Most clearly established is the long history of importation of cultigens from parallel latitudes. The process began with plants from south-east Asia and India, introduced through the Indian Ocean trade, from which East African farmers had adopted Asian rice, Asian yams, and, above all, the banana-plantain family, before the inception of the Atlantic trade.[109] Over the last five centuries, however, a still greater impact has been made by crops from the Americas, especially south and central America. In particular, maize offered much higher yields and often more than one crop a year; cassava (manioc) more calories and drought resistance. Maize is probably now the most widely grown crop in Africa, cassava and groundnuts (peanuts) also became major domestic food sources, while in the nineteenth and twentieth centuries, groundnuts and cocoa became the major export commodities of much of savannah and forest-zone West Africa respectively.[110] With the adoption of cocoa, for the first time Asante producers in the inland reaches of the Ghanaian forest zone had a fully cultivated commodity with which to capture the 'forest rent'. Their older 'agricultural' exports, kola nuts and rubber, came from trees which were weeded around but not planted.[111] Africans' adoption of exotic cultigens was both selective and actively adaptive. For instance, in 1915 the head of the French agricultural service in colonial Ivory Coast was struck by the proliferation of hybrid varieties of cotton growing in African farmers' fields, as the farmers experimented with newly acquired 'American' varieties, combining them with locally established ones to produce new forms suited to local conditions.[112]

It should be noted, because the point has been generally underplayed, that where and when fixed capital formation could be profitable in African agriculture it seems to have been undertaken. To the examples given earlier, it should be added that where the natural environment permitted the successful use of ploughs, and the level of demand for their produce made it possible to finance them, Africans

[106] Roberts, 'Linkages'.
[107] Hopkins, *Economic history*, pp. 76–7; Austen and Headrick, 'Role', p. 171.
[108] For example, Hay, 'Luo women', pp. 95–6; Vansina, *Paths*, pp. 85–6.
[109] See Schoenbrun, *Green place*, pp. 79–83.
[110] McCann, *Maize*.
[111] Austin, *Labour*, p. 48.
[112] Bassett, *Peasant cotton*, pp. 32–3. The 'American' varieties were genetically half-African themselves (ibid., p. 32).

adopted them. This occurred in Ethiopia, where plough use was ancient but became increasingly common, especially during the sixteenth and twentieth centuries.[113] It happened further south too, primarily though not exclusively in sub-tropical southern Africa. While the growing use of the ox-plough in inter-world-war Southern Rhodesia was partly a 'Boserupian' response to a diminishing land/labour ratio—under the impact of European expropriations of land[114]—this was not always so with the earlier wave of African adoptions of the same equipment, further south, in the second half of the nineteenth century.[115] In the Mpondo chiefdom and in the kingdom of Lesotho, for example, the adopters responded to incentives to shift resources from pastoral to arable production, to expand grain stores after a period of droughts and cattle diseases, and to take advantage of external demand from rising urban and mining populations.[116] In the forest zones of West Africa, the major example of wide-scale fixed capital formation was the creation of tree-crop farms, most notably in cocoa: the planting of trees that took several years before they began to bear, but might then yield for decades. This investment was made easier by being essentially a case of the capitalization of simple, tool-aided labour.[117] What stimulated the growth of export agriculture in the nineteenth and twentieth centuries was access, via the steamship and later also the railway and the lorry, to the mass markets overseas created by the first and second industrial revolutions.

## Raising Labour Productivity in the Dry Season

The productivity of dry-season labour could be raised most obviously in non-agricultural occupations, but we should first note that over the long term there was some scope to do this even through agriculture. One means was the development and refinement—in the myriad of local circumstances—of intercropping (the mixing of different crops in the same field), the benefits of which include smoothing the labour burdens over the farming season, partly by extending the planting period.[118] In some cases, this made it possible to shift other farming operations to the dry season, as is detailed in a postcolonial case study in the Nigerian savannah (comparing the mid-1960s and 1985).[119] Another method was to create or exploit land moist enough to cultivate in the dry season. By 1800, Nyanja farmers in the Shire Highlands of Malawi, responding to increasing population densities, had created dry-season gardens, thereby stretching the agricultural year and simultaneously getting more from their supplies of labour and land. Meanwhile, their counterparts in the Upper Shire Valley exploited marshland to grow maize all year round.[120] As the latter case illustrates, intercontinental trade, by providing access to new cultigens and new markets (whether overseas or, as in Malawi, via facilitating domestic population growth), often facilitated or even permitted the extension of

[113] McCann, *People*, p. 70.
[114] Mosley, *Settler economies*, pp. 77–9.
[115] Etherington, 'African economic experiments'; Bundy, *Rise*, pp. 44–6, 49, 51, 70–2, 76–7, 96, 173.
[116] Beinart, *Political economy*, pp. 25–8; Eldredge, *South African kingdom*, pp. 101–2, 104, 110, 114, 198.
[117] Hill, *Migrant*; Szereszewski, *Structural changes*; Berry, *Cocoa*, pp. 54–89; Austin, *Labour*, pp. 48–52, 68–9, 78–9, 87–8.
[118] Richards, *Indigenous agricultural revolution*, pp. 67–8; Stone, Netting, and Stone, 'Seasonality', pp. 15–16.
[119] Stone, Netting, and Stone, 'Seasonality', pp. 19–20.
[120] Vaughan, 'Food production', pp. 353–5.

