African Affairs, 109/434, 77–96 doi: 10.1093/afraf/adp064

Advance Access Publication 11 November 2009

THE RELATIVITY OF POVERTY AND INCOME: HOW RELIABLE ARE AFRICAN ECONOMIC STATISTICS?

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ABSTRACT

It has been argued that the fundamental cause of Africa's current relative poverty is a lack of pro-growth institutions deriving either from the colonial system, the period of slavery, or from particular geographic or population characteristics. This article takes a fresh look at estimates of African country incomes. It subjects the available datasets to tests of accuracy, reliability, and volatility, and finds that there is very little to explain in terms of diversity of income between countries. With the exception of some resource-rich enclaves, a few island states, and South Africa, the income of one African economy is not meaningfully different from another. It is found that the majority of African countries should for all practical purposes be considered to have the same income level. The article therefore concludes that it is futile to use GDP estimates to prove a link between income today and existence of pro-growth institutions in the past, and recommends a searching reconsideration of the almost exclusive use of GDP as a measure of relative development.

THE NOTION THAT AFRICA'S HISTORY CAN IN PART EXPLAIN its current underdevelopment has recently gained popularity among development economists, who previously focused almost exclusively on the period after 1960.[1] A range of suggestions have been made by different scholars, and where there previously was a dichotomy between the effect of geography and the effect of institutions, the debate has taken on an additional layer of sophistication.[2] Institutions have been disentangled from effects deriving from ethnicity, geography, or specific historical experience such as colonization and slavery. Recent attempts to explain the relative poverty of African economies have focused on the negative economic effects of the

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1. Gareth Austin, 'Reciprocal comparison and African history: tackling conceptual eurocentrism in the study of Africa's economic past', *African Studies Review* **50,** 3 (2008), pp. 1–28, p. 12.

2. David E. Bloom and Jeffrey D. Sachs, 'Geography, demography and economic growth in Africa', *Brookings Papers on Economic Activity* **29**, 2 (1998), pp. 207–96. William Easterly and Robert Levine, 'Tropics, germs and crops: how endowments influence economic development', *Journal of Monetary Economics* **50,** 3 (2003), pp. 3–39.

slave trade, following up research on the potential negative effects of colonial rule.[3] The former investigation is based on an African sample of income levels,[4] while in the latter African income estimates dominate the sample. These accounts are likely to be influential because they appeal to at least two types of audience. First, for economists these are impressive explanatory models spanning centuries of institutional development and economic performance. Second, for Africa specialists and historians, who have often claimed that orthodox economists ignore history, these explanations are likely to be welcomed as a useful corrective. Gareth Austin cautions that these modelling efforts entail a compression of history and lack empirical accuracy,[5] but this warning might be ignored because these models highlight the negative effects of the slave trade and colonial rule, hitherto relatively neglected factors in accounting for the predicament of Africa in the post-colonial period.

A striking commonality of these approaches is the central role played by national income data as the central evidence of relative poverty and income in the present day. This article does not take issue with the different contesting modelling efforts on the right-hand side of the equation, but provides a fresh look at the left-hand side, asking if there actually is anything to explain in terms of diversity of national income distribution between African economies. While it certainly is a reasonable proposition that we need to look at the historical roots of the current underdevelopment of African economies, there is good reason to doubt the linear correlations because the pattern of income distribution among African economies is far from straightforward.

