Universidad Carlos III de Madrid
www.uc3m.es

Working Papers in Economic History

November 2012 WP 12-11

Output Per Head in Pre-Independence Africa: Quantitative Conjectures

Leandro Prados de la Escosura

Abstract
GDP figures for Africa are unreliable. More dependable information can be found in government expenditure and international trade records. These records, though, provide little insight into non-market output. In this paper an attempt is made to draw explicit conjectures on real output per head in pre-independence Africa on the basis of trade data so that conjectures can be established about Africa's long-run growth. Two alternative approaches are considered. One estimates per capita GDP by assuming no increase in output per head outside the tradable sector, for which the purchasing power of per capita exports is accepted as a proxy. Another approach establishes an econometric association between real per capita GDP and the income terms of trade per head for 1950-1990 and, on the basis of the prediction equation's parameters and the values of the RHS variables, infers real output per head for 1870-1938. Trends in real output per head are then drawn for Africa (and its main regions). By comparing these trends with those from other developing regions, some conjectures about Africa's relative position over time are put forward. It emerges that economic growth started earlier than usually assumed and there is continuity in growth before and after colonial independence. Sub-Saharan Africa's retardation is a gradual process, as growing and falling behind took place simultaneously. But it is in the period 1975-1995 when the worst setback in modern Africa's history took place.

Keywords: GDP, long-run growth, pre-independence Africa, Sub-Saharan Africa
JEL Classification: E01; N17; O47; O55

Leandro Prados de la Escosura: Departamento de Historia Económica e Instituciones and Instituto Figuerola de Historia y Ciencias Sociales, Universidad Carlos III de Madrid, Calle Madrid, 126, 28903 Getafe (Madrid), Spain, and CEPR Research Fellow.
E-mail: leandro.prados.delaescosura@uc3m.es
http://www.uc3m.es/portal/pae/portal/dpto_historia_economica_inst/profesorado/leandro_prados_escosura
UNIVERSIDAD CARLOS III DE MADRID • c/ Madrid 126 • 28903 Getafe (Spain)• Tel: (34) 91 624 96 37
Site: http://www.uc3m.es/uc3m/dpto/HISEC/working_papers/working_papers_general.html

DEPARTAMENTO DE HISTORIA ECONÓMICA E INSTITUCIONES

INSTITUTO FIGUEROLA DE HISTORIA Y CIENCIAS SOCIALES
Universidad Carlos III de Madrid

Output Per Head in Pre-Independence Africa: Quantitative Conjectures

Leandro Prados de la Escosura
(Universidad Carlos III and CEPR)

Output Per Head In Pre-Independence Africa: Quantitative Conjectures[1]

ABSTRACT

GDP figures for Africa are unreliable. More dependable information can be found in government expenditure and international trade records. These records, though, provide little insight into non-market output. In this paper an attempt is made to draw explicit conjectures on real output per head in pre-independence Africa on the basis of trade data so that conjectures can be established about Africa's long-run growth. Two alternative approaches are considered. One estimates per capita GDP by assuming no increase in output per head outside the tradable sector, for which the purchasing power of per capita exports is accepted as a proxy. Another approach establishes an econometric association between real per capita GDP and the income terms of trade per head for 1950-1990 and, on the basis of the prediction equation's parameters and the values of the RHS variables, infers real output per head for 1870-1938. Trends in real output per head are then drawn for Africa (and its main regions). By comparing these trends with those from other developing regions, some conjectures about Africa's relative position over time are put forward. It emerges that economic growth started earlier than usually assumed and there is continuity in growth before and after colonial independence. Sub-Saharan Africa's retardation is a gradual process, as growing and falling behind took place simultaneously. But it is in the period 1975-1995 when the worst setback in modern Africa's history took place.

Keywords: GDP, long-run growth, pre-independence Africa, Sub-Saharan Africa

JEL Classification: E01, N17, O47, O55

Leandro Prados de la Escosura,
Universidad Carlos III de Madrid,
Departamento de Historia Económica e Instituciones
and Instituto Figuerola de Historia y Ciencias Sociales,
Edificio Foronda, 7.0.14
Calle Madrid, 126
28903 Getafe (Madrid), Spain
Tel. +34 916249623
leandro.prados.delaescosura@uc3m.es
http://www.uc3m.es/portal/pae/portal/dpto_historia_economica_inst/profesorado/leandro_prados_escosura

[1] I have benefited from participants' comments at the World Economic History Congress sessions on the Maddison Project and 'New African Economic History' (Stellenbosch, July 2012). The idea of the paper originated in a conversation with Gareth Austin to whom I am obliged. I am also grateful to Ewout Frankema and Morten Jerven for their comments, and to Jutta Bolt, Johan Fourie, Alex Moradi, and Isabel Sanz-Villarroya for their suggestions and encouragement. Ewout Frankema kindly shared his unpublished data. Financial support from the HI-POD Project, Seventh Research Framework Programme Contract no. 225342 and from Fundación Rafael del Pino's research project on 'Economic Freedom in History' is gratefully acknowledged. The usual disclaimer applies.

Introduction

How has Africa performed over the long run and how does its performance compare with other developing regions? Economists have addressed these questions mainly for the recent past, and only occasionally ventured beyond the half-century since independence, c. 1960. As a result, they have concluded that Africa failed to grow in the long run (Jerven 2010). Lack of hard empirical evidence has not prevented the emergence of explicit thought-provoking hypotheses about the causes of Africa's long-term retardation (Acemoglu and Robinson 2010, Bates et al. 2007, Heldring and Robinson 2012, Nunn 2008). Often, however, these writers are guilty of what Gareth Austin has labelled a 'compression of history' (Austin 2008). Economic historians have only recently begun to challenge this linear and deterministic approach to history by quantitatively investigating Africa's long-run economic performance (Fourie and van Zanden 2012, Jerven 2010, 2011a, 2011b, Smits 2006).

Unfortunately, African GDP figures are very unreliable, even for the present day. The most dependable information can be found in government expenditure and international trade records. However, assessing non-market outputs presents a major challenge for constructing modern national accounts (Jerven 2009, 2011c). For the pre-independence era, it is impossible to construct an accurate picture of the size of domestic market activity, but most of the data that is available belongs to market activity. Non-marketed output is completely unknown (Austin 2008).

In this paper an attempt is made to draw explicit quantitative conjectures on long-run trends in real output per head on the basis of international trade data. I share Angus Maddison's (2007) view that quantification clarifies issues as it sharpens scholarly debate and is contestable. Furthermore, in the absence of proper 'data' (Austin 2008), it stimulates research by providing explicit testable hypotheses. As a consensus seems to exist that "specialization for export production is at the heart of Africa's growth episodes" (Jerven 2010: 130), I rely on foreign trade data as the most suitable way to build quantitative conjectures about long-run growth in Africa. Specifically, to proxy GDP per head, I will rely on the income terms of trade (that is, the value of exports per head deflated by the price of imports) per person, which measures the purchasing power of exports in terms of imports.

Among the findings that can be highlighted, economic growth appears to have started earlier than is usually assumed, and there is continuity in growth before and after independence from colonialism. Sub-Saharan Africa's retardation emerges as a gradual process, as growth and falling behind took place simultaneously. However, it is in the period 1975-1995 when the major growth setback took place in Africa's modern history.

Pre-Independence Africa's Real Per Capita GDP: Available Estimates and Conjectures

Comparable GDP per head estimates, even crude and debatable, are available for Africa in the second half of the 20th century (Penn World Tables 2012, World Bank

Indicators 2012), among which the more comprehensive dataset is provided for 1950-2008 by Maddison (2006, 2010), who expressed them in Geary-Khamis 1990 dollars, and have been yearly updated by the Conference Board (2012).

Prior to 1950 GDP estimates are scant. There are only a few countries for which GDP estimates are available and most of them are in North Africa. Maddison (2006: 577-580) constructed crude benchmark estimates on the basis of Amin's (1966) figures for Algeria (1870, 1880, 1913, 1920, 1930, 1950), Morocco (1870, 1913, 1950), and Tunisia (1870, 1913, 1950). For Egypt, Maddison (2006: 577) relied on Hansen's (1979, 1991) and Hansen and Marzouk's (1965) estimates, and dismissed Tarik Yousef's (2002) money-based approach estimates as too low. In his survey on the Middle East's real GDP per head, Sevket Pamuk (2006: 817) revised upwards Maddison's estimates for Egypt in 1850 and 1913.

South of the Sahara, the evidence is even thinner, with South Africa as an exception. South Africa's Bureau of Census and Statistics (1960) provided estimates for 1911-1959, partly used by Maddison (2006: 579), who complemented them with unpublished estimates by L.J. Fourie (1971) for 1920-1950, plus his own guesstimate for 1870. Recently, Johan Fourie and Jan-Luiten van Zanden (2012) spliced their detailed computations for the Cape Colony up to 1850 with different estimates for the nineteenth and early twentieth century and, then, with modern national accounts since 1946 (South African Reserve Bank 2011), in order to produce long-run series of real GDP per head up to 2008. Thus, they used the Bureau of Census and Statistics to 1924 and, then, Schumann's (1938) estimates to push them back to 1910, which were, in turn, projected backwards to 1850 with the unpublished estimates for the Cape Colony by Greyling et al. (2010). Interestingly, neither Maddison nor Fourie and van Zanden were aware of the revision of the Bureau of Census and Statistics figures carried out by J.J. Stadler (1963), who produced nominal GDP, rather than relying, as previous estimates, on NDP. Outside of South Africa, estimates are available for three Sub-Saharan countries: Benin, Kenya, and Ghana. In the case of Kenya, Arne Bigtsen (1986) constructed benchmark estimates for 1914, 1921, 1927, and 1936 on the basis of labour incomes, and GDP was obtained by assuming the labour share to be a fixed 30 per cent. For Ghana, Robert Szereszewski (1965) derived benchmark per capita output estimates in 1891, 1901, and 1911 by assuming that consumption per head in the 'traditional' sector was stable over time and any intensive growth (namely, per head) depended exclusively on the 'modern' sector. Using Szereszewski's estimates for 1960, Maddison (2006) projected his GDP estimates backwards so he could obtain benchmark estimates back to 1891, expressed in 1990 Geary-Khamis dollars. Recently, Morten Jerven (2011a) has constructed more sophisticated estimates for Ghana (1890-1954). By accepting Szereszewski's assumption that domestic consumption per head in the traditional sector was constant, and using physical indicators for government and non-traditional private consumption, gross capital formation, and exports and imports, Jerven weighted them with 1891 sector shares from Szereszewski in order to derive a volume index of GDP. Lastly, for Benin (formerly Dahomey), Patrick Manning (1982) employed the income terms of trade per person to proxy GDP per head over the long run.

Estimating Real Output per Head in the Absence of Data: Indirect Approaches

International trade is at the centre of historical growth episodes in Africa (Jerven 2010: 128, 130). Thus, in the broad absence of pre-1950 GDP data, it seems appropriate to use the available information on trade flows to proxy aggregate economic trends.[2]

Two alternative indirect approaches appear feasible. The first one – which I will label the 'dual' approach- is grounded on Szereszewski's (1965) method and assumes a dual economy, whose 'traditional' sector evolves along with population growth and whose 'modern' sector is closely connected to the international economy. The income terms of trade provide a measure of the performance of the modern sector. Thus, any increase in output per head results from the growth of the tradable sector of the economy (that is, the one producing goods and services traded internationally), which is captured by the purchasing power of per capita exports, weighted by the share of the tradable sector in the economy. The main challenge is establishing the relative size, in terms of GDP, of the tradable sector. The approach should also include a measure of potential trade spillovers to the rest of the economy. I have explored this approach to derive GDP estimates and arbitrarily assumed a share of the 'modern' sector equivalent to twice the export share in GDP, to allow for trade spillovers.[3]

I construct the estimates backwards, starting from 1950, so I firstly obtain GDP per head for 1938. Thus, in order to derive per capita GDP of country *i* in 1938 I compute first the output per head in the 'modern', tradable sector: $((ITT/N)_{i1938} / (ITT/N)_{i1950}) * (Y/N)_{i1950} * (2 * (ITT/N)_{i1950} : (Y/N)_{i1950})$, where the 'modern' output per head for 1938 is obtained by multiplying per capita income for 1950, $(Y/N)_{i1950}$, by the ratio of the per capita income terms of trade in 1938 to that of 1950, $(ITT/N)_{i1938} / (ITT/N)_{i1950}$, and, then, weighted by the assumed share of the tradable sector in the whole economy (twice the export share of export/GDP ratio), $2 * (ITT/N)_{i1950} : (Y/N)_{i1950}$. The second term, captures output per head in the 'traditional' sector, $(Y/N)_{i1950} * (1 - (2 * (ITT/N)_{i1950} : (Y/N)_{i1950})$, that is, it weights the level of GDP per head in 1950, $(Y/N)_{i1950,}$ by the share of the 'traditional' sector in the economy (=1- the share of the tradable sector), $1 - (2 * (ITT/N)_{i1950} : (Y/N)_{i1950})$. Thus, for 1938 GDP per head is generated as,

$$Y/N_{i1938} = ((ITT/N)_{i1938} / (ITT/N)_{i1950}) * (Y/N)_{i1950} * (2 * (ITT/N)_{i1950} : (Y/N)_{i1950}) + (Y/N)_{i1950} * (1 - (2 * (ITT/N)_{i1950} : (Y/N)_{i1950})) \quad [1]$$

GDP per head computed this way for 1938 is used, in turn, to compute the GDP per head for 1929, and the same procedure is used all the way back to 1870.

[2] There are also unpublished GDP estimates for Sub-Saharan Africa (1910-1950) by Jan-Pieter Smits (2006).

[3] Dalton (1976: 71, Table 5) provides the share of employment in the tradable sector that shows a reasonable association (a correlation coefficient of 0.5) with my estimates of relative size of the tradable sector (twice the export to GDP ratio).

A major objection to this approach results from the implicit assumption of zero price and income elasticities of demand for goods produced in the non-tradable sector. Why should it be assumed that consumers do not react to changes in relative prices of goods or in their disposable income? Moreover, why should we assume that output per head did not grow in the 'traditional' or 'domestic' sector? As Wolfgang Stolper (1966) put it, in the absence of a Malthusian scenario, there is no reason to assume that all increase in output per head results exclusively from the modern sector (quoted in Jerven 2011b). . Moreover, there is evidence suggesting productivity growth in the subsistence sector. People grew taller, the frequency of famines declined, markets became integrated largely because of railway infrastructure, and new production techniques enter the market.[4]

The astringent assumptions underlying the 'dual economy' approach have led me to explore another alternative, that I will call the 'econometric' approach. This approach consists of establishing an association between per capita GDP and the income terms of trade per capita, plus other control variables, on the basis of the available evidence for the post-1950 era and, then, inferring real GDP per head for earlier years with the resulting parameters and the historical values of the right-hand-side variables.

$$\log Y = a_1 \log ITT + a_2 \log ITT^2 + a_3 RE + a_4 Location + a_5 Colonial + a_6 Region \quad [2]$$

Using a pool regression with nine cross-sections (for those years ending in 0 and 5 between 1950 and 1990) and fixed time effects, the log of GDP per head, log Y (provided in Maddison 2010), was regressed on the log of per capita income terms of trade, log ITT -computed by deflating African countries' nominal export values with the industrial countries' export unit values (taken from IMF 2003) and then divided by the countries' population (from Maddison 2010); its quadratic term, log ITT^2, in order to allow for non-linearities; and dummy variables to capture:

- Location, namely, whether a country is coastal (value 1) or landlocked (value 0),
- Resource endowment (RE), that is, resource rich (value 1) or poor (value 0) (from Collier and O'Connell 2008)
- Colonial legacy, in other words, whether it had a British or a French colonial background (value 1, if former French (or British) colony; 0, otherwise) (Bertocchi and Canova 2002)
- Region of the main five African ones (north, central, east, west, and southern) in which the country is located.[5]

The econometric results show a good fit that explains three-fourths of the variance (Table 1). Only the regional dummy for the North appears to be significant, and both geographical variables (location and resource endowment) interact significantly with the income terms of trade, negatively in the case of resource

[4] I owe this remark to Ewout Frankema

[5] The only exception has been including Mauritania in West Africa rather than in North Africa, as defined by the ADB.

abundance and positively in the case of coastal location –implying that, for a given ITT per head, per capita income was lower in resource rich countries and higher in coastal ones.[6]

Thus, under the arbitrary assumption that the econometric relationship derived for the period 1950-1990 remained stable over time, GDP per head volumes were obtained by multiplying the parameters from the equation's right-hand side variables by the values of each independent variable for African countries at benchmark years over the period 1870-1950.[7]

Since pre-1950 trade data corresponds to colonial boundaries a conversion to the independent countries was made. This implied that, for example, within French West and Equatorial Africa similar income volumes were assigned to all countries that only differed depending whether the country was coastal and resource rich.