 

the domestic agricultural year. In Burundi, from the eighteenth century, the adoption of maize and an American variety of haricot bean enabled farmers to insert a second crop cycle per year. This entailed heavy agricultural work (harvesting and sowing) in December, previously a relatively slack (because partly dry) month. In Cochet's assessment, the general adoption of new crop sequences and the adjournment of sowing of an established staple, sorghum, 'led to a progressive filling in of the agricultural work-calendar, and to a better distribution of the volume of work done'.[121] In colonial West Africa, especially in southern Ghana, south-west Nigeria, and (particularly after 1945) in Ivory Coast, the widespread adoption of cocoa—largely by African initiative—extended the productive period for agricultural labour much further into the dry season, for harvesting and marketing.[122]

However, it was outside agriculture that the main opportunities existed to raise the productivity of dry-season labour. In transport, the late nineteenth and early twentieth centuries brought a revolution: mechanization bypassed the tsetse fly, replacing head-porterage by the railway and, after *c.* 1918, the lorry. The use of the latter in Nigeria and Ghana was pioneered to a large extent by African entrepreneurs.[123] A nineteenth-century example of innovation in a craft occupation, cotton textiles, will be discussed below, as will the beginnings of modern manufacturing in the twentieth century.

## Coercion to reduce the cost of labour

The remaining 'growth strategy' was to use coercion to reduce the reservation price of extra-familial labour. This was a recurring feature of the history of precolonial and colonial sub-Saharan Africa, responding to the relatively high cost of free labour in land-abundant economies. Principals wanting to increase labour inputs beyond those available from themselves and their families faced what might be called the 'Nieboer' problem: that with land available to all, and in the absence of a technology yielding economic advantages of scale, there was no wage which it would be profitable both for a prospective employer to pay and for a prospective worker to accept, as opposed to working for him- or herself.[124] Precisely this situation existed in the precolonial kingdom of Asante in the nineteenth century, where slave masters apparently did not have the option of becoming employers instead.[125] A milder form of the problem, highlighted by Hopkins, was where wage contracts were mutually affordable, but sufficiently expensive to the prospective employer that he (as it usually was) preferred to use coerced labour.[126] In such contexts, it is not surprising that the internal labour markets of precolonial Africa mostly took the form of slave and pawn rather than wage labour. Slavery became more widespread during the precolonial nineteenth century in the context of

[121] Cochet, 'Burundi', pp. 22–9 (quotation translated from pp. 27–8).

[122] Beckett's data on monthly labour inputs from his 1932–5 survey of a Ghanaian cocoa-farming village show the extinction of the traditional agricultural slack season for farmers possessing both immature and bearing trees (Beckett, *Akokoaso*, p. 81).

[123] Heap, 'Development'; Drummond-Thompson, 'Rise of entrepreneurs'.

[124] Nieboer, *Slavery*; Domar, 'Causes of slavery'.

[125] Austin, *Labour*, pp. 155–70.

[126] Hopkins, *Economic history*, pp. 23–7. Again in South Africa, migrant labour was expensive for European employers until real wages were forced downwards by methods described below. See, for example, Harries, 'Kinship'.

 

expanding market production[127] on the east coast (51.7 per cent of an estimated 1,487,000 captives brought from the interior to the East African coast in the nineteenth century are estimated to have been retained on the coast, including in plantations producing spices and grains for export).[128] The same happened in West Africa on a wider scale, in the context of production of goods both for regional and for European markets, taking advantage of the initial fall in slave prices there in the aftermath of British withdrawal from the Atlantic slave trade in 1807.[129]

The colonial regimes in West Africa, imposed in the late nineteenth and early twentieth centuries, responded to the Nieboer problem by taking a mainly gradualist approach to ending slavery: forbidding the trade but generally tolerating the institution for years (for decades in the cases of Sierra Leone and northern Nigeria).[130] Further, in the early colonial period, European administrations throughout Africa made extensive use of *corvée*: for public works and—especially but not exclusively in settler and plantation economies—in recruitment for European private employers. This was, for instance, abolished in the French Empire only by a law of 1945.[131]