Explaining African failure: from lack of growth to underdevelopment

The link between economic growth and income made in the economic growth literature is fairly straightforward: low income today must be the result of a lack of income growth in the past. The initial research on African economic growth performance focused on averaged gross domestic product (GDP) *per capita* growth in the post-colonial period. The specific aim was to explain the lack of growth in African economies as compared to a global sample. In the words of one article summarizing the mainstream

3. Nathan Nunn, 'Historical legacies: a model linking Africa's past to its current development', *Journal of Development Economics* **83**, 1 (2007), pp. 157–75; Daron Acemoglu, Simon Johnson, and John A. Robinson, 'The colonial origins of comparative development: an empirical investigation', *American Economic Review* **91,** 5 **(**2001), pp. 1369–1401.
4. Nathan Nunn, 'The long-term effects of Africa's slave trades', *Quarterly Journal of Economics* **123**,1 (2008), pp. 139–76.
5. Gareth Austin, 'The "reversal of fortune" thesis and the compression of history: perspectives from African and comparative economic history', *Journal of International Development* **20**, 1 (2008), pp. 1–32.

view, 'it is clear that Africa has suffered a chronic failure of economic growth. The problem for analysis is to determine its causes'.[6] If one accepts a linear understanding of economic growth, the next logical step from this stylized fact of a chronic growth failure is, and has been, to concentrate research on explaining the persistence of low incomes in African economies. As has been pointed out, 'one limitation of the growth regression literature is that to date it has focused upon explaining long-term average African slow growth'.[7] This limitation has not been taken adequately into consideration, and it could be argued that the growth literature thus has ignored the wide range of growth trajectories within Africa.[8] By making almost exclusive use of statistics that show average growth over time, the literature has not explained periods of growth and stagnation, but been focused on explaining a 'chronic failure of economic growth'. By extension, since most poor economies have displayed slow growth on average, explaining slow growth has been conflated with explaining low income.

Thus it has been argued that the fundamental cause of Africa's current relative poverty is the lack of pro-growth institutions which originated either under the colonial system or during the period of slavery, or even as a result of African special geographical features or population characteristics.[9] Of course tracing the cause of current economic success far back in history runs the risk of neglecting important developments which lie in between time t = 0 and today. Growth has been episodic in African countries, and it is a major challenge to establish at what point in time it is correct to judge that the historical roots of growth manifested themselves. There is a considerable risk that the chosen metric to describe the prosperity of the polity, within some geographical boundary, taken as a snapshot at a given time, is inaccurate and therefore not representative.

This rejoinder takes a closer look at the sub-Saharan economies and the measurement of their respective GDP *per capita*. The article asks what there is to explain in terms of income diversity among African economies, considering three key problems. First, there is a wide discrepancy in terms of ranking of African economies according to which source is consulted. Here the three major sources of data are considered: World Development Indi-

6. Paul Collier and Jan Willem Gunning, 'Why has Africa grown slowly?', *Journal of Economic Perspectives* **13**, 3 (1999), pp. 1–22, p. 4.
7. Paul Collier and Jan W. Gunning, 'Explaining African economic performance', *Journal of Economic Literature* **37**, 1 (1999), pp. 64–111, p. 79.
8. Morten Jerven, 'The quest for the African dummy: explaining African post-colonial economic performance revisited', *Journal of International Development* (forthcoming).
9. Acemoglu *et al.*, 'The colonial origins', pp. 1369–1401; Nathan Nunn and Diego Puga, 'Ruggedness: the blessing of bad geography in Africa' (Centre for Economic Policy Research Discussion Papers No. 6253, 2007);William Easterly and Robert Levine, 'Africa's growth tragedy: policies and ethnic divisions', *Quarterly Journal of Economics* **112**, 4 (1997), pp. 1203–50.

Table 1. Estimated correlation matrix of the data sources

	Maddison	WDI	PWT
Maddison	1.00	0.79	0.89
WDI	0.79	1.00	0.90
PWT	0.89	0.90	1.00

cators, Penn World Tables and Maddison.[10] Second, there is the issue of reliability of African GDP level estimates. The authoritative source on the subject, Derek Blades, suggested that African GDP level estimates had large errors, and should be considered with a plus-minus margin.[11] Third, as well as being considered very unreliable, African income estimates are very volatile. This is of course a different issue from those of accuracy and reliability. However, changes in income over time do affect the relative ranking of African economies. Therefore it is of interest to see to what extent a distribution of incomes is fairly stable through time. If there is considerable change through time, the growth literature might benefit from investigating trajectories of growth in order to explain periods of contraction and expansion – rather than explaining the current distribution of African incomes as if it has been constant through time.