GDP per head at 1990 Geary-Khamis dollars for 1870-1938 was, then, derived by projecting Maddison's (2010) levels for the 1950 benchmark with these volume indices.[8]

It must be remembered that the resulting estimates, as in the case of those derived via the 'dual' approach, should only be taken as quantitative conjectures on real output per head. These are useful in allowing us to generate a set of explicit hypotheses about the performance of pre-independence Africa, which should then be tested in future research.[9]

The income terms of trade for the period 1870-1938 were computed by deflating export values with import prices. Current price exports come from Hanson (1980) for 1860-1900 and Bairoch and Etemad (1985) for 1860-1938 –with some log-linear interpolations for missing values in 1870 and 1890-, completed with Banks (2010) for Liberia and Lains (2003) for the Portuguese colonies (Angola, Guinea-Bissau, Mozambique, and Sao Tomé and Principe), and, from 1913 onwards, the League of Nations (1927-1943). Export values were, then, deflated with the British export price index (Mitchell 1988) in order to obtain the income terms of trade, and divided by

[6] I have replicated the econometric exercise for 1960-1990 in order to see how the prediction fits the 1950-1960 period. The resulting values for the equation's parameter are very close to those obtained for the 1950-1990, so the results from the original exercise appear to be robust. See Appendix B, Table B.2

[7] The choice of 1990 as the end point for the regression is certainly arguable. Since 1990 can be regarded as close to the end of the economic collapse in many countries, missing the post-1990 recovery years may bias the estimates. However, when choosing 1950-1990 for the econometric estimates my purpose was to avoid the AIDS-HIV era just in case it represented a regime shift. It is worth stressing that period fixed effects are used in the econometric estimates and that in the backward prediction I corrected the constant with the coefficient for the period effect in 1950. Thus, the strong assumption underlying the estimates, namely that the structural relationship between GDP per head and income terms of trade per head for the post-1950 period holds for the pre-1950 era is softened.

[8] The backward projection of Maddison's per capita GDP for 1950 with these volume indices increased the variance in income levels within both French West and Equatorial African countries.

[9] The uncertainty about 1950 GDP levels in Sub-Saharan Africa no doubt increases the error margins of these conjectural estimates (Jerven 2012b).

population.[10] Population data for Sub-Saharan Africa come from Mitchell (1993); Smits (private communication), for the early twentieth century; completed with Banks (2010), for Ethiopia, Liberia, Malawi, and Sierra Leone; Fargues (1986), for Algeria and Tunisia; Feinstein (2005) for South Africa; and Maddison (2006), for Egypt and Ghana. Missing population observations for Sub-Saharan African countries in the late nineteenth century were filled, assuming that average growth rates held in the neighbouring region. A caveat about the crude population figures used here is needed. On-going research on population trends shows the actual lack of knowledge on the colonial period. Manning (2010), on the basis of India's experience, suggests that population growth has been wildly overestimated and, therefore, if mid-twentieth century population figures are accepted, their levels in the colonial period were higher than assumed. Frankema and Jerven (2012) have challenged Manning's assumption that population levels of the 1950s are reliable, suggesting that they maybe underestimated as well, and pointing out that India, as a land scarce country, is not a good proxy for natural resource abundant Africa and, consequently, colonial population growth might have been faster than Manning reckoned. Therefore, the uncertainty about the available population figures represents an additional weakness of my conjectural per capita output estimates.

Some assumptions were needed to fill missing values of GDP per head for some countries. Following Maddison's approach, I assumed that growth trends in missing countries were similar to those of their neighbours. In the case of French Equatorial Africa (CAR, Congo, Gabon, and Chad), over 1870-1929, I assumed they grew as similar countries (coastal or landlocked, resource abundant or scarce) in French West Africa. Similarly, during the same period, Cameroon, Guinea-Bissau, and Togo were assumed to grow at the same rate of similar countries in West French Africa. Liberia was assumed to evolve as Sierra Leone over 1900-1913. In East Africa, I accepted Uganda's pace of growth for Rwanda and Burundi (1913-1929) while Kenya's pace of growth during 1870-1913 was assumed to be similar to Tanzania's. Also, Ethiopia and Sudan were assumed to evolve as Egypt over 1870-1913. In southern Africa, Mozambique was accepted to evolve as Angola (1870-1900), and Zambia and Malawi (1913-1929) as Zimbabwe. Lastly, in the cases of Botswana, Lesotho, and Swaziland (1913-1938), and Namibia (1870-1913), I accepted the growth rate for South Africa.

I have further assumed a lower bound for *per capita* GDP set at Geary-Khamis 1990 $ 300, which represents a basic level of physiological subsistence (Milanovic *et al*. 2011, Sagar and Najam 1998), lower than the World Bank's one dollar a day extreme poverty threshold and Maddison's (2006) subsistence minimum of G-K 1990 $ 400 per head. This 'floor' for per capita income, which, no doubt, truncates the data set at the bottom, allows the inclusion of countries in years for which no data exist. Pritchett (1997: 7) alternatively used Geary-Khamis 1985 $ 250 as a lower bound for income per

[10] In addition to the fact that Britain represented the main source of African imports, the reason why I chose the British over a combination of export unit values for a group of colonial metropolis was to represent the purchasing power of African exports at international market prices and Britain's export unit values were, at least, until the early 1930s, the closest proxy for it, while in France and Portugal export price distortions derived from protectionism. The poor quality of trade statistics in some metropolis (see, for example, Lains 1995 on Portugal) is an additional reason for my choice. Alternative estimates using both French and British export price indices do not change the results significantly.

head. The increase in the U.S. GDP deflator between 1985 and 1990 renders the difference between the two lower bounds negligible (1985 $ 250 are equivalent to 1990 $ 293) (Johnston and Williamson 2002).

Then, I completed the GDP data set for Africa with the available estimates for the northern region and South Africa. In the case of North Africa, I have accepted Maddison's estimates with some interpolations on the basis of my own indirect estimates. Thus, for Algeria, I interpolated the levels for 1890 and 1900. For Tunisia, I accepted Maddison estimates for 1913 and interpolated the rest of the benchmarks. In the case of Morocco I found Maddison's level for 1913 too low relative to Tunisia, and I have employed my own estimates. For Egypt, Maddison figures were also used but re-scaled by accepting Pamuk's (2006) level for 1950. I also used available estimates for South Africa. Specifically, I deflated Stadler's (1963) nominal GDP estimates for 1913-1950 with Facundo Alvaredo and Anthony Atkinson (2010) price index, and used population figures from Charles Feinstein (2005: 257-8) to derive per capita GDP. Then, the resulting estimates were projected backwards to 1870 with my own indirect estimates.

Testing The Quantitative Conjectures

I have tested the results from both the 'dual' and the 'econometric' approaches by comparing them with the available information on real wages. A previous caveat is needed: wages and output per head measure different aspects of economic activity and, therefore, discrepancies between them should be expected. Usually, the available data on wages refers to rates per day or week, with no information about the amount of work per year and its changes over time. But, even when they capture annual wage returns, they only represent returns to one factor of production, raw labour. GDP, in turn, comprises returns to all factors. Thus, changes in the functional distribution of income can explain their differences and, if measured in real terms, their different deflators.

The path-breaking research on African real wages by Ewout Frankema and Marlous van Waijenburg (2012) provides 'welfare ratios'–that is, a labourer's full year earnings deflated by the annual cost of maintaining a family at subsistence level- for nine countries in British Africa. If we assume, along these authors, that a welfare ratio of 1 equals a subsistence per capita income level of 1990 Geary-Khamis $300 (see also Milanovic et al. 2011 and Allen 2012), and multiply each of the nine countries' welfare ratios by $300, the resulting figures would provide a lower bound for income per head, as it derives exclusively from unskilled workers' returns.[11] Frankema and van Waijenburg's (2012) welfare ratios suggest that countries in British Africa were above the physiological subsistence level or extreme poverty threshold of $300 for most of the colonial period. However, these welfare ratios derive exclusively from urban wages, which are part of the formal sector (Heldring and Robinson 2012), while a nominal urban-rural wage gap exists, and are computed by assuming full employment

[11] This assumption is supported by Allen's recent finding that welfare ratio of 1 is roughly equivalent to the World Bank poverty line (Allen 2012).

(a working year of 312 days). Therefore, such 'minimum' income level may be exaggerated.[12] In any case, the comparison with the 'minimum' or subsistence per capita income estimates, resulting from the welfare ratios, provides a crude test for my indirect estimates of real output per head.

A glance at individual countries comparisons suggests that, if one allows for discrepancies deriving from income inequality, the alternative output per head estimates do not seem off the mark. A further implication appears to be that income inequality was not deep. The rationale for this assertion is that the output per head-'minimum' income comparison implies confronting the bottom of the distribution (that is, the returns to raw labour captured by the welfare ratio) with the average (namely, output per capita, which, in addition to labourers' incomes includes those incomes accruing to land and capital owners, for whom returns per head tend to be higher).

As regards West Africa, evidence on four countries is available.[13] In Sierra Leone the 1920s and, to less extent, the late 1930s would have witnessed episodes of growing inequality, unlike the rest of the considered period in which real output per head and 'minimum' income are close (Figure 1). As for Ghana, the gap between average and subsistence incomes seems to have widened between World War I and the Great Depression and, again, after World War II (Figure 2). These results appear to be consistent with the negative impact of World Wars on living standards across the British colonies (Frankema and van Waijenburg 2012). In the case of Nigeria, it is worth noting that the available welfare ratios correspond to the southern region, mostly to Lagos, that is, by far, the richest part of the country, so we can hypothesize that average national welfare ratios were significantly lower (Aka 1995, Timothy et al. 2008). This may explain the high 'subsistence' income resulting from the welfare ratios prior to 1913 and, again, in the late 1930s, well above my output per head estimates. Nonetheless, it can be suggested that, in the 1920s and 1950s, discrepancies between output per head and 'subsistence' income imply phases of rising inequality (Figure 3). Lastly, from the results for The Gambia it could be hypothesized that there was an increase in inequality during the 1950s (Figure 4).

In the case of East Africa, both for Kenya and Uganda, the differences between output per head and 'subsistence' income estimates point to higher inequality than in the cases considered for West Africa, with income distribution worsening from the 1920s, to peak in the 1930s and, then, gradually declining during the 1950s (Figures 5 and 6). The implicit inequality trends for Kenya are rather similar to those drawn by Bigsten's (1986).[14] In Tanzania output per head and welfare-ratio based income are highly coincidental suggesting low inequality although it appears to have increased during the 1940s and early 1950s (Figure 7).[15] The contrast between high inequality in

[12] See, for example, the cases of 18th century Italy or Spain, where days worked per year and occupied would have been just above half this figure (Álvarez-Nogal and Prados de la Escosura 2012). In early modern England, however, the number of days worked per year increased remarkably during the 'industrious revolution' that precede the Industrial Revolution (Allen and Weisdorf 2010).

[13] The welfare ratios are expressed in maize except for The Gambia, for which it is rice.

[14] In Bigsten's (1986) Gini estimates, however, inequality increases over 1914-1950 to slightly decline and stabilize thereafter.

[15] The welfare ratios are expressed in maize for Kenya and from millet for Tanzania and Uganda.

a settler economy like Kenya, and low inequality in peasant economies such as Ghana and Tanzania is consistent with the historical literature, but not the apparent high inequality in a peasant export economy such as Uganda's (Austin 2008, Bowden et al. 2008, Bowden and Mosley 2010). . It is worth bearing in mind the possible impact on living standards of immigration from Asia towards the East and Southern African countries that did not take place in West Africa (Frankema and van Waijenburg's 2012).

In southern Africa, the case of Mauritius, a rich plantation economy, suggests high inequality throughout the considered period (Figure 8).[16]

A more comprehensive picture results from the whole British colony sample. Population-weighted levels of indirect real output per head and 'subsistence' incomes -based on welfare-ratio estimates are offered in Figure 9. With the exception of the year 1900, all series fluctuate between $500 and $800 during the period 1880-1960. This reinforces the view that the differences between returns to raw labour (captured by welfare ratios) and to all factors of production (captured by GDP) are not large and, to the extent that the functional distribution of income proxies personal income distribution, it can be hypothesized that income inequality was not very high. Nonetheless, the widening gap between output per head and 'subsistence' income between the eve of World War I and the Great Depression and, again, in the post-World War II years, suggests the existence of phases in which inequality increased. However, the inclusion of Nigeria, a country with a large population – and whose welfare ratios seem over-exaggerated- conditions the results. So I replicated the comparison excluding Nigeria (Figure 10). In this case, my indirect output estimates provide higher levels than the 'subsistence' income estimates, but the hypothesised phases of increasing income inequality are mostly confirmed.

All in all, the comparative exercise suggests that my real output per head estimates and the 'subsistence' incomes derived from Frankema and van Waijenburg's (2012) welfare ratios seem reasonably consistent, with the latter perhaps upward biased as a result of its full employment assumption and its exclusive coverage of the urban sector.

A second test derives from comparing the real output per head estimates with urbanization rates.[17] The comparison is predicated on the high association economists have found between levels of urbanization and economic development. As urbanization goes hand-in-hand with expansion of the market, specialization, and incentives to innovate, it is associated with economic growth (Kuznets 1966, North 1982). In figures 11 and 12 a direct, positive association, although not a particularly strong one, is found between urbanisation and output per head.

[16] In the case of Malawi, Frankema and van Waijenburg (2012) suggest wage labour was not widespread so other sources of income are not captured in their welfare ratios. Output per head levels were, in turn, very low, so the assumption of $300 'floor' had to be applied. All this makes the comparison between output per head and 'subsistence' income inadequate here.

[17] The urbanization rate has been derived from data on urban population at the Clio-Infra database and the population estimates in Prados de la Escosura (2012).