In the settler economies, notably South Africa, Southern Rhodesia (Zimbabwe), and Kenya, the Nieboer problem was tackled mainly indirectly. African farmers had responded to market demand for food by growing crops for sale. Governments applied two measures to force them out of the produce market and into the labour market: the reservation of much of the land for Europeans; and, equally importantly, the prohibition of Africans from working on European-owned land except as pure wage labourers.[132] Thus share-tenancy, in both its explicit form (common in South Africa) and in the implicit form of 'squatting' (common in Kenya) were either banned (as under the 1913 Natives Lands Act in South Africa) or permitted only on the condition that a specified minimum number of days of labour service were performed on the European landowner's farm (as under Kenyan colonial legislation). Thus, in the settler economies, wage labour for European-owned farms and mines was not only legal but was enjoined through the use of force to exclude alternative market options.

## *II.2 Outcomes of These Strategies*

### Tendencies of Economic Growth

Composing his 'millennial' figures for world GDP, Maddison baldly 'assumed that African per capita income did not change from 1500 to 1700'.[133] I see no purpose

[127] For overviews, see Lovejoy, *Transformations*; and Manning, *Slavery*.

[128] Lovejoy, *Transformations*: the figures are on p. 151.

[129] See several of the essays in Law, ed., *From slave trade*; also Eltis, *Economic growth*; Lovejoy and Richardson, 'British abolition'; Austin, *Labour*, pp. 122–7, 183–7, 200–1.

[130] There is a large and expanding literature on this. See, for example, Lovejoy and Hogendorn, *Slow death*; for a recent overview, Miers, 'Slavery to freedom'; for an analysis of colonial motivation on this, Austin, *Labour*, pp. 205–14.

[131] See Cooper, *Decolonization*.

[132] The seminal paper was Arrighi, 'Labour supplies'; further, Palmer and Parsons, eds., *Roots*, and Bundy, *Rise*. Since then, revisionist literature has documented effective African resistance to being driven out of the produce market, notably in Kenya and what is now Zimbabwe; but the claim that this was the initial aim of European policy appears well-founded. See, for example, Mosley, *Settler economies*; Kanogo, *Squatters*.

[133] Maddison, *World economy*, p. 259. He includes North Africa.

 

in trading guesses about aggregates for periods for which such data as are worthy of the name are too few to be worth aggregating. There is reason, however, to think that the combined productive capacity of the economies of sub-Saharan Africa expanded during this period. The same basic long-term tendencies as before—and after—are apparent: notably towards the expansion of settlement and of agriculture, and the adoption of new crops and crop varieties.

The latter process was intensified, as we have seen, by the importation of exotic cultigens. Though selective and in some cases very gradual, it has been hailed as an 'agricultural revolution' in major regional studies. By facilitating population growth, maize and cassava from the Americas encouraged the extension of habitation and farming,[134] just as bananas and plantains from south-east Asia had done in earlier centuries and even millennia.[135] Wilks has argued that the formation of Akan-speaking agricultural communities in the forest zone of what is now Ghana was the result of a 'big bang' in the sixteenth and seventeenth centuries, in which relatively large-scale land clearances were achieved, partly by the importation of slaves paid for with gold. The slaves were supplied both by Wangara traders who obtained them in the neighbouring savannah, while retailing much of the gold into the Saharan trade; and by Portuguese traders who trans-shipped slaves they had purchased in the Kingdom of Benin and sold them to Akan buyers on what is now the Ghanaian coast.[136] Thus in this example, the arrival of European ships served to accelerate an established pattern of external trade, facilitating what we used to consider basically the 'subsistence' process of establishing dwellings and cultivation. The same could be said of Hawthorne's picture of Balanta farmers taking advantage of the fact that iron obtained from Portuguese merchants was cheaper than African-produced iron to equip themselves with the tools needed to cultivate paddy rice in mangrove crops.[137]

The expansion of settlement was supported by the above-noted social preference for high fertility. Thornton's study of baptism statistics from the kingdom of Kongo, 1550–1750, provides a rare quantitative glimpse of the demography of the period: one which is consistent with the general impression from later sources for other areas of Africa in that it suggests a relatively high birth rate.[138] It is only really for the eighteenth century, when the Atlantic slave trade was at its peak,[139] that it seems likely that the outflow of people, and the social costs of procuring captives (and of the defensive measures taken against slave raids by decentralized societies, which themselves surely increased the transactions costs and risks of trade)[140] were so great as to make it likely that overall productive capacity shrank in those societies most affected by the trade, in West and West-Central Africa. When and where it occurred, much of the growth in productive capacity was presumably directly attributable to the application of additional labour to land. However, the

[134] Miller, *Way of death*, pp. 19–21; Chrétien, *Great lakes*, pp. 64–5.

[135] Vansina, 'Towards', pp. 172–4; Chrétien, *Great lakes*, pp. 63–4; Mitchell, *African connections*, pp. 106–8.