Accuracy in reporting

The three major sources of income data on African economies[12] are all loosely based on national account files as prepared by the respective national statistical agencies, but differ in their modifications and according to currencies and purchasing adjustments. First, without attention to the absolute levels of income, the article examines the different rankings of countries according to each source. Only sub-Saharan African economies are considered, and the countries in the rankings only include countries for

10. Alan Heston, Robert Summers, and Bettina Aten, *Penn World Table Version 6.2* (Center for International Comparisons of Production, Income and Prices, University of Pennsylvania, 2006); Angus Maddison, *The World Economy: Historical statistics* (OECD, Paris, 2003); *World Development Indicators* (World Bank, Washington, DC, 2007).
11. Derek Blades, 'What do we know about levels and growth of output in developing countries? A critical analysis with special reference to Africa' in R. C. O. Mathews (ed.), *Economic Growth and Resources: Proceedings of the Fifth World Congress, International Economic Association, Tokyo,* Volume 2, *Trends and Factors* (St Martin's Press, New York, NY, 1980), pp. 60–77.
12. From World Development Indicators (henceforth WDI) GDP *per capita* (constant 1995 US$) is used. The best equivalent from Penn World Tables (henceforth PWT) is Real GDP *per capita* (Laspeyres) in 1996 International Geary Dollars. Finally, from Maddison *per capita* GDP in 1990 International Geary-Khamis Dollars is used.

which all three sources have GDP *per capita* data for the year 2000.[13] Thus a sample of 45 countries is considered, and the result of the simple exercise of calculating the correlation coefficients of the income estimates according to the three sources is presented in Table 1.

It is not easy to say what kind of correlation should be expected here. It could be equated with measuring the weight of 45 different bags of flour with three different weights. In that case, some kind of systematic error might be expected. This would mean a clearly discernible and stable plus-minus error attributable to the specific weight, but a correlation coefficient extremely close to 100 percent. It is after all a measure of the income in the same country, in the same year, and theoretically using the same method. In Table 2 the countries are ranked according to the reported GDP *per capita* for year 2000, the poorest countries on the top and the richest countries at the bottom. It is obvious from this table that there is no systematic error in measurement between the sources, as in the example of a faulty weight. Instead, it is as if each time the income is measured using a different weight with an unknown margin or direction of error.

The three sources agree on the ranking of some countries, but disagree on most – in some cases with a large discrepancy. The sources agree unanimously that Democratic Republic of Congo (DRC), formerly Zaïre, is the poorest country. It should be noted that its income is probably grossly understated in the official statistics. Janet MacGaffey noted this some time ago, and the situation has certainly not improved since.[14] Among the ten poorest economies, there are only six that consistently appear in that bracket according to all three sources. In addition to DRC those are Sierra Leone, Niger, Burundi, Tanzania, and Ethiopia. There is better agreement in identifying the ten richest countries. In the relative ranking among them there is wide variation, but nine out of ten countries appear in the top ten groups in all the three sources.

There are also large fluctuations in the rankings. When considering the lowest and highest rank of a country across the three sources, some stand out. The highest uncertainty regards Guinea, which is ranked as the seventh poorest economy according to Maddison, while PWT has it one place behind the ten richest African countries in *per capita* terms. Mozambique is considered the eighth poorest country by WDI, while Maddison

13. Thereby directly excluding Algeria, Egypt, Libya, Morocco, and Tunisia. In addition World Development Indicators does not have data for Djibouti, Mayotte, Reunion, and Somalia, while Maddison lacks a separate estimate for Eritrea (his estimate for Eritrea and Ethiopia is considered to represent Ethiopia).