Furthermore, in an attempt to expand the contrast of my indirect output per head estimates, I have carried out comparisons between my estimates and those available for individual countries: Jerven's (2011a) for Ghana, Fourie and van Zanden's (2012) for South Africa, and Bigtsen's (1986) for Kenya. In the case of South Africa, my 'econometric' estimates closely match the trends in Fourie and van Zanden's series. The differences are the result of their reliance on Bureau of Census and Statistics (1960) estimates while I draw on the revised estimates of Stadler (1963).The 'dual' estimates follow a more erratic path (Figure 13). As for Kenya, Bigtsen's (1986) figures, based exclusively on labour incomes, neither match my indirect estimates nor those based on the welfare ratios, suggesting they are well off the mark (Figure 14). Lastly, the contrast with Jerven's (2011a) estimates for Ghana, suggests that my 'econometric' estimates follow a similar path up to World War I. But the estimates then diverge as Jerven's figures show rapid acceleration in the early 1920s and then decline in the 1930s and 1940s, (Figure 15). Jerven's increases in the early 1920s and steady declines up to 1950 seem, in my view, exaggerated and might be the result of the fixed early weights (1891) used to combine physical indicators in his estimates of non-domestic ('non traditional') consumption and capital formation.

Long-Run Trends

Trends in real GDP per head for pre-independence Africa and Sub-Saharan Africa, derived from my alternative estimates and from Madisson's, are confronted in Figures 16-17 and their growth rates presented in Table 2. The new estimates revise downwards Maddison's long-run growth for Africa, while increasing the level of income per head during the colonial period. Interestingly, neither the 'econometric' nor the 'dual' estimates support Maddison's contention that Africa was close to minimum subsistence levels (1990 Geary-Khamis $ 400).

Although the results of my alternative approaches are not far from each other, I tend to favour the 'econometric' estimates that seem, despite their simplicity, more sensitive to economic changes. This may result from the critical role international trade played in colonial Africa's economic performance, as well as from avoiding the arbitrary assumption of no per capita growth in the 'traditional' sector of the economy (as is the case in the 'dual' estimates). The resulting differences are particularly noticeable during the Great Depression. There are also significant disparities in the 'dark' statistical era up to 1900, for which the 'dual' approach suggests lower initial levels and faster growth. Thus, in order to facilitate comparisons, I will focus on the 'econometric' estimate for the rest of the paper.

A glance at Figure 18 and Table 3 (and Table B-3 and B-4 at country level) indicates that real output per head increased slowly up to 1900, and then accelerated up to World War I. After the set back of World War I and the 1920s, growth resumed its earlier pace in the 1930s and 1940s. The Golden Age (1950-1975) marks the peak of African growth, with a more intense pace in (most of) Sub-Saharan Africa during the 1950s and in the North and West regions after 1960. Thus, continuity appears to exist between the colonial era and the post-independence years. The progress of the 1930s and 1940s was replicated and improved upon from 1950 onwards. Thus, the

quantitative conjectures support the view that the Golden Age is the culmination of a phase of sustained growth that can be traced back to 1900. Such a view contradicts the gloomy picture of Sub-Saharan African stagnation so often presented in the development economics literature.

The growing European demand for tropical consumer products and industrial raw materials may have functioned as a stimulus for growth during the early twentieth century, to which mining exports contributed after 1930. Colonial administrations built infrastructural links between ports and production centres for cash crops and minerals in the interior with apparently a major impact on capital formation (Wood and Mayer 2001). After independence, trade expansion, that brought with it an improvement in the net barter terms of trade, occurred between the mid-1960s and 1970s (Deaton 1999, Bates et al. 2007), and the inflow of foreign capital contributed to a better resource allocation and to an increase in output (Rodrik 1998, Wood and Mayer 2001).

The late 1970s until the mid-1990s were the so-called 'lost decades' of Sub--Saharan Africa's growth. In North Africa, declines in real per capita income only occurred during the decade of 1985-1995. For Africa as a whole, terms of trade deteriorated and capital flight took place from the late 1970s until the 1990s, which impacted negatively on aggregate performance. The period from 1996 to 2007 may represent a turning point in Africa's economic performance as the pace of economic growth has picked up.

Interestingly, a gradual decline in the dispersion of income levels occurred across Africa up to World War II (Figure 19). This tendency was reversed thereafter, accelerating between 1960 and 1975 and, again, from 1995 onwards.

It is important to maintain a healthy scepticism about the comparability of economic performance indicators across space and time (Jerven 2012). Nevertheless, Africa's long-run economic performance has to be viewed from a comparative perspective if we are to put forward at least some tentative hypotheses to encourage further research. Although this kind of exercise amounts, perhaps, to writing history backwards (Kelley et al. 1971), asking questions relevant for the present from a long-run perspective forms the basis for a 'new comparative' approach to economic history (Hatton et al. 2007).

When African regions, both North and South of the Sahara, are viewed from an international perspective, it appears that while the North declined relatively to the world average up to 1975, stabilizing thereafter, the South lost ground steadily until 1929, stabilized during the middle decades of the twentieth century, and fell behind again between 1975 and 1995. The region has since maintained its relative position through the turn of the new century (Figure 20).

Way behind Eastern Europe (including Russia) and Latin America, North Africa remained in third place of world developing regions, until it was recently over-taken by East Asia. Sub-Saharan Africa, in turn, which was on a similar income level as South and East Asia up to 1938, managed to forge ahead of Asia between the 1940s and 1960s. It

then fell behind after 1975, remaining at the bottom of developing regions pile by 2007. Nevertheless, it has to be noted that the regions deterioration relative to the world average has been halted since 1995.

A closer look at the regions that make up Sub-Saharan Africa shows that their performances diverged. Southern Africa is on top in terms of performance, while East Africa was at the bottom most of the time. Recently, Central Africa replaced East Africa as the worst performing region (Figure 21). East Africa is the only Sub-Saharan region that did not improve its relative performance during the middle decades of the twentieth century. An interesting picture that confounds the orthodox view of Africa's long-term growth performance also emerges if we compare the performance of Sub-Saharan Africa with Asia (excluding Japan). It is true, that the two regions have mostly vied for the bottom position in the world income per head tables, but it is important to note that the growth episodes of the middle decades of the twentieth century put Sub-Saharan Africa ahead of Asia. It was only after 1975 that Sub-Saharan Africa sunk firmly to the bottom of the world income league.

References

Acemoglu, D. and J.A. Robinson (2010), 'Why is Africa Poor?' *Economic History of Developing Regions* 25 (1), 21-50.

Aka, E.O. (1995), 'Regional Inequalities in the Process of Nigeria's Development: Socio-Political and Administrative Perspective', *Journal of Social Development in Africa* 10 (2), 61-80.

Allen, R.C. (2012), Porridge to progress: the history of world poverty through the lens of wage and price history. Paper presented at the conference "Wellbeing and inequality in the long run: measurement, history and ideas", Instituto Figuerola, Universidad Carlos III-Fundación Ramón Areces, Madrid.

Allen, R.C., Weisdorf, J. (2010), Was there an 'Industrious Revolution' before the Industrial Revolution? An empirical exercise for England, c. 1300-1830, University of Copenhagen, Department of Economics, Discussion Paper 10-14.

Alvaredo, F., Atkinson, A.B. (2010), Colonial rule, apartheid and natural resources: top incomes in South Africa 1903-2005, OxCarre Research paper 46/2010.

Álvarez-Nogal, C., Prados de la Escosura, L. (2013), 'The Rise and Fall of Spain, 1270-1850', *Economic History Review* 66

Amin, S. (1966), *L'Économie du Maghreb*, Paris, Editions de Minuit.

Austin, G. (2008), 'The "Reversal Of Fortune" Thesis and the Compression of History: Perspectives from African and Comparative Economic History', *Journal of International Development* 20, 996–1027

Banks, A. S. (2010), Cross-National Time-Series Data Archive http://www.databanksinternational.com/

Baten, J. and M. Blum (2012), 'Growing Taller, But Unequal: New Findings and New Background Evidence on Anthropometric Welfare in 156 Countries, 1810-1989' *Economic History of Developing Regions* 27, Supplement 1, S66-S85.

Bates, R.H., J.H. Coatsworth and J.G. Williamson (2007), 'Lost Decades: Post Independence in Latin America and Africa', *Journal of Economic History* 67 (4), 917-943.

Bigsten, A. (1986), 'Welfare and Economic Growth in Kenya, 1914-76', *World Development* 14 (9), 1151-1160

Bowden, S., B. Shiripanhura, and P. Mosley (2008), 'Measuring and Explaining Poverty in Six African Countries: A Long-period Approach', *Journal of International Development* 20, 1040-1079.

Bowden S. and P. Mosley (2012), Politics, Public Expenditure and the Evolution of

Poverty in Africa 1920-2009, Sheffield Economic Research Paper Series 2012 003

Bureau of Census and Statistics (1960), *Union Statistics for Fifty Years, 1910-1960*, (Jubilee Issue), Pretoria, Bureau of Census and Statistics

Conference Board (2010), Total Economy Database, January 2010, http://www.conference-board.org/economics/database.cfm

Dalton, G. (1976), 'An Economic History of West Africa by A. G. Hopkins', *African Economic History* 1 (1): 51-101 http://www.jstor.org/stable/4617579

Fargues, P. (1986), 'Un siècle de transition démographique en Afrique méditerranéenne 1885-1985', *Population* 41 (2), 205-232

Feinstein, C.H. (2005), *An Economic History of South Africa. Conquest, Discrimination and Development*, Cambridge, Cambridge University Press

Fourie, L.J. (1971), Contribution of Factors of Production and Productivity to South African Economic Growth, paper presented to the IARIW Conference 1971.

Fourie, J., van Zanden, J.L. (2012), GDP in the Dutch Cape Colony: the National Accounts of a Slave-based Economy, Stellenbosch Economic Working Papers 4/12

Frankema, E. and M. van Waijenburg (2012), 'Structural Impediments to African Growth? New Evidence from Real Wages in British Africa, 1880-1965', *Journal of Economic History* 72 (4)

Greyling, L., E. Lubbe and G. Verhoef (2010), Savings and economic growth in South Africa, ERSA/FRESH Conference, Stellenbosch.

Hansen, B. (1979), Income and Consumption in Egypt, 1886/7 to 1937, *International journal of Middle Eastern Studies* 10 (1), 27-47

Hansen, B. (1991), *The Political Economy of Poverty, Equity and Growth: Egypt and Turkey*, New York, Oxford University Press.

Hansen, B. and G.A. Marzouk (1965), *Development and Economic Policy in the UAR*, Amsterdam, North Holland.

Hatton, T.J., K.H. O'Rourke and A.M. Taylor (eds.) (2007), *The New Comparative Economic History*, Cambridge, MA., MIT Press, pp. 1-6.

Heldring, L. and J.A. Robinson (2012), Colonialism and Development (mimeo).

International Monetary Fund [IMF] (2003), *International Financial Statistics*, CD Rom

Jerven, M. (2009), The Relativity of Poverty And Income: How Reliable Are African Economic Statistics? *African Affairs* 109 (434), 77–96.

Jerven, M. (2010), 'African Growth Recurring: An Economic History Perspective on African Growth Episodes, 1690-2010', *Economic History of Developing Regions* 25 (2), 127-154

Jerven, M. (2011a), Comparing Colonial and Post-Colonial Output: Challenges in Estimating African Economic Change in The Long Run, CGEH Working Paper Series 10.

Jerven, M. (2011b). Controversy, Facts and Assumptions: Lessons from Estimating Long Term Growth In Nigeria, 1900–2007, School for International Studies, Simon Fraser University, Simons Papers in Security and Development No. 13/2011.

Jerven, M. (2011c), 'Growth, Stagnation or Retrogression? On the Accuracy of Economic Observations, Tanzania, 1961-2001', *Journal of African Economies* 20 (3), 377-394.

Jerven, M. (2012), 'An Unlevel Playing Field: National Income Estimates and Reciprocal Comparison in Global Economic History', *Journal of Global History* 7 (1), 107-128.

Jerven, M. (2012b). Comparability of GDP estimates in Sub Saharan Africa: the effect of revisions in sources and methods since structural adjustment (mimeo).

Johnston, L. and Williamson, S.H. (2002), The Annual Real and Nominal GDP for the United States, 1789 - Present. Economic History Services http://www.eh.net/hmit/gdp/

A.C. Kelley and J.G. Williamson (1971), 'Writing History Backwards: Meiji Japan Revisited', *Journal of Economic History* 31 (4), 729-776

Kuznets, S. (1966), *Modern Economic Growth. Rate, Structure, and Spread*. New Haven, CT, Yale University Press.

Lains, P. (1995), *A Economia portuguesa no século XIX. Crescimento económico e comércio externo*, Lisboa: Instituto de Ciências Sociais.

Lains, P. (2003), *Os progressos do Atraso. Una Nove História Económica de Portugal*, Lisboa: Instituto de Ciências Sociais.

League of Nations (1927-1943), *Statistical Yearbook*, Geneva, League of Nations

Maddison, A. (2006), *The World Economy*, Paris, OECD Development Centre.

Maddison, A. (2007), *Contours of the World Economy, 1–2030 AD: Essays in Macro-Economic History*, Oxford, Oxford University Press.

Maddison, A. (2010), Statistics on World Population, GDP and Per Capita GDP, 1-2008 AD, last update: March 2010, horizontal file http://www.ggdc.net/maddison/

Manning, P. (1982), *Slavery, Colonialism and Economic Growth in Dahomey, 1640-1960*, Cambridge, Cambridge University Press.

Milanovic, B., P.H. Lindert, and J.G. Williamson (2011), 'Preindustrial Inequality', *Economic Journal* 121, 255-272

Mitchell, B. R. (2003), *International Historical Statistics: Africa, Asia, and Oceania 1750-2000*, New York, Palgrave Macmillan.

Ndulu, B.J., O'Connell, S.A., Azam, J.P., Bates, R.H., Fosu, A.K., Gunning, J.W., Njinkeu, D. (Eds.), *The Political Economy of Economic Growth in Africa, 1960-2000*, Cambridge, Cambridge University Press, 2 vols. CD-ROM.

North, D.C. (1982), *Structure and Change in Economic History*, New York, Norton.

Pamuk, S. (2006), 'Estimating Economic Growth in the Middle East since 1820', *Journal of Economic History* 66 (3), 809-828

Penn World Tables (2012), version 7.0, www.pwt.econ.upenn.edu

Prados de la Escosura, L. (2012), World Human Development, 1870-2007, Universidad Carlos III Working Papers

Pritchett, L. (1997), 'Divergence, Big Time', *Journal of Economic Perspectives* 11 (3): 3-17

Sagar, A .D., Najam, A. (1998), 'The Human Development Index: A Critical Review', *Ecological Economics* 25, 249-264

Schumann, C.G.W. (1938), *Structural changes and business cycles in South Africa, 1806-1936*, P.S. King and Son, London

Smits, J.P. (2006), Economic Growth and Structural Change in Sub Saharan Africa during the Twentieth Century: New Empirical Evidence, Helsinki, International Economic History Association Conference.

South African Reserve Bank (2011), *Quarterly Bulletin*, South African Reserve Bank

Stadler, J. J. (1963), 'The Gross Domestic Product of South Africa 1911-1959', *South African Journal of Economics*, 31 (3), 185-208

Stolper, W.F. (1966), *Planning Without Facts: Lessons in Resource Allocation from Nigeria's Development*, Cambridge, MA: Harvard University Press.

Szereszewski, R. (1965), *Structural Changes in the Economy of Ghana, 1891-1911*, London: Weidenfeld and Nicolson.

Timothy, A.T., O.Y. Busayo, and O. Adewusi (2008), Inequality, Polarization and Poverty in Nigeria (mimeo).