[136] Wilks, 'Land'; see also Kea, *Settlements*, pp. 85–94; and for an archaeological perspective, Shinnie, 'Early Asante'. For the continuation (in different social forms) of the imposition of population and agriculture on nature in the Akan forests, see McCaskie, *Asante identities*.

[137] Hawthorne, 'Nourishing a stateless society'; idem, *Planting rice*.

[138] Thornton, 'Demography'. For an overview, see Iliffe, 'Origins'.

[139] Over half of all slaves exported across the Atlantic were shipped during that century (Lovejoy, 'Volume', pp. 477–8; Eltis, 'Volume', tab. 2, p. 44).

[140] Searing, ' "No kings" ', pp. 414–17; Klein, 'Slave trade', pp. 55–6, 58.

 

Table 1. *Foreign trade of selected African economies, selected years (£ million, rounded down, at 2005 UK prices)*

| | *1897* | *1913* | *1919* | *1929* | *1932* | *1938* | *1945* | *1952* | *1960* |
|---|---|---|---|---|---|---|---|---|---|
| Ghana | 133 | 557 | 547 | 881 | 614 | 980 | 741 | 2,946 | 3,611 |
| Nigeria | 224 | 837 | 783 | 1240 | 752 | 978 | 940 | 4,743 | 5,942 |
| South Africa | 3,568 | 6,875 | 4,398 | 6,809 | 4,507 | 8,425 | 7,746 | 16,347 | n.a. |

*Source:* Nominal data from Munro, *Africa*, app. 1, pp. 217–19. Converted to real terms via Lawrence H. Officer, 2006, EH.Net converter.

adoption of new crops, the availability of cheaper iron tools (because of imports), and in some cases the substitution of farming for hunter-gathering may have allowed not only an expansion of the carrying capacity of the land, but also provided the food security required to encourage further production for the market. For example, the Balanta proceeded to expand their rice output, for sale, at least replacing lower-value yams as their main agricultural commodity; another instance was the cassava trade that developed in parts of West-Central Africa.[141] Until the nineteenth century, however, in much of Africa the biggest opportunities to make money were often through the export trades in slaves.

## Specific Growth Episodes

There were notable episodes of economic growth in different parts of sub-Saharan Africa during the nineteenth and twentieth centuries, sustained over decades; but followed by perhaps shorter, though typically sharp, years of slump. In considering the results of the strategies outlined above, it is useful to focus on two major instances of growth and subsequent—partial—decline. One is the 'cash-crop revolution', mainly but not exclusively in West Africa; Uganda being the biggest other example. This can be dated from *c*. 1890 to *c*. 1930, but in part can be seen as an amplification of trends already established in the preceding precolonial decades. In West Africa, *c*. 1808–*c*. 1890 was the era of 'legitimate commerce', following the beginning of the end of the Atlantic slave trade. It is important to note, though, that the economic growth in the precolonial nineteenth century was not confined to the coastal economies with their new export trades in palm oil and peanuts. Long-distance trade within the region, especially that centred on Kano and the Sokoto Caliphate, was also very important. Within the West African cash-crop expansion, the focus here will be the spread of cocoa growing from the late nineteenth century in Ghana and Nigeria. The other major case is the largest African settler economy: South Africa, from the mineral discoveries (diamonds in 1867, gold in 1886) to the growth of modern manufacturing, a sequence which involved generally sustained growth until the 1970s. Both episodes are illustrated by table 1. We want to consider them in terms of the strategies identified earlier. In this context, it is necessary to make a distinction between the implications of the labour-coercion strategy for economic development outside and inside Africa.

[141] Hawthorne, 'Nourishing a stateless society'; idem, *Planting rice*; Harms, *River of wealth*, pp. 52–4.

 

Gathering, guarding, and selling captives, whether for deployment inside or outside Africa, produced grievous externalities. While the magnitudes of these are far from certain—how far the wars of the periods concerned are attributable to slave trading, for instance—it is clear that such commerce distracted from and actively damaged peaceful economic activity. In the case of slaving for export, the fact of export magnified these adverse consequences for African economies as a whole, profitable as it was for the merchants and rulers involved.[142] Admittedly, we cannot confidently assess the demographic consequences. We now have a fairly reliable sense of the numbers shipped from Africa, at least in the Atlantic trade, but we can only make rough estimates of the size of the population of Africa, or of the regions most affected, before or during the trade.[143] The basic economic consideration, however, is that to remove labour from a labour-scarce continent was the opposite of what the economies required for long-term growth.