14. Maddison also expressed doubts about the validity of the estimates for DRC when presenting his paper and dataset at the Comparative Economic History Seminar at London School of Economics, 12 June 2008. Janet MacGaffey suggested that the real economy might be three times larger than what the official statistics recorded. Janet MacGaffey, *The Real Economy of Zaire: The contribution of smuggling and other unofficial activities to national wealth* (James Currey, London, 1991), p. 11.

Table 2. Relative income ranking in Africa according to three data sources

	Maddison		WDI		PWT	
1	Congo, Dem. Rep.*	217	Congo, Dem. Rep.*	92	Congo, Dem. Rep.*	359
2	Sierra Leone	410	Ethiopia	115	Liberia	472
3	Chad	429	Burundi	139	Sierra Leone	684
4	Niger	486	Sierra Leone	153	Burundi	699
5	Burundi	496	Malawi	169	Ethiopia	725
6	Tanzania	535	Tanzania	190	Guinea-Bissau	762
7	Guinea	572	Liberia	191	Niger	807
8	Central African Rep.	576	Mozambique	191	Tanzania	817
9	Comoro Islands	581	Niger	200	Togo	823
10	Ethiopia*	605	Guinea-Bissau	210	Madagascar	823
11	Togo	614	Chad	218	Chad	830
12	Zambia	645	Rwanda	242	Malawi	839
13	Malawi	656	Burkina Faso	243	Zambia	866
14	Guinea-Bissau	681	Madagascar	246	Burkina Faso	933
15	Madagascar	706	Nigeria	254	Central African Rep.	945
16	Angola	765	Mali	294	The Gambia	954
17	Uganda	797	Sudan	313	Rwanda	1018
18	Rwanda	819	Togo	323	Mali	1047
19	Mali	892	Kenya	328	Sudan	1048
20	Gambia	895	Central African Rep.	339	Uganda	1058
21	Burkina Faso	921	São Tomé & Principe	341	Nigeria	1074
22	Liberia	990	Uganda	348	Mozambique	1093
23	Sudan	991	Gambia, The	370	Benin	1251
24	Mauritania	1017	Zambia	394	Kenya	1268
25	Kenya	1031	Ghana	413	Congo-Brazzaville	1286
26	Cameroon	1082	Benin	414	São Tomé & Principe	1300
27	São Tomé & Principe	1226	Comoros	436	Comoros	1359
28	Nigeria	1251	Mauritania	495	Ghana	1392
29	Ghana	1270	Angola	524	Mauritania	1521
30	Benin	1283	Lesotho	548	Senegal	1571
31	Zimbabwe	1328	Guinea	605	Lesotho	1834
32	Côte d'Ivoire	1352	Senegal	609	Angola	1975
33	Senegal	1358	Zimbabwe	620	Côte d'Ivoire	2171
34	Mozambique	1365	Cameroon	675	Cameroon	2472
35	Lesotho	1490	Côte d'Ivoire	739	Guinea	2546
36	Cape Verde	1777	Congo-Brazzaville	791	Zimbabwe	3256
37	Congo-Brazzaville	2005	Swaziland	1538	Cape Verde	4984
38	Swaziland	2630	Cape Verde	1541	Namibia	5269
39	Namibia	3637	Equatorial Guinea	1599	Equatorial Guinea	6495
40	Gabon	3847	Namibia	2366	Botswana	7256
41	South Africa	3978	Botswana	3931	South Africa	8226
42	Botswana	4269	South Africa	4020	Swaziland	8517

Continued

Table 2. Continued

Maddison		WDI		PWT	
43 Seychelles	6354	Mauritius	4104	Gabon	10439
44 Equatorial Guinea	7973	Gabon	4378	Seychelles	10593
45 Mauritius	10652	Seychelles	6557	Mauritius	15121

places it among the twelve richest economies. Across the three sources, Liberia jumps 20 places, ranked second poorest by PWT and richer than the majority of African countries according to Maddison. Angola, Central African Republic, Comoros, Congo-Brazzaville, Nigeria, and Zambia all make leaps of more than ten places in the rankings from one source to the other. In sum, the relative ranking of one fifth of the countries is a matter of high uncertainty.