World Bank (2012), World Development Indicators Database, World Bank, Washington D.C. http://data.worldbank.org/data-catalog

Yousef, T.M. (2002), 'Egypt's Growth Performance under Economic Liberalism: a Reassessment with New GDP Estimates', *Review of Income and Wealth* 48 (4), 561-579.

Table 1 Econometric Estimate

	Dependent Variable log (Y)	
	Coefficient	**t-Statistic**
Constant	6.482	48.389
log (ITT)	-0.280	-4.496
Log (ITT)^2	0.059	9.133
RR * log (ITT)	-0.026	-2.914
COAST * log (ITT)	0.073	8.289
NORTH	0.277	4.807
British Colony	0.228	4.388
French Colony	0.269	5.404
Adjusted-R squared	0.752	
S.E. of regression	0.331	
F-statistic	79.058	
Number of observations	387	

Notes: Pooled Ordinary Least Squares with period fixed effects
White Heteroskedasticity-Consistent Standard Errors & Covariance
t-ratios in brackets

Variable definitions
Y: Per Capita GDP ((1990 Geary-Khamis $) (in logs) (Maddison 2010)
ITT: Income Terms of Trade per Head (in logs) (IMF 2003 and Maddison 2010)
RR: takes value 1 when a country is resource-rich and 0 otherwise (Collier and O'Connell (2008)
COAST: takes value 1 when a country is coastal and 0 otherwise (Collier and O'Connell (2008)
NORTH: takes value 1 when a country is located in North Africa and 0 otherwise
British Colony: takes value 1 when a country was a British colony; 0, otherwise (Bertocchi and Canova 2002)
French Colony: takes value 1 when a country was a French colony; 0, otherwise (Bertocchi and Canova 2002)

Sources: See the text

Table 2
Real Output Per Head Growth, 1870-1950: Alternative Estimates (%)

	Econometric Approach		*Dual* Approach		Maddison
	SSA	Africa	SSA	Africa	Africa
1870-1880	0.4	0.4	0.3	0.4	
1880-1890	0.3	0.5	0.4	0.6	
1890-1900	0.3	0.2	0.4	0.4	
1900-1913	0.7	0.8	1.6	1.4	0.4
1913-1929	0.1	0.2	0.3	0.3	
1929-1938	0.8	0.6	0.9	0.9	
1938-1950	0.9	0.6	0.3	0.2	0.7
1870-1900	0.3	0.4	0.4	0.5	0.6
1900-1950	0.6	0.5	0.8	0.7	0.8
1870-1950	0.5	0.5	0.6	0.6	0.7

Sources: Maddison (2010) and see the text.

Table 3. Real GDP per head in Africa and its main regions

Panel A: Levels

	North Africa	Central Africa	Southern Africa	West Africa	East Africa	SSA	Africa
1870	740	494	777	585	346	560	613
1880	772	462	890	568	356	582	637
1890	845	512	899	577	402	603	670
1900	876	532	926	595	424	619	684
1913	1021	516	1045	656	463	677	758
1929	1101	505	1095	644	499	690	779
1938	1117	559	1245	647	511	739	821
1950	1133	657	1472	752	526	828	887
1960	1328	832	1794	868	609	986	1054
1975	1944	984	2361	1166	728	1267	1399
1985	2752	925	2148	1006	686	1142	1457
1995	2594	584	2000	1025	680	1056	1345
2007	3721	728	2582	1498	918	1404	1814

Panel B: Growth Rates (%)

	North Africa	Central Africa	Southern Africa	West Africa	East Africa	SSA	Africa
1870-1880	0.4	-0.7	1.4	-0.3	0.3	0.4	0.4
1880-1890	0.9	1.0	0.1	0.2	1.2	0.3	0.5
1890-1900	0.4	0.4	0.3	0.3	0.5	0.3	0.2
1900-1913	1.2	-0.2	0.9	0.8	0.7	0.7	0.8
1913-1929	0.5	-0.1	0.3	-0.1	0.5	0.1	0.2
1929-1938	0.2	1.1	1.4	0.0	0.2	0.8	0.6
1938-1950	0.1	1.3	1.4	1.3	0.2	0.9	0.6
1950-1960	1.6	2.4	2.0	1.4	1.5	1.8	1.7
1960-1975	2.5	1.1	1.8	2.0	1.2	1.7	1.9
1975-1985	3.5	-0.6	-0.9	-1.5	-0.6	-1.0	0.4
1985-1995	-0.6	-4.6	-0.7	0.2	-0.1	-0.8	-0.8
1995-2007	3.0	1.8	2.1	3.2	2.5	2.4	2.5
1870-1900	0.6	0.2	0.6	0.1	0.7	0.3	0.4
1900-1929	0.8	-0.2	0.6	0.3	0.6	0.4	0.4
1929-1950	0.1	1.3	1.4	0.7	0.2	0.9	0.6
1950-1975	2.2	1.6	1.9	1.8	1.3	1.7	1.8
1975-1995	1.4	-2.6	-0.8	-0.6	-0.3	-0.9	-0.2
1900-1950	0.5	0.4	0.9	0.5	0.4	0.6	0.5
1950-2007	2.1	0.2	1.0	1.2	1.0	0.9	1.3
1900-1975	1.1	0.8	1.2	0.9	0.7	1.0	1.0
1975-2007	2.0	-0.9	0.3	0.8	0.7	0.3	0.8
1870-2007	1.2	0.3	0.9	0.7	0.7	0.7	0.8

Sources: See the text. Table B3 and Maddison (2010)