The coercion of labour within Africa, on the other hand, not only created economic rents but also facilitated the two major phases of growth in output and productivity identified above. In West Africa, pawns, slaves, and semi-dependent descendants of slaves helped their masters adopt cocoa on a wide scale in parts of Ghana and Nigeria during the early colonial period.[144] In the concessionaire-plantation and the settler economies of Africa, the role of coercion was more general and enduring. In the former, coercion took primarily the direct form of forced labour.[145] In the settler economies, the most important form of coerced labour was indirect: as noted earlier, here the state made land institutionally scarce for Africans, in order to drive them out of the produce market and into the (in some cases monopsonistic) labour market. This made a massive contribution to keeping labour costs down. It is critical in explaining, for example, how the real wages of black gold miners in South Africa were not only ratcheted downwards but then remained below their 1890s–1900s levels until after 1970 (with a ratio of white to black miners' wages of more than 11 in 1911 and 1931, for instance).[146] The agricultural consequences may have been damaging for economic growth. However, the cheap labour contributed decisively to the profits and tax revenues from mining in southern Africa, part of which were reinvested, directly or indirectly, in manufacturing. Noting Frankel's calculation that the net rate of return on capital in South African gold mining during 1897–1932 averaged 4.1 per cent, Feinstein estimated (for two representative years) that a mere doubling of the wages of unskilled black workers would have cut total profits by well over 60 per cent.[147] He concluded that it 'seems clear that for . . . some five decades from the beginning of mining to devaluation in 1933, the industry as a whole would not have survived if obliged to pay its black workers even the modest improvement assumed in this exercise'.[148]

[142] On the concentration of the African end of the trade, and the highly unequal distribution of income from it, see Hopkins, *Economic history*, pp. 104–10, 119–20; Evans and Richardson, 'Hunting for rents'.

[143] Henige, 'Measuring the unmeasurable'.

[144] Austin, *Labour*, pp. 236–49; Oroge, 'Iwofa', pp. 345–7.

[145] Fine studies for Mozambique and the eastern Congo respectively are Vail and White, *Capitalism*, and Northrup, *Beyond the bend*.

[146] Lipton, *Capitalism and apartheid*, p. 410; Harries, 'Kinship'.

[147] Feinstein, *Conquest*, pp. 109–12.

[148] Ibid., p. 111.

 

Turning to another of the producers' strategies, clearly the productivity of agricultural labour benefited intermittently from the spread of ploughs and/or the adoption of new cultigens, whether the latter were imported or generated by trial and error in African farmers' experience.[149] The nature of the improvements in crop repertoire has tended to be underestimated in the past. Let us consider the adoption and spread of cocoa cultivation in West Africa, which was a key part of the 'cash-crop revolution' of the early colonial period. This involved what should be seen, like the adoption of the plough, as a shift to new and higher production functions rather than simply as 'vent-for-surplus' growth within the same production function.[150] The linkages from cash-crops to industrial growth within Africa, however, were very limited.[151] On the demand side, African cash-crop earnings enlarged the market for manufactured goods, improving the prospects for industrialization.[152] On the supply side, however, the relatively widely dispersed ownership of cash-crop farms, coupled with a lack of institutions for cheaply channelling savings into regional or national capital markets,[153] meant that there was no African parallel with the contribution of Brazilian coffee barons to the creation of the Sao Paulo manufacturing sector, before 1914.[154]

There were also instances of improvement in the productivity of off-farm labour. A precolonial case which deserves to be better known occurred through innovation and fixed capital formation in the Kano cotton textile industry (handicrafts) in the nineteenth century. Shea has shown that Hausa cloth-dyers achieved technical advances, notably a new, much larger dyeing pit, which he suggests reduced unit costs; thus constituting a rare example of economic advantages of scale in precolonial production.[155] Where it happened is significant for the argument here: Kano was the commercial capital of the most populous state in nineteenth-century West Africa, whose merchants carried its products over much of West and West-Central Africa, and a city whose immediate hinterland was relatively densely settled by precolonial standards. As Mahadi and Inikori have argued, this fits the contention that precolonial economic development was, in general, hindered on both the demand and supply sides by low population density.[156]

It should be noted explicitly that the strategies discussed here were frequently combined. Thus, as with the adoption of cocoa in West Africa, and the mining and mineral developments in southern Africa, so also with Shea's improved dyeing pits, coercion is part of the story. For much of the raw cotton and indigo used in Kano was produced by slaves, imported into the Caliphate as captives from wars against 'pagan' neighbours.[157]

[149] Richards, *Indigenous agricultural revolution*.
[150] Austin, *Labour*, pp. 70, 77–9.
[151] Austin, 'African rural capitalism'.
[152] Kilby, 'Manufacturing', pp. 472–5; Sender and Smith, *Development*, pp. 10–13.
[153] This is not to say that there were no credit institutions, both indigenous and introduced. See, for example, Austin, 'Indigenous credit institutions'.
[154] Dean, 'Planter as entrepreneur'.
[155] Shea, 'Economies of scale'; idem, 'Development'.
[156] Mahadi and Inikori, 'Population'; further, Hopkins, *Economic history*.
[157] Lovejoy, 'Plantations'.