The average variation in the whole sample, calculated as the sum of the highest minus the lowest ranking for each and every country divided by the number of countries, is seven places. If this average variation is accepted as a basis to create cohorts of countries, the sample can be neatly divided into three groups: low-income, middle-income and high-income African economies, where the middle of each cohort is ranked as eighth, 23rd and 38th respectively. Of course, these categories are measures of relative income in the African sample alone, and do not match the UN classifications of low-, middle- and high-income economies. In order to establish beyond doubt which group a country belongs to, an exclusion criteria is adapted. Countries that do not remain within the same cohort according to all three sources are eliminated as having too inaccurate estimates of income.

By this measure we are left with 30 countries, as displayed in Table 3. Given that there is no criterion to decide which of the three datasets has the most authoritative ranking for year 2000, and given that there is an average variation of seven places in the rankings across the three datasets, it is left undecided to which of the three groupings Guinea, Central African Republic, Comoro Islands, Togo, Zambia, Angola, Rwanda, Burkina Faso, Liberia, Cameroon, Nigeria, Senegal, Mozambique, Lesotho, and Congo-Brazzaville belong. Given the large average variation of seven places between the three datasets it should be noted there is no real cause for distinguishing the income levels of the countries within the three different groups.

To conclude: to read the available income statistics as if there were 45 different income levels among African economies is meaningless and potentially misleading. Based on the exercise above it is more accurate to analyse the relative poverty and income of African economies as if there were three different levels: relatively poor African economies, middle-income African economies, and relatively rich African economies.

Table 3. Low-, middle- and high-income African economies for the year 2000, synthesizing all three rankings

Low-income economies		
Congo Dem. Rep	Niger	Burundi
Sierra Leone	Ethiopia	Guinea-Bissau
Chad	Malawi	Madagascar
Tanzania		
Middle-income economies		
Uganda	Sudan	São Tomé & Principe
Mali	Mauretania	Ghana
Gambia	Kenya	Benin
High-income economies		
Zimbabwe	Gabon	Namibia
Côte d'Ivoire	South Africa	Equatorial Guinea
Cape Verde	Botswana	Mauritius
Swaziland	Seychelles	

Reliability of the estimates

A pressing question is whether this inaccuracy in reporting is common to all income data. It is true that there is always some variation between estimates depending on which source the data was taken from and what method was chosen to express the data in international currency. However, the range of variation and therefore uncertainty of the information deriving from African economies is much larger. To test this a similar comparison using income estimates of 22 Latin American countries from the Maddison and WDI datasets showed that the sources agreed about the relative income ranking for the majority of the countries.[15] So why are there particular problems with the African data? Roger Riddell argues that 'Perhaps the most fundamental problem with the available Africa data is that these are widely known to be inaccurate but the degree of inaccuracy cannot easily be judged – itself a sign of the underdevelopment of the region.' In this candid manner a number of quantitative studies on manufacturing in Africa are introduced, and he admits that this 'throws considerable doubt on *all* the aggregate data used subsequently'.[16]

The combined effect of lack of manpower and other resources means that statistical offices lack the time and funds to collect the necessary basic statistical data required to compile data in accordance with the standards of

15. The ranking matches country by country in the bottom and the top of the distribution. In the middle of the income distribution the countries Guatemala, Ecuador, Jamaica, Dominican Republic, and Columbia jump a few places up and down from one source to the other. The average of jumps in the ranking is less than 1, compared to 7 in the African sample.
16. Roger C. Riddell, *Manufacturing Africa: Performance and prospects of seven countries in sub-Saharan Africa.* (James Currey, London, 1990), p. 20. Emphasis in original.

Table 4. Reliability band of GDP estimates

		Income estimate	Upper bound	Lower bound	Highest	Lowest	Range
1	Sierra Leone	410	533	287	9	1	8
2	Chad	429	557	300	9	1	8
3	Niger	