Figure 1. Welfare Ratios and Alternative Output per Head Estimates: Sierra Leone

Figure 2. Welfare Ratios and Alternative Output per Head Estimates: Ghana

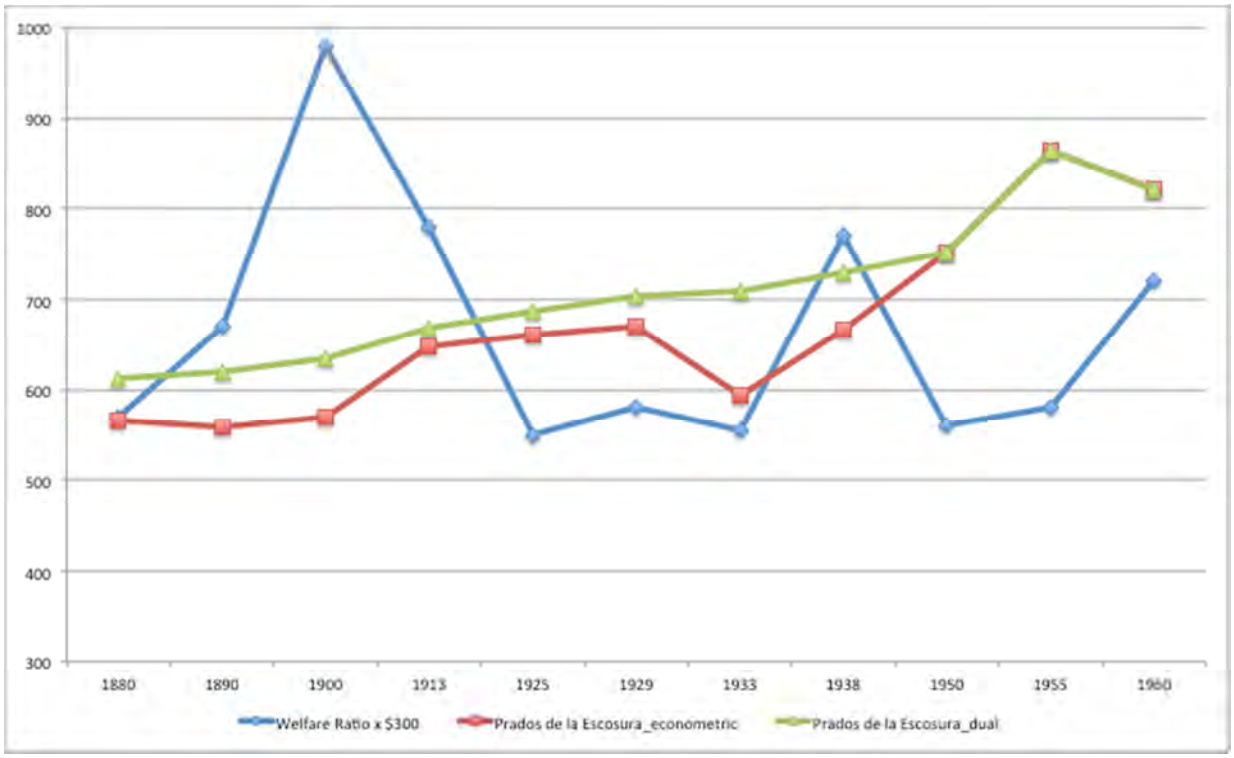

Figure 3. Welfare Ratios and Alternative Output per Head Estimates: Nigeria

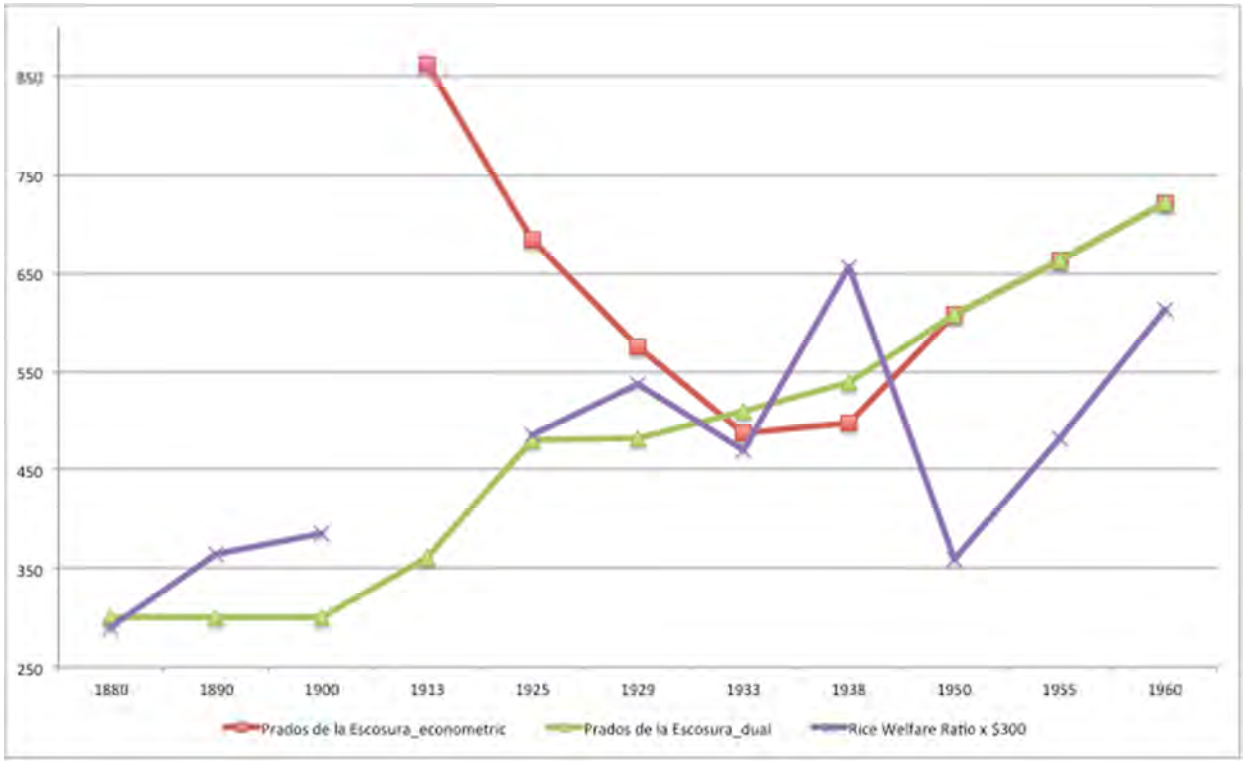

Figure 4. Welfare Ratios and Alternative Output per Head Estimates: Gambia

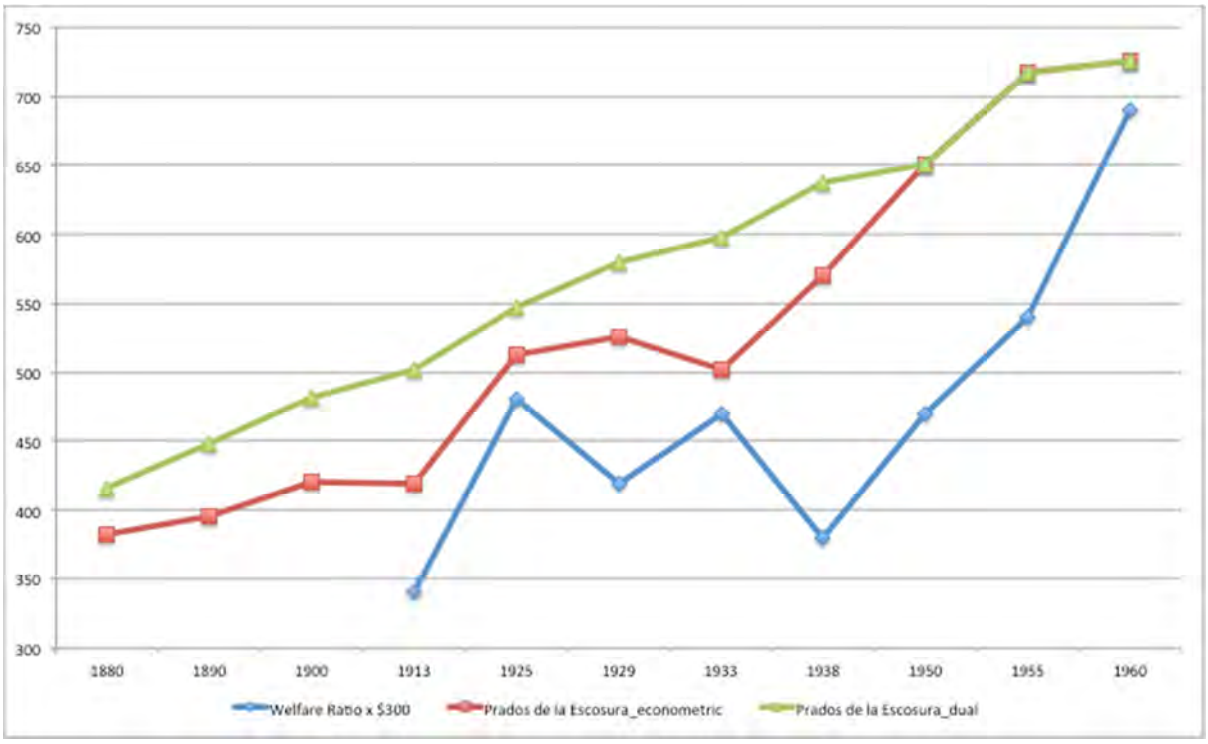

Figure 5. Welfare Ratios and Alternative Output per Head Estimates: Kenya

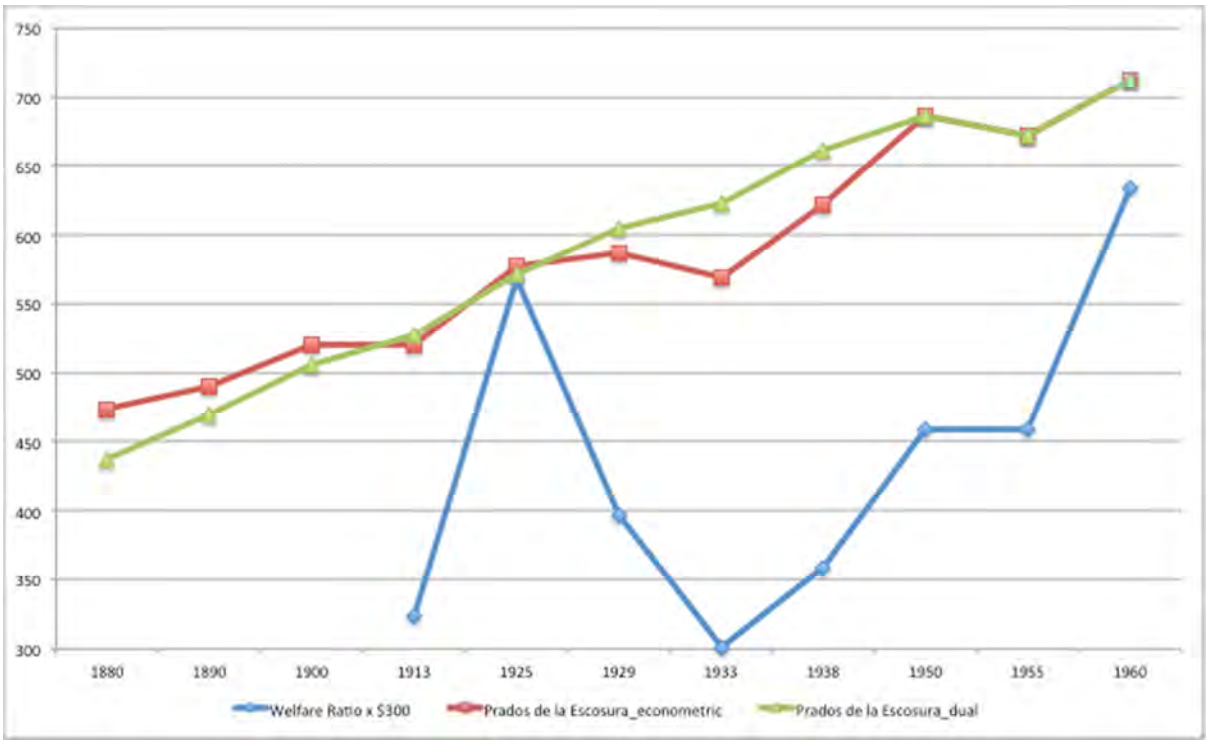

Figure 6. Welfare Ratios and Alternative Output per Head Estimates: Uganda

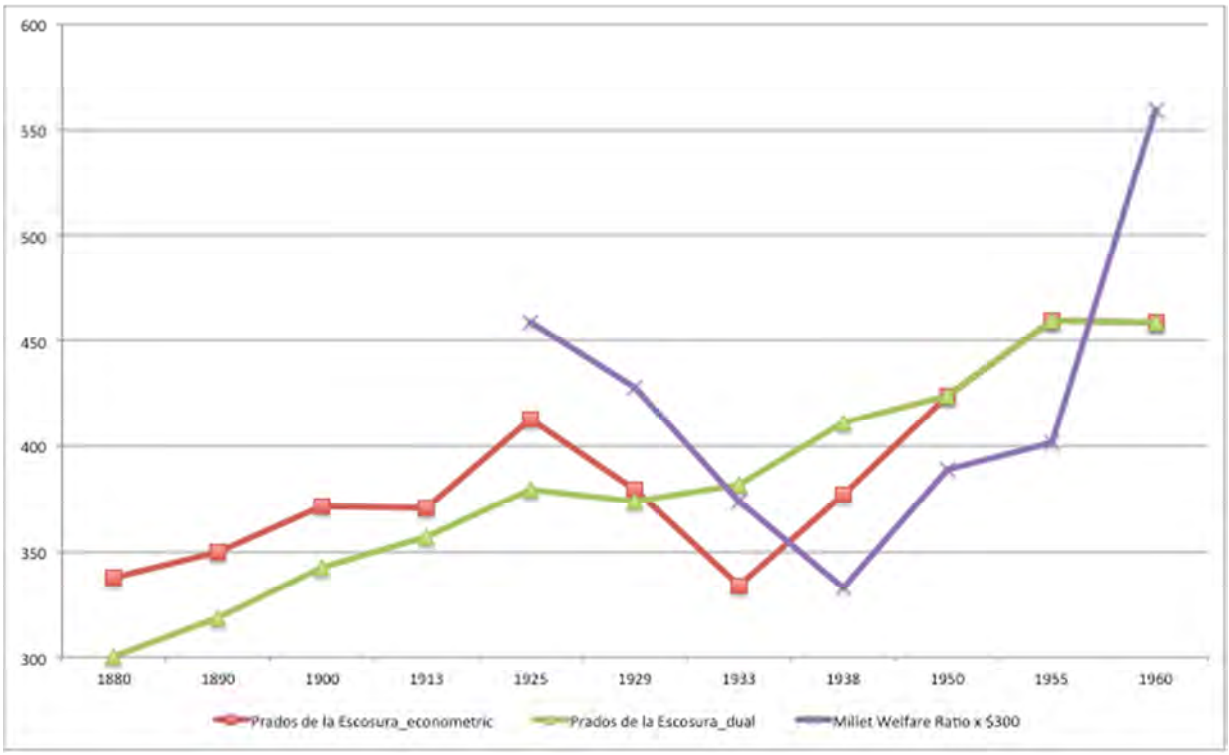

Figure 7. Welfare Ratios and Alternative Output per Head Estimates: Tanzania

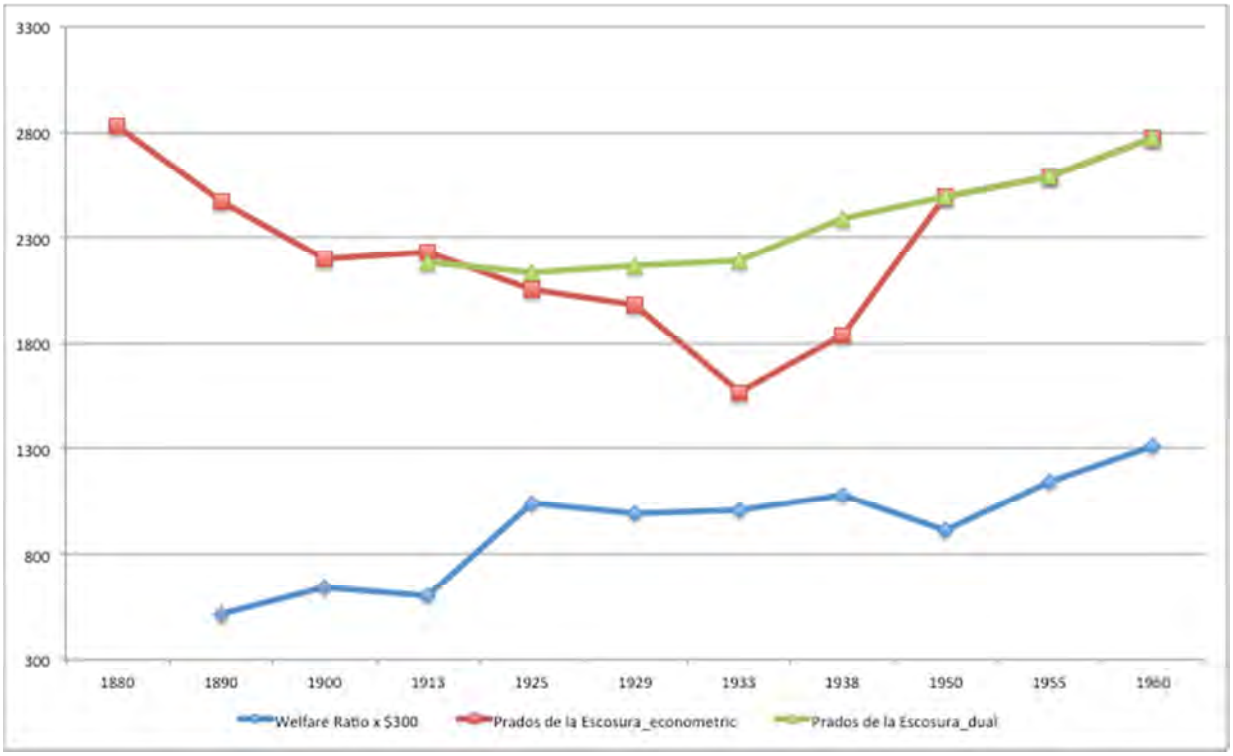

Figure 8. Welfare Ratios and Alternative Output per Head Estimates: Mauritius

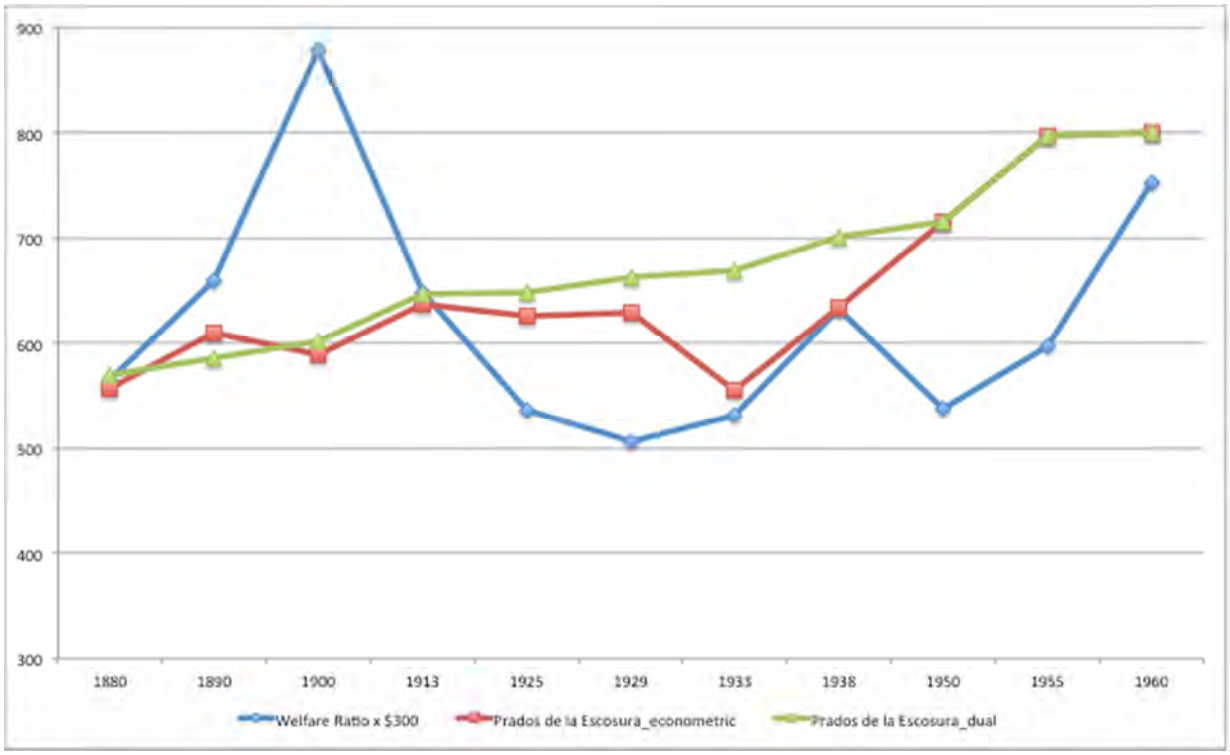

Figure 9. Welfare Ratios and Alternative Output per Head Estimates: British Africa's Sample

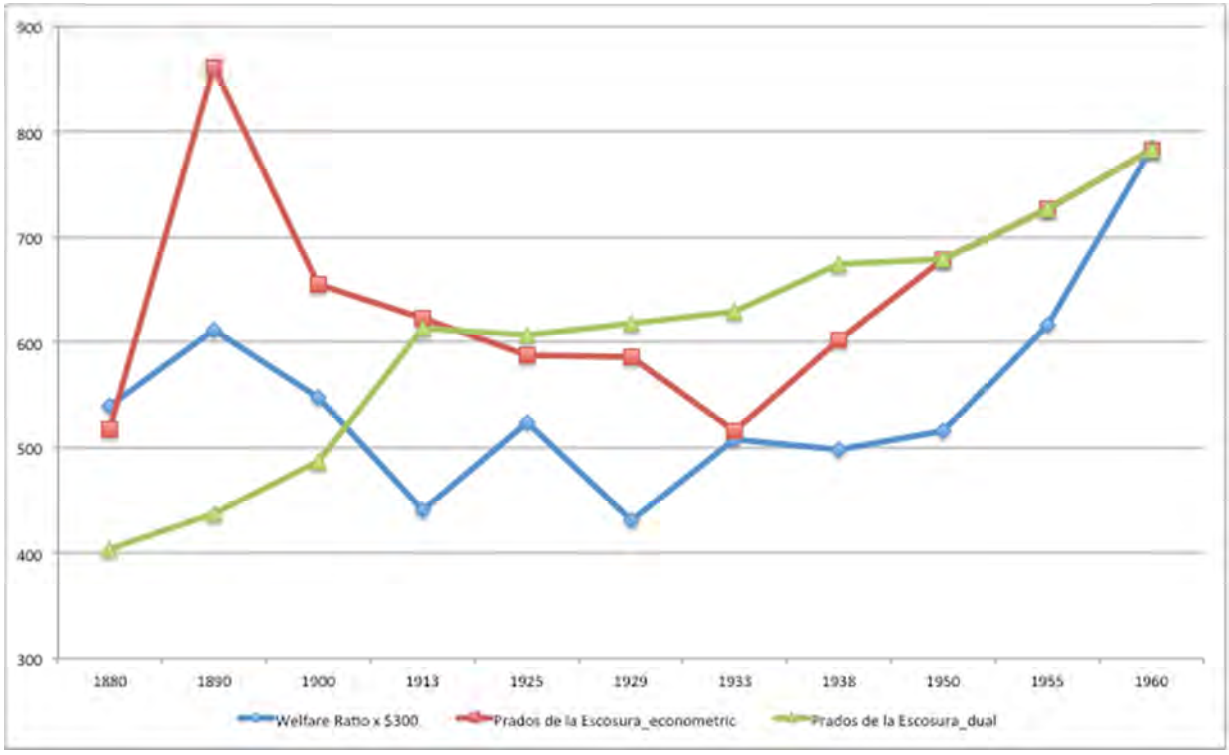

Figure 10. Welfare Ratios and Alternative Output per Head Estimates: British Africa Sample (excluding Nigeria)