 

### *II.3 Towards Intensive Growth?*

During the twentieth century the three strategies largely exhausted their limits, partly because their internal logic contributed to fundamental shifts in factor ratios. As noted earlier, the pursuit of higher output through land-extensive cultivation eroded the land surplus—and the 'forest rent'. Meanwhile, in sub-Saharan Africa generally, rapid population growth (after the 1918 influenza pandemic, and especially during *c.* 1945–*c.* 1990) reduced the scarcity of unskilled labour.

Again, the pursuit of higher productivity outside agriculture led to increasing employment in mineral, manufacturing, and service industries. In some areas, along with increased demand for agricultural labour in the dry season (as where cocoa cultivation was adopted), this had the effect of progressively eroding the seasonal divide in labour supply. By 1990, a transition to land scarcity and to a relative abundance, throughout the year, of unskilled (and now uncoerced) labour, was well underway in most of the continent—though challenged, to varying degrees in different countries, by the new tragedy of HIV/AIDS. Coercion, for all its external costs, had contributed in some cases to economic growth in agriculture and mining. But not only did it become politically less and less widely acceptable during the century, the 'Nieboer problem' gradually dissolved through a combination of decreasing labour scarcity and greater opportunities for mutually profitable contracts between prospective employers and prospective employees. Relations akin to slavery could be found in some parts of Africa at the end of the twentieth century, but not what Nieboer called 'slavery as an industrial system'.

To the extent that the transition to a relative scarcity of land and a relative abundance of unskilled labour was occurring, future prospects for raising total-factor productivity depended much less on minimizing the use, or coercively reducing the cost, of unskilled labour; and much more on the successful adoption of intensive methods in agriculture and on human capital formation.

Two types of evidence, from the twentieth century rather than before, could be used to suggest that a historic transition is underway in the macro-economic implications of agricultural intensification: that there were and are increasing, and increasingly large, exceptions to the old tendency, highlighted in the endowments literature on Africa, for a higher ratio of capital and/or labour to land to produce diminishing returns, leading eventually to stability if not involution. The first is the reinforcement of African farmers' long-standing propensity to improve their crop repertoires by the creation of scientific agricultural research units, actively looking for promising cultigens to import, and carrying out their own experiments locally. The development of higher-yielding, quicker-maturing varieties of cocoa by the West African Cocoa Research Institute after 1945 is an early, export-crop example of what would later be called the 'Green Revolution' project.[158] Realization of the potential of this approach for food crops was often slowed by the reluctance of some scientists and officials to relate the scientific approach to farmers' own problems, experience, and knowledge. However, there has been progress in this respect,[159] which has contributed to major advances in the productivity of maize and cassava farming.[160] The second reason for optimism about intensification is

[158] Austin, *Labour*, pp. 84–6.
[159] For the issues and some of the earlier progress, see Richards, *Indigenous agricultural revolution*.
[160] McCann, *Maize*; Nweke, Spencer, and Lynam, eds., *Cassava*.

 

case studies, of which the classic is by Tiffen, Mortimore, and Gichuki on Machakos in Kenya. They reported that in this district, major population growth over several decades induced a progressive shortening of fallow periods and increased applications of labour per hectare—without any tendency for returns on land, and apparently on labour, to fall. They attributed this partly to farmers' investing in land quality.[161]

This Boserupian, anti-Malthusian story has, however, been qualified by Murton, comparing his own survey evidence from 1996 with findings from a 1965 study. He reports not just the expected shrinkage of average farm size, but also increasing inequality in land holding, with a growing number of households losing food self-sufficiency and depending on off-farm income, not only to finance consumption but also to buy the manure and fertilizer required to maintain output per hectare on their small plots. Murton comments that 'Boserupian intensification on richer farms, and a form of Geertzian involution on poorer farms are seen to be proceeding side by side within the same village'.[162] A marxist would see this as evidence not of paradox but of constructive contradiction: providing the markets continue to operate, the more efficient producers would displace the less efficient. That remains to be seen. Meanwhile, in Ivory Coast, peasant cultivation of cotton took an increasingly intensive form in the context of high producer prices and subsidized inputs in the 1960s–70s. But when these conditions disappeared in the mid-1980s, peasants switched to 'extensification': increasing the area under cultivation, and decreasing the ratios of capital and labour to land.[163] Overall, it is too early to conclude that the more intensive use of land has successfully superseded the land-extensive approach as the main avenue of growth in African agriculture, offering the prospect of intensification and population growth reinforcing each other and thereby creating advantages of agglomeration, such as larger markets and lower per capita costs of distributing public services.[164] Perhaps the most that can be said is that in principle the opportunities for profitable, long-term intensification have been gradually improved by advances in know-how and by the availability of capital accumulated off-farm, and by labour derived ultimately from increasing population.[165]