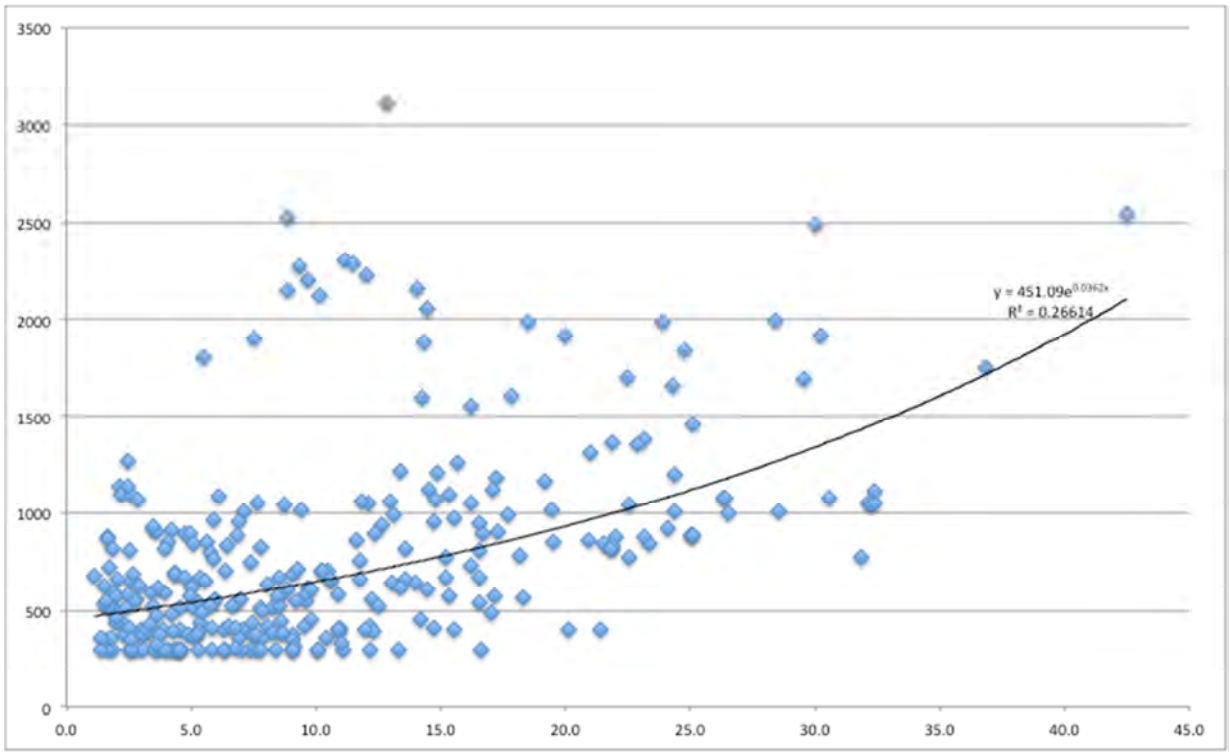

Figure 11 Output per Head -'econometric' estimates- (vertical axis) v Urbanization Rates (%) (horizontal axis), 1900-1950

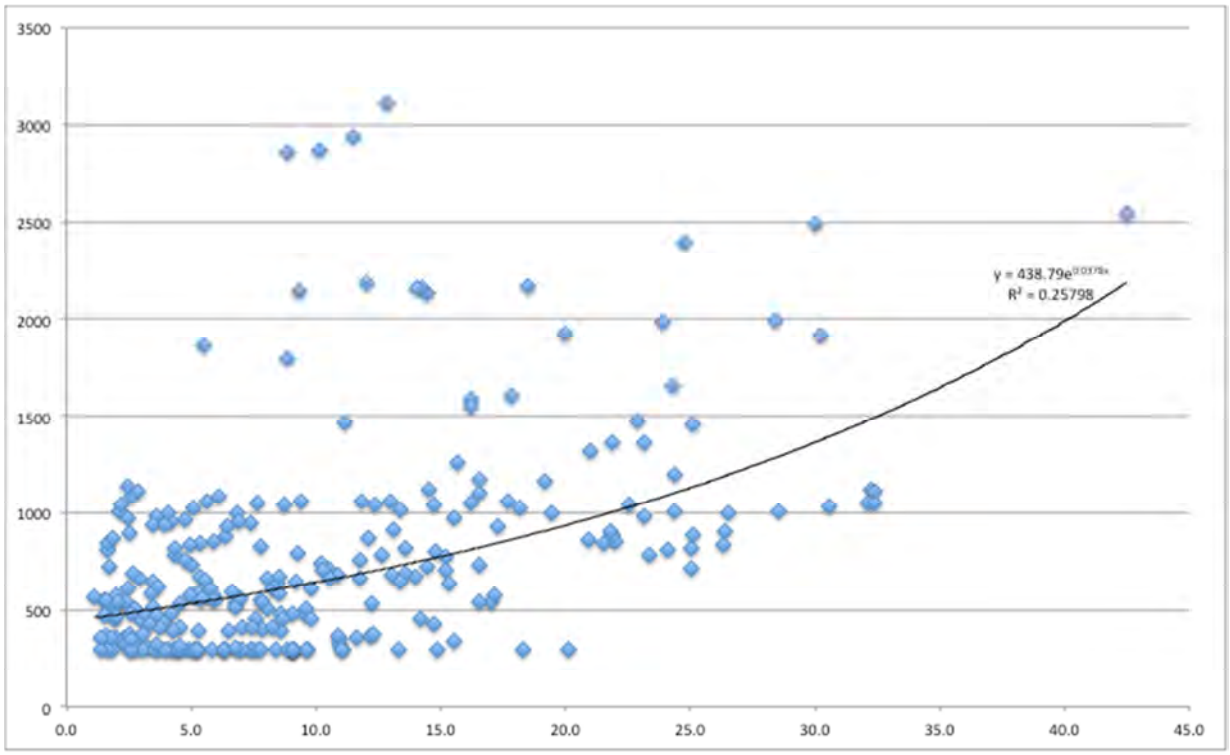

Figure 12 Output per Head -'dual' estimates- (vertical axis) v Urbanization Rates (%) (horizontal axis), 1900-1950