The imperative to invest more in human capital was a key reason why apartheid became, by the 1970s, a brake on rather than an engine of economic growth in South Africa.[166] The constraints it had imposed on human capital formation, in particular, have been seen as a major source of the sustained climb in the gross incremental capital-output ratio, from the mid-1960s onwards (more than tripling between 1967 and 1986), which underpinned the stagnation of the economy that preceded the political decisions to abandon white minority rule.[167] Arguably, the

[161] Tiffen, Mortimore, and Gichuki, *More people*.
[162] Murton, 'Population growth' (quotation at p. 44).
[163] Bassett, *Peasant cotton*, esp. pp. 107–73, 176–8, 180–3.
[164] An example of success in these terms is presented from an ecological perspective in Börjeson, *History under siege*. It is not clear to me, however, that the avoidance of environmental degradation was associated with actual growth in income per head, or in total-factor productivity. Platteau's overview emphasizes the very limited shift towards intensification by the 1990s (Platteau, 'Food crisis').
[165] For the importance of off-farm wage earnings as a source of investment in agriculture in postcolonial Kenya, see Collier and Lal, *Labour and poverty*, pp. 252–74, 278; Murton, 'Population growth'.
[166] For a survey of the literature, see Nattrass, 'Controversies'; see, further, Feinstein, *Conquest*.
[167] Lewis, *Economics of apartheid*, pp. 132–3.

 

labour-coercive approach had facilitated 'extensive' growth, but proved inadequate to supply the scale of human capital formation required for a transition to 'intensive' growth; that is, growth based on improved total-factor productivity. Indeed, Belgian mining companies in the Congo had reached the same conclusion as early as the 1920s, when they began hiring African miners on 'stabilized' instead of migrant terms, paying them higher wages in return for higher productivity. Their wages, in turn, contributed to the growth of a market for locally produced factory products.[168] In tropical Africa, though newly independent states tended to subsidize the scarce factor, capital, instead of economizing on it, generally they invested heavily in education. In that sense they improved their prospects of future total-factor productivity growth.[169] Already, it is arguable that this expansion of education contributed to the emergence, in certain parts of tropical Africa in the late twentieth century, of what could be seen as forms of labour-intensive, capital-sparing, mostly small-scale industrialization.[170]

## III

This article has sought to refocus the discussion of economic development in African history on the productive process: on the relationships between people and their environment which are the foundation of all economic activity; and on how those relationships have altered, which could be described as the core of economic history. Specifically, while markets, property rights, the capacity and policies of states, and external relationships are important parts of the story presented here, the article has offered a revision and elaboration of the factor endowments approach to African economic history, focusing on production strategies and techniques.

Section I reviewed the key arguments of writers taking this approach, most notably Hopkins. The fundamental proposition that, historically, land was generally abundant in relation to labour, was upheld. So was the notion with which it is rightly coupled in the literature, that the land was hard to exploit intensively, in that environmental obstacles constrained severely the opportunities for, and returns on, efforts to raise the ratio of capital and/or labour to area under cultivation. The prediction that land-extensive methods were favoured in farming is also well justified for the precolonial era. On the other hand, a series of revisions to the framework were proposed.

On factor ratios, three modifications were suggested. First, it should give explicit recognition of the importance of fixed capital in precolonial economies. Second, it should take systematic account of the contrast between the scarcity of labour in the busy parts of the agricultural year and the low opportunity cost of labour in the heart of the agricultural off-season. Third, it should incorporate Ruf's idea of 'forest rent', for the one-off bounty of soil fertility determined by the fact that land was often both relatively abundant and easily eroded.

On choice of technique, the labour intensity of precolonial methods of non-agricultural production was not entirely determined by technical constraints. In

[168] Austen, *African economic history*, pp. 165–8, 183; further, Fetter, *Creation of Elizabethville*, pp. 110–15.
[169] Sender, 'Africa's economic performance' (I here use a term that John Sender would avoid).
[170] See, for these admittedly varied cases, Forrest, *Advance*; Dawson, 'Development'; Ball, 'State'; King, *Jua Kali Kenya*. On the contribution of education see, for example, Ball, 'State', pp. 229–31, 284.

 

most of tropical Africa, at least before the twentieth century, labour was actually relatively abundant during the heart of the dry season. The argument here is that the low opportunity cost of this seasonal labour facilitated the diversity of precolonial economies, especially in West Africa, with their considerable output of textiles and, to a lesser extent, metal goods and gold.[171] The predominance of the narrow loom in West African cotton weaving deserves highlighting, because this is unusual in being, in technical terms, a genuine choice—and the choice was for a more rather than less labour-intensive technique. Besides relating this to the seasonality of the labour supply, it was suggested above that this was also a response to the low elasticity of the supply of raw cotton. That, along with the shortage of potential charcoal, are examples of a theme which also needs to be highlighted: environmental constraints on manufacturing.