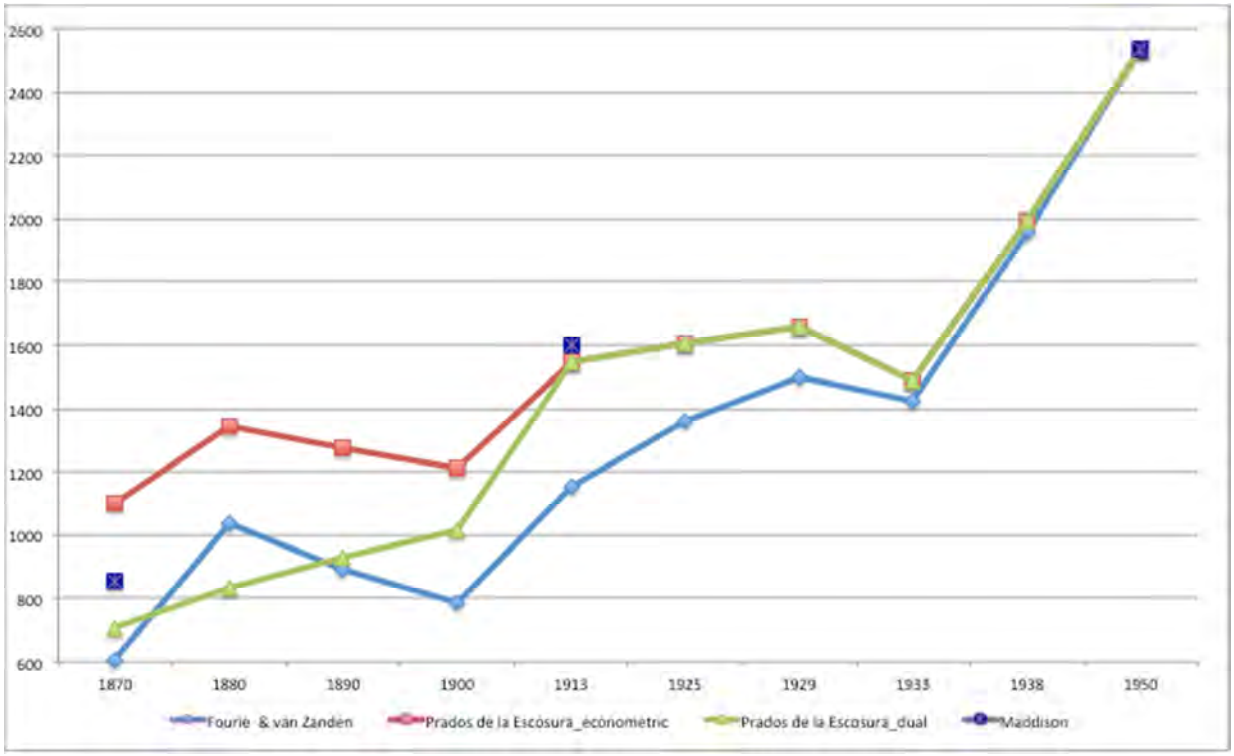

Figure 13. Alternative Output per Head Estimates: South Africa

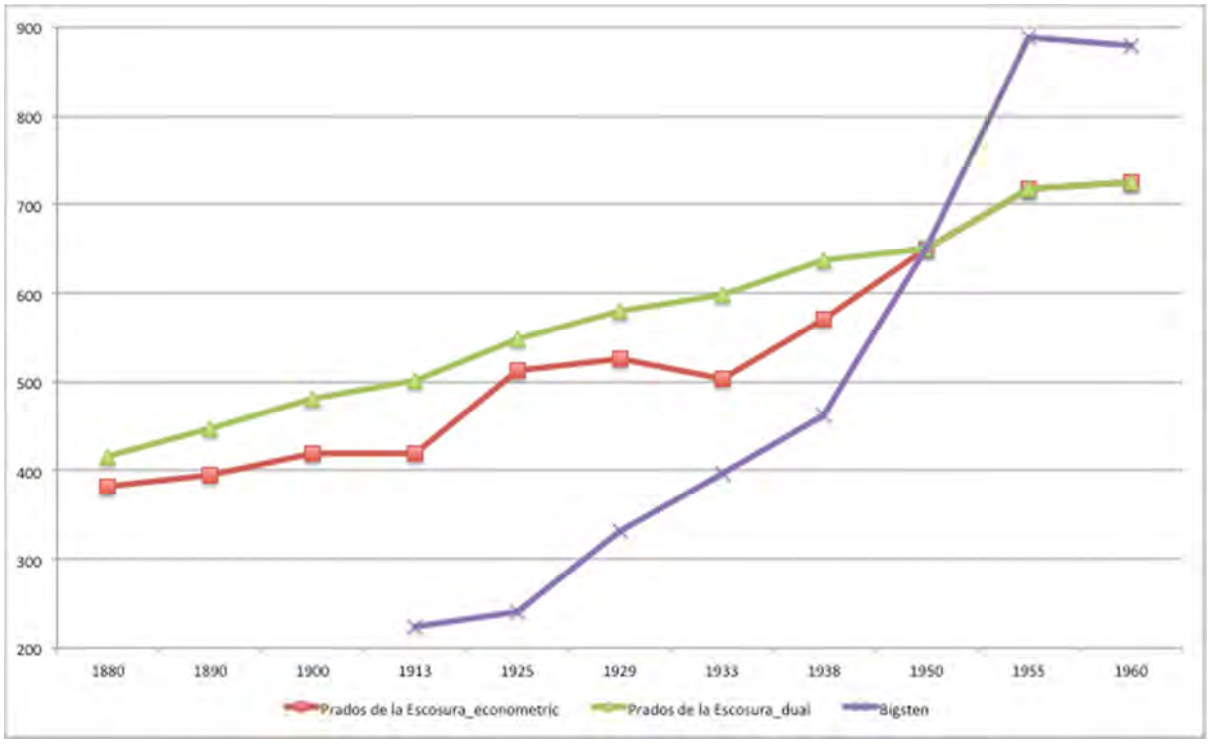

Figure 14. Alternative Output per Head Estimates: Kenya

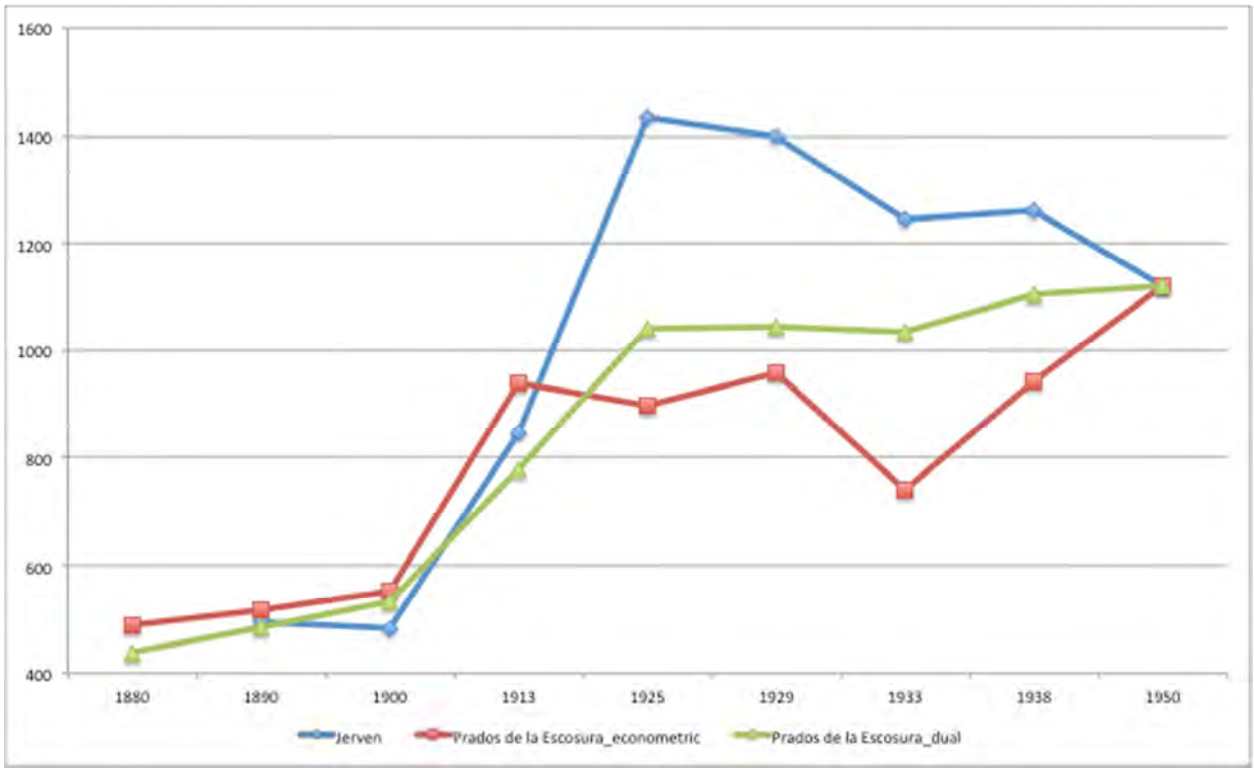

Figure 15. Alternative Output per Head Estimates: Ghana

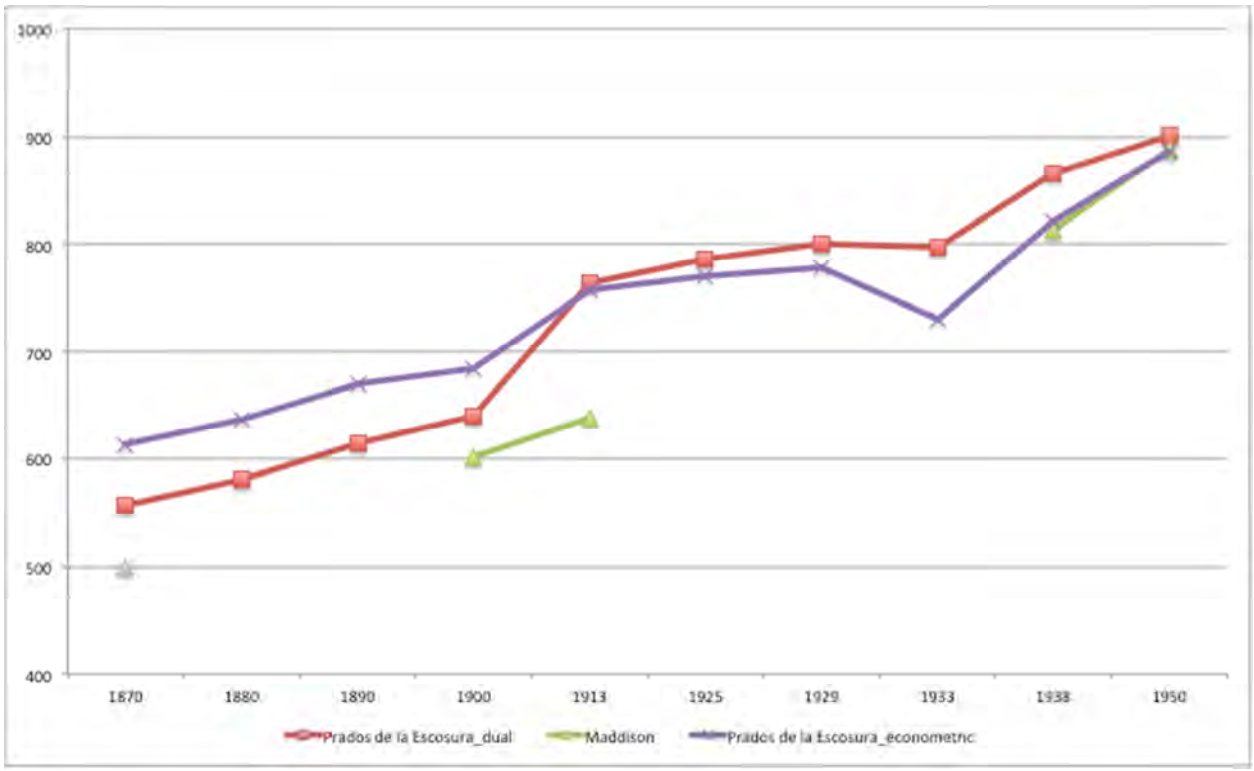

Figure 16. Alternative Output per Head Estimates: Africa

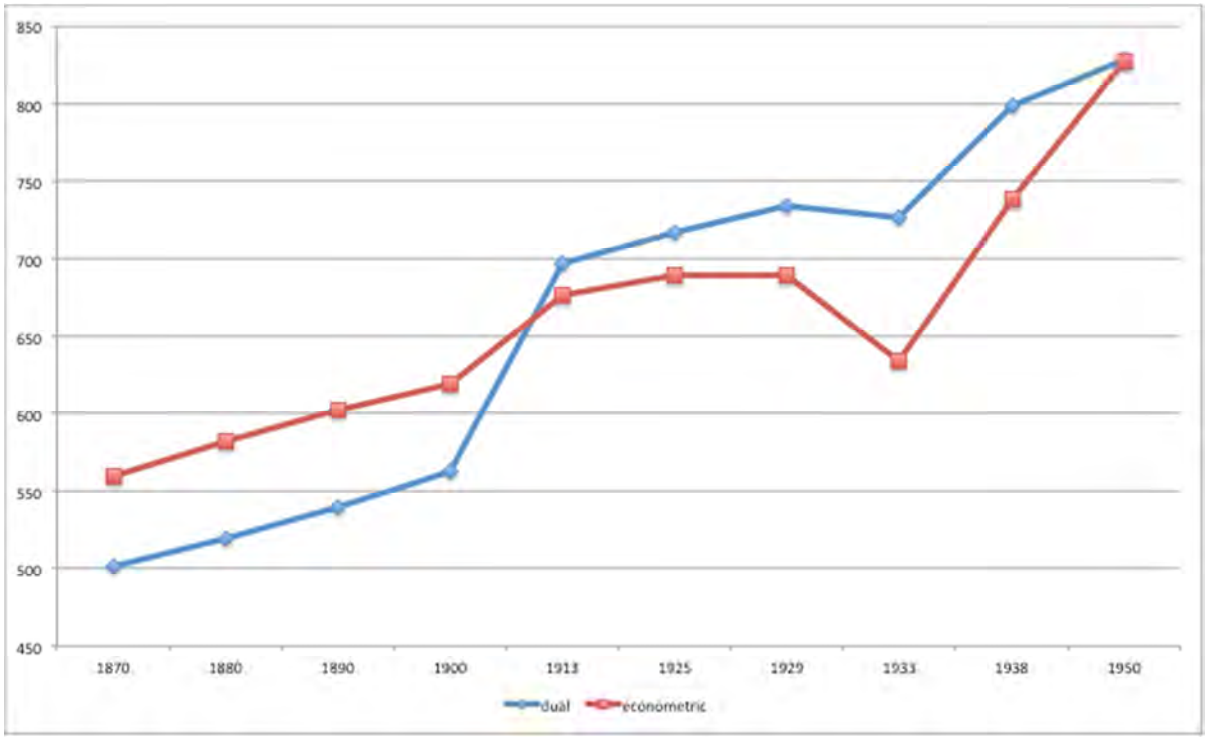

Figure 17. Alternative Output per Head Estimates: Sub-Saharan Africa

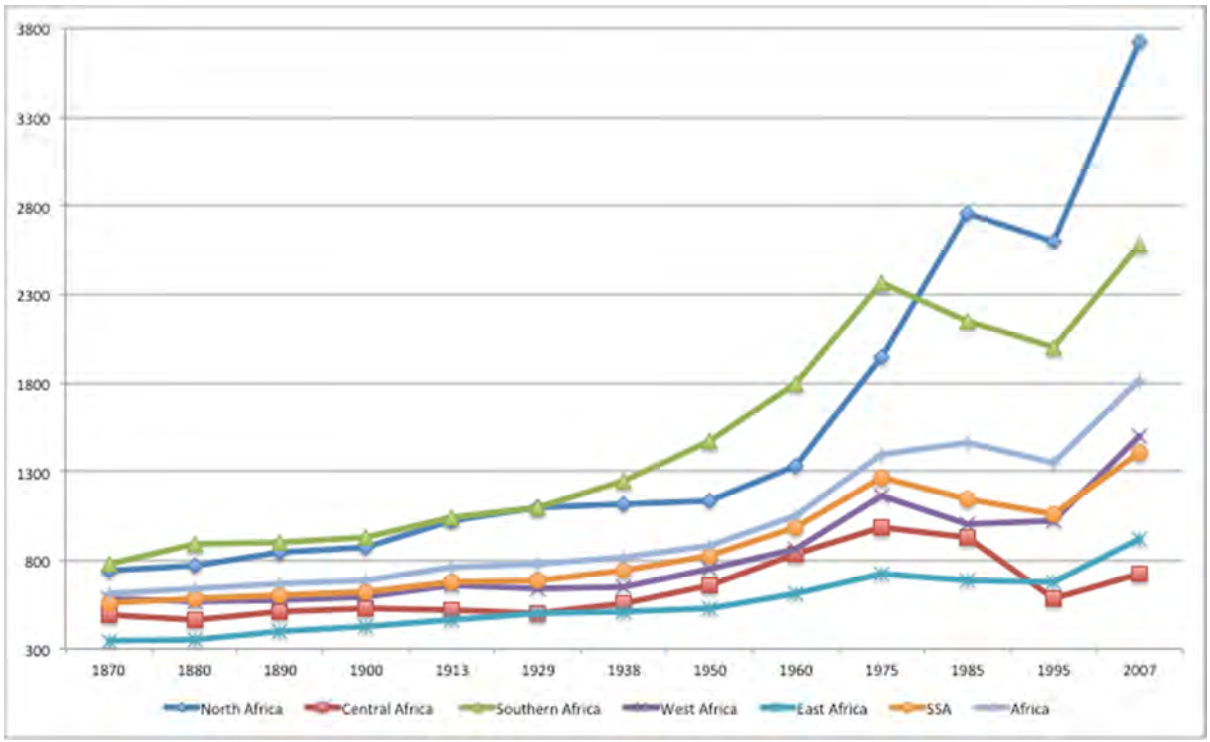

Figure 18. Trends in Real Output per Head in Africa and Its Main Regions, 1870-2007

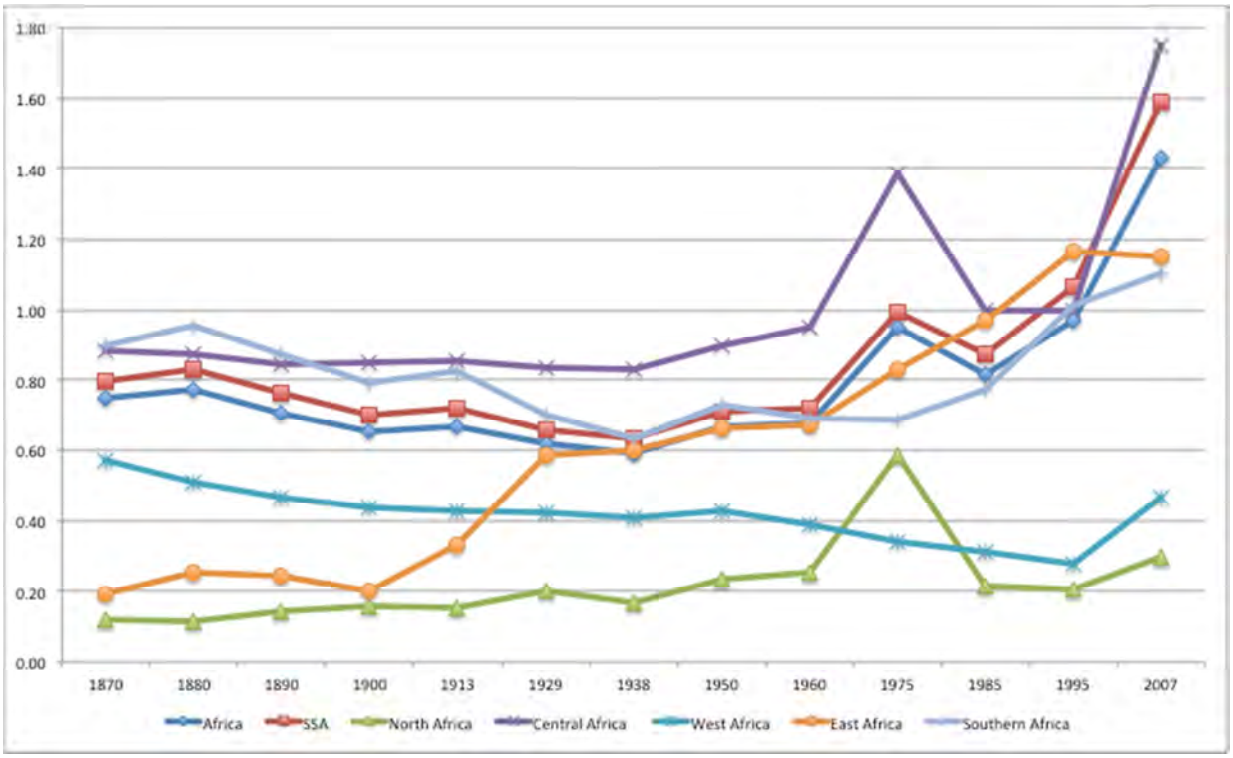

Figure 19. Real Output per Head Dispersion in Africa and Its Main Regions, 1870-2007 (coefficient of variation)

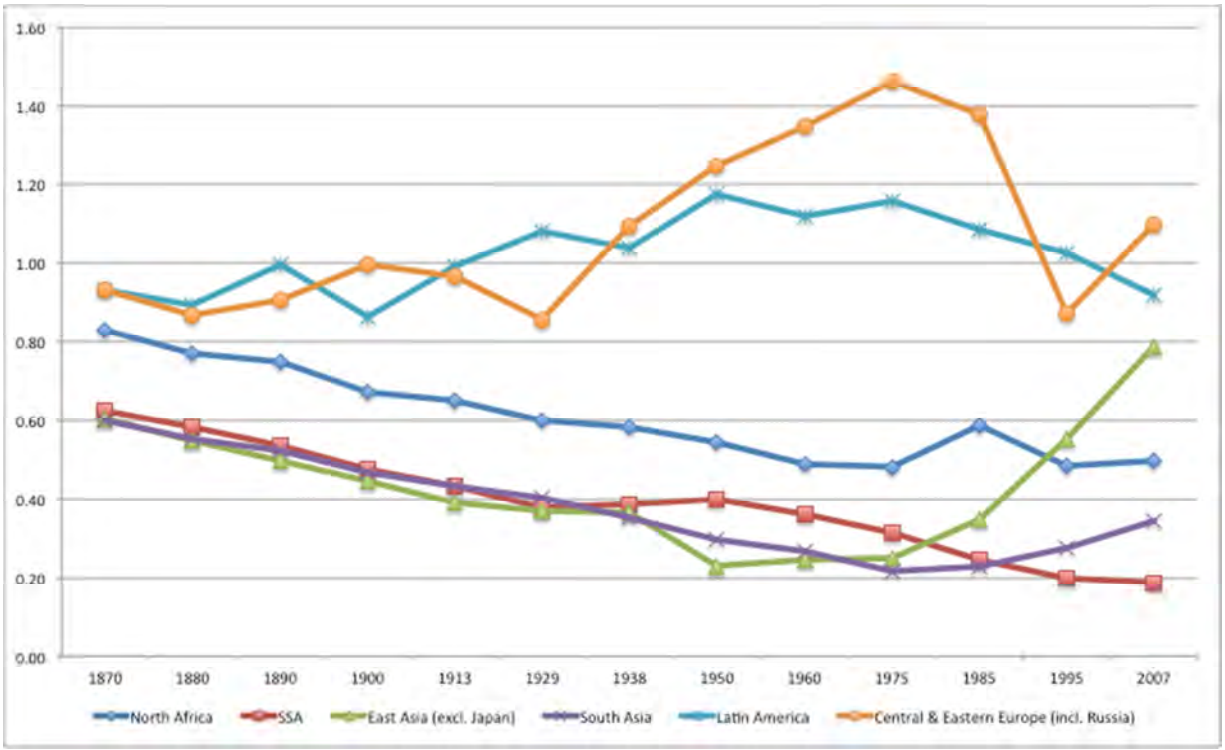

Figure 20. Trends in Real Output per Head: North Africa and Sub-Saharan Africa in Comparative Perspective (World = 1)