Section II used this revised factor endowments framework to reflect on the paths and patterns of economic development in sub-Saharan Africa over five centuries. A series of themes emerge. The most fundamental is that there were indeed long-term dynamics of economic development south of the Sahara, in forms shaped to these circumstances. The article distinguished different strategies which producers (and political authorities) adopted in response to the prevailing factor ratios: land-intensive methods where necessary, but land-extensive ones where possible; the general preference for labour-saving techniques in agriculture, but not always outside it; and efforts to raise labour productivity in agriculture, or in the activities pursued during the agricultural slack season, and the use of various forms of coercion to reduce the supply price of labour.

These strategies were sources of economic growth and development. In this context the article highlighted an observation familiar to archaeologists and historians of Africa, but whose economic significance is generally underrated: the very long-term process of selective adoption and adaptation of cultigens from other parts of the tropics and within Africa. Thus were the purely natural endowments of the region improved upon. In the context of the gradual settlement of the landscape, this constituted the major driver of economic development over the centuries, even into the twentieth (in some cases dramatically so). This process must be regarded as gradually pushing out the production possibility frontier, even for the periods for which no meaningful GDP estimates are possible. It has also to be acknowledged that the coercion of labour—in various forms—within Africa contributed to economic growth; for example, in West Africa after the ending of the Atlantic slave trade, and in the expansion of the South African economy in the early twentieth century.

'Dynamics', however, can be finite, even self-limiting, or indeed double-edged. These paths of development must be seen in the context of the constraints, as well as the opportunities, of the environments in which they were blazed. The difficulty of finding profitable ways to increase the capital–labour ratio helps to explain the low productivity of labour in precolonial handicraft manufacturing (despite the quality of much African output, in textiles and iron). This low productivity outside

[171] Cf. Sokoloff and Dollar's argument that [even in] land-scarce, early industrial England, the low opportunity cost of winter labour in grain-farming areas enabled cottage manufacturers to compete with technically more advanced, centralized plants. The authors suggest that, of the two, labour-intensive, decentralized production may have been less favourable for rapid technical progress (Sokoloff and Dollar, 'Agricultural seasonality').

 

agriculture is a necessary part of any account of how it could have been even privately profitable for slaves to be sold out of sub-Saharan Africa, rather than deployed within the region. That export of captives, however rewarding to the captors and traders involved, left Africa with the devastating third-party costs of the supply of slaves; and (unlike the intra-African slave trade) without the benefit of their productive capacity.

Furthermore, the analysis here suggests that Africa's characteristic factor ratio favoured certain kinds of growth: land-extensive export agriculture and—with coercion—relatively low-technology 'extensive' growth in mineral and manufacturing industries. The linkages created, at least in themselves, were not conducive to continuous intensive growth, whether in agriculture or industry, as twentieth-century experience showed. The argument may help to account for the lack of industrialization in Africa. For 1987, for example, it was reported that manufacturing accounted for precisely 10 per cent of GDP in sub-Saharan Africa, excluding South Africa and Nambia. In South Africa, the figure was 23 per cent, as it had been in 1965.[172] By the 1980s, the strategy of labour coercion had not only reached its limit but became counterproductive with respect to economic growth. More widely in the continent, the pursuit of land-extensive agriculture, and—often related to that—of larger families is necessarily limited by the availability of land. Thus Africa's historically characteristic factor ratios, land-abundant and labour-scarce, have been changed by the very responses they inspired.

The ending of labour coercion during the twentieth century, and the gradual shift of factor ratios in the direction of more abundant labour and human capital, help to account for modest but significant instances of labour-intensive industrial growth in the closing decades of that century. There are also reasons to think that agricultural intensification may begin to be a path to sustained development, rather than (sooner or later) to diminishing returns, as so often in the past; though it is not clear that this has happened yet.

This article has argued that the factor endowments approach to African economic history, traditionally seen as static, can—with suitable revisions to its premises and conceptual repertoire—help us to frame and explain the patterns of long-term development south of the Sahara. The substantive implication of the analysis is that discussions of postcolonial, and especially contemporary, economic performances in Africa need to be informed by a sense that growth strategies that, at a micro and even macro level, had operated over several centuries are (depending on the area) either no longer possible or are reaching their limits. However, some of the environmental constraints—especially hindering agricultural intensification—remain to reduce the returns on alternative strategies. Equally important, for development economists and for economic historians, is that we recognize that Africa's economic history is old, and is a story (or range of stories) of progress as well as pain.

[172] World Bank, *World development*, pp. 168–9.

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