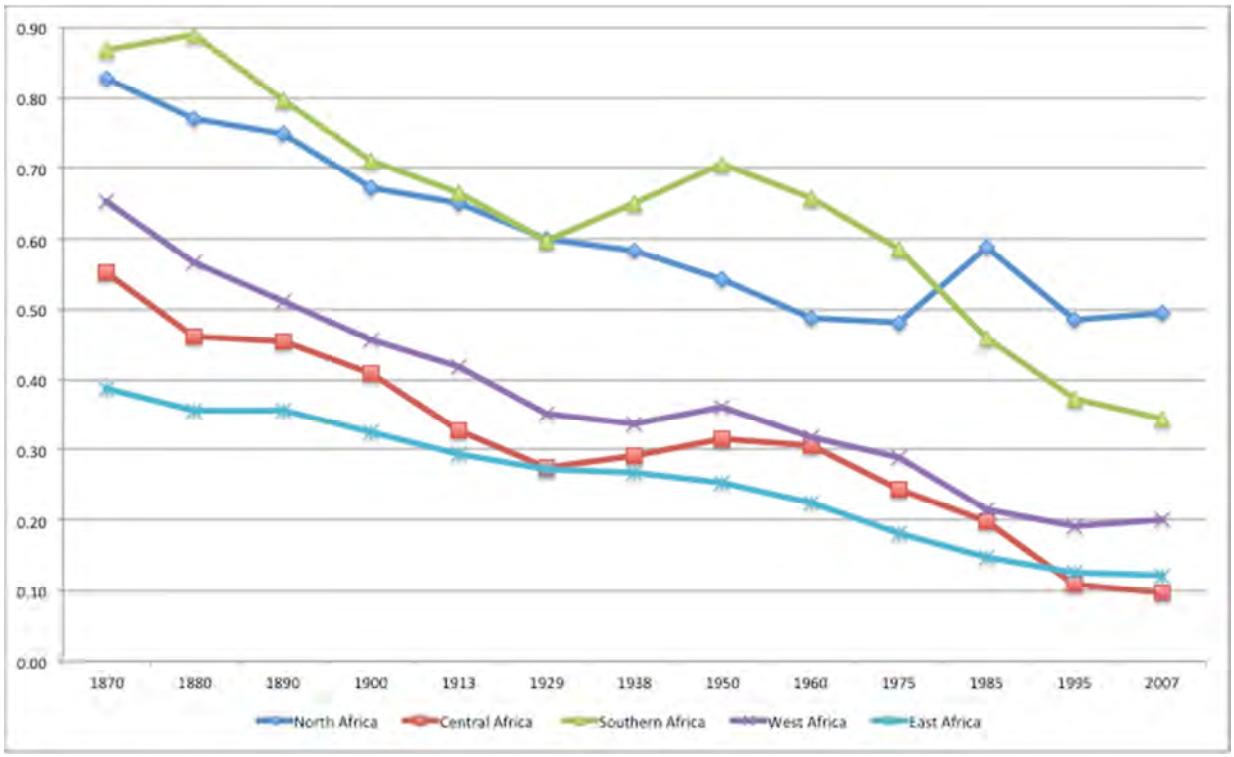

Figure 21. Trends in Real Output per Head: Africa Regions in Comparative Perspective (World = 1)

Appendix A. African Regions

Five regions are defined according the African Development Bank (with the exception of Mauritania which is assigned to West Africa and not to North Africa here). North Africa includes Algeria, Egypt, Libya, Morocco, and Tunisia. Central Africa contains Cameroon, Central African Republic, Chad, Congo, Democratic Republic of Congo, Equatorial Guinea, and Gabon. East Africa comprises Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Seychelles, Somalia, Sudan, Tanzania, and Uganda (Comoros, Seychelles, and Somalia are excluded here due to lack of historical data. Ethiopia includes Eritrea, only independent since 1993). West Africa comprises Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea□Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, and Togo. Lack of data prevents the inclusion of São Tomé and Principe. Southern Africa consists of Angola, Botswana, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Zambia, and Zimbabwe.

Appendix B
Estimating GDP Indirectly

Table B.1 Summary Statistics of the Variables Used

	Mean	Std. Dev.
Y	1370.69	1280.86
ITT	266.48	700.06
COAST	0.65	0.48
RR	0.28	0.45
DUM_NORTH	0.12	0.32
British Colony	0.42	0.49
French Colony	0.40	0.49

Variable definitions
Y: Per Capita GDP ((1990 Geary-Khamis $) (in logs) (Maddison 2010)
ITT: Income Terms of Trade per Head (in logs) (IMF 2003 and Maddison 2010)
RR: takes value 1 when a country is resource-rich and 0 otherwise (Collier and O'Connell (2008)
COAST: takes value 1 when a country is coastal and 0 otherwise (Collier and O'Connell (2008)
NORTH: takes value 1 when a country is located in North Africa and 0 otherwise
British Colony: takes value 1 when a country was a British colony; 0, otherwise (Bertocchi and Canova 2002)
French Colony: takes value 1 when a country was a French colony; 0, otherwise (Bertocchi and Canova 2002)

Table B.2 A Robustness Test: Econometric Estimate for 1960-1990

	Dependent Variable log (Y)	
	Coefficient	**t-Statistic**
Constant	6.461	38.145
log (ITT)	-0.220	-2.867
log(ITT)^2	0.055	7.157
RR * log(ITT)	-0.028	-2.956
COAST * log(ITT)	0.071	7.629
NORTH	0.257	4.088
British Colony	0.153	2.703
French Colony	0.166	3.066
Adjusted-R squared	0.788	
S.E. of regression	0.315	
F-statistic	82.229	
Number of observations	301	

Notes: Pooled Ordinary Least Squares with period fixed effects
White Heteroskedasticity-Consistent Standard Errors & Covariance
t-ratios in brackets

Sources: See the text

Table B.3 Real GDP per Head in Africa, 1870-1950 (1990 Geary-Khamis $)

	1870	1880	1890	1900	1913	1925	1929	1933	1938	1950
North Africa	**740**	**772**	**845**	**876**	**1021**	**1048**	**1101**	**1077**	**1117**	**1133**
Algeria	715	792	957	1013	1163	1313	1377	1377	1357	1365
Egypt	749	769	830	841	1041	1005	1007	1025	1052	1050
Libya	577	592	639	648	802	774	776	747	849	857
Morocco	772	785	809	842	883	924	1079	978	1080	1455
Tunisia	637	711	757	814	883	997	1080	965	1044	1115
Central Africa	**494**	**462**	**512**	**532**	**516**	**502**	**505**	**490**	**559**	**657**
Cameroon	549	516	531	559	552	523	516	492	544	671
CAR	607	582	593	615	609	587	582	592	608	772
Chad	374	359	365	379	376	362	359	365	375	476
Congo	872	819	843	887	876	830	820	844	880	1198
DR Congo	**300**	**300**	**400**	414	394	394	411	393	489	570
Gabon	2261	2125	2186	2301	2272	2154	2127	2190	2284	3108
West Africa	**585**	**568**	**577**	**595**	**656**	**646**	**644**	**576**	**647**	**752**
Benin	898	838	865	916	903	851	839	763	854	1084
Burkina Faso	415	398	405	420	416	401	398	381	402	474
Cape Verde	300	300	300	300	300	300	300	300	400	450
Côte d'Ivoire	863	805	831	879	867	817	806	733	820	1041
Gambia					863	685	575	486	498	607
Ghana	474	489	516	553	938	896	959	740	942	1122
Guinea	300	300	300	300	300	300	300	300	300	303
Guinea-Bissau	300	300	300	300	300	300	300	300	300	300
Liberia	568	568	757	922	931	896	888	999	1014	1055
Mali	400	383	390	405	401	386	383	367	387	457
Mauritania	390	367	377	397	392	372	367	339	373	464
Niger	540	517	527	547	542	522	518	496	523	617
Nigeria	590	565	558	570	647	661	671	595	666	753
Senegal	1043	973	1005	1064	1049	988	974	887	992	1259
Sierra Leone				506	511	592	543	482	631	656
Togo	548	512	528	559	551	519	512	440	486	574
S. Tomé & P.				961	1011	448	360	390	526	820
East Africa	**346**	**356**	**402**	**424**	**463**	**497**	**499**	**475**	**511**	**526**
Burundi	300	300	300	300	388	430	438	440	350	360
Djibouti									1441	1500
Ethiopia	300	300	369	383	436	413	410	405	437	390
Kenya	374	382	396	420	419	513	526	503	570	651
Réunion						1749	1689	1703	1698	1989
Rwanda	300	300	300	400	589	654	665	668	532	547
Somalia	300	300	300	400	893	1093	1120	1081	1178	1057
Sudan	441	541	544	564	642	701	706	616	709	821
Tanzania	330	338	350	371	371	412	379	334	376	424
Uganda	463	474	491	521	520	577	587	569	622	687
Southern Africa	**777**	**890**	**899**	**926**	**1045**	**1089**	**1095**	**995**	**1245**	**1472**
Angola	604	616	644	692	685	673	706	683	745	1052
Botswana	300	300	300	300	300	300	300	300	300	349
Lesotho	300	300	300	300	300	300	300	300	300	355
Madagascar	586	592	603	621	670	898	765	753	835	951
Malawi	300	300	300	300	300	300	300	300	300	324
Mauritius	2494	2832	2471	2202	2230	2051	1981	1570	1839	2490
Mozambique	1107	1129	1180	1268	1137	1092	1092	948	1065	1133
Namibia	951	1166	1105	1050	2520	1804	1912	1058	1599	2160
South Africa	1098	1346	1276	1213	1548	1605	1656	1490	1993	2535
Swaziland	300	300	300	300	400	593	628	589	678	721
Zambia	300	300	300	300	347	311	333	428	615	661
Zimbabwe	300	300	300	400	812	728	779	710	903	701

Table B.4 Real GDP per Head Growth in Africa, 1870-1950 (%)

	1870-1880	1880-1890	1890-1900	1900-1913	1913-1929	1929-1938	1938-1950	1870-1900	1900-1929	1929-1950	1870-1950
North Africa	**0.4**	**0.9**	**0.4**	**1.2**	**0.5**	**0.2**	**0.1**	**0.6**	**0.8**	**0.1**	**0.5**
Algeria	1.0	1.9	0.6	1.1	1.1	-0.2	0.0	1.2	1.1	0.0	0.8
Egypt	0.3	0.8	0.1	1.6	-0.2	0.5	0.0	0.4	0.6	0.2	0.4
Libya	0.3	0.8	0.1	1.6	-0.2	1.0	0.1	0.4	0.6	0.5	0.5
Morocco	0.2	0.3	0.4	0.4	1.3	0.0	2.5	0.3	0.9	1.4	0.8
Tunisia	1.1	0.6	0.7	0.6	1.3	-0.4	0.5	0.8	1.0	0.1	0.7
Central Africa	**-0.7**	**1.0**	**0.4**	**-0.2**	**-0.1**	**1.1**	**1.3**	**0.2**	**-0.2**	**1.3**	**0.4**
Cameroon	-0.6	0.3	0.5	-0.1	-0.4	0.6	1.7	0.1	-0.3	1.2	0.3
CAR	-0.4	0.2	0.4	-0.1	-0.3	0.5	2.0	0.0	-0.2	1.3	0.3
Chad	-0.4	0.2	0.4	-0.1	-0.3	0.5	2.0	0.0	-0.2	1.3	0.3
Congo	-0.6	0.3	0.5	-0.1	-0.4	0.8	2.6	0.1	-0.3	1.8	0.4
DR Congo	0.0	2.9	0.3	-0.4	0.3	1.9	1.3	1.1	0.0	1.6	0.8
Gabon	-0.6	0.3	0.5	-0.1	-0.4	0.8	2.6	0.1	-0.3	1.8	0.4
West Africa	**-0.3**	**0.2**	**0.3**	**0.8**	**-0.1**	**0.0**	**1.3**	**0.1**	**0.3**	**0.7**	**0.3**
Benin	-0.7	0.3	0.6	-0.1	-0.5	0.2	2.0	0.1	-0.3	1.2	0.2
Burkina Faso	-0.4	0.2	0.4	-0.1	-0.3	0.1	1.4	0.0	-0.2	0.8	0.2
Cape Verde	0.0	0.0	0.0	0.0	0.0	3.2	1.0	0.0	0.0	1.9	0.5
Côte d'Ivoire	-0.7	0.3	0.6	-0.1	-0.5	0.2	2.0	0.1	-0.3	1.2	0.2
Gambia					-2.5	-1.6	1.7			0.3	
Ghana	0.3	0.5	0.7	4.1	0.1	-0.2	1.5	0.5	1.9	0.7	1.1
Guinea	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0
Guinea-Bissau	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liberia	0.0	2.9	2.0	0.1	-0.3	1.5	0.3	1.6	-0.1	0.8	0.8
Mali	-0.4	0.2	0.4	-0.1	-0.3	0.1	1.4	0.0	-0.2	0.8	0.2
Mauritania	-0.6	0.3	0.5	-0.1	-0.4	0.2	1.8	0.1	-0.3	1.1	0.2
Niger	-0.4	0.2	0.4	-0.1	-0.3	0.1	1.4	0.0	-0.2	0.8	0.2
Nigeria	-0.4	-0.1	0.2	1.0	0.2	-0.1	1.0	-0.1	0.6	0.5	0.3
Senegal	-0.7	0.3	0.6	-0.1	-0.5	0.2	2.0	0.1	-0.3	1.2	0.2
Sierra Leone	-1.8	-1.2	-8.4	0.1	0.4	1.7	0.3	-3.8	0.2	0.9	-1.1
Togo	-0.7	0.3	0.6	-0.1	-0.5	-0.6	1.4	0.1	-0.3	0.5	0.1
S. Tomé &P				0.4	-6.4	4.2	3.7		-3.4	3.9	
East Africa	**0.3**	**1.2**	**0.5**	**0.7**	**0.5**	**0.2**	**0.2**	**0.7**	**0.6**	**0.2**	**0.5**
Burundi	0.0	0.0	0.0	2.0	0.8	-2.5	0.2	0.0	1.3	-0.9	0.2
Ethiopia	0.0	2.1	0.4	1.0	-0.4	0.7	-0.9	0.8	0.2	-0.2	0.3
Kenya	0.2	0.3	0.6	0.0	1.4	0.9	1.1	0.4	0.8	1.0	0.7
Réunion						0.1	1.3			0.8	
Rwanda	0.0	0.0	2.9	3.0	0.8	-2.5	0.2	1.0	1.8	-0.9	0.8
Somalia	0.0	0.0	2.9	6.2	1.4	0.6	-0.9	1.0	3.5	-0.3	1.6
Sudan	2.0	0.1	0.4	1.0	0.6	0.0	1.2	0.8	0.8	0.7	0.8
Tanzania	0.2	0.3	0.6	0.0	0.1	-0.1	1.0	0.4	0.1	0.5	0.3
Uganda	0.2	0.3	0.6	0.0	0.8	0.6	0.8	0.4	0.4	0.7	0.5
Southern Africa	**1.4**	**0.1**	**0.3**	**0.9**	**0.3**	**1.4**	**1.4**	**0.6**	**0.6**	**1.4**	**0.8**
Angola	0.2	0.4	0.7	-0.1	0.2	0.6	2.9	0.5	0.1	1.9	0.7
Botswana	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.7	0.2
Lesotho	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.8	0.2
Madagascar	0.1	0.2	0.3	0.6	0.8	1.0	1.1	0.2	0.7	1.0	0.6
Malawi	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.4	0.1
Mauritius	1.3	-1.4	-1.2	0.1	-0.7	-0.8	2.5	-0.4	-0.4	1.1	0.0
Mozambique	0.2	0.4	0.7	-0.8	-0.3	-0.3	0.5	0.5	-0.5	0.2	0.0
Namibia	2.0	-0.5	-0.5	6.7	-1.7	-2.0	2.5	0.3	2.1	0.6	1.0
South Africa	2.0	-0.5	-0.5	1.9	0.4	2.1	2.0	0.3	1.1	2.0	1.0
Swaziland	0.0	0.0	0.0	2.2	2.8	0.9	0.5	0.0	2.5	0.7	1.1
Zambia	0.0	0.0	0.0	1.1	-0.3	6.8	0.6	0.0	0.4	3.3	1.0
Zimbabwe	0.0	0.0	2.9	5.4	-0.3	1.6	-2.1	1.0	2.3	-0.5	1.1

Sources: See the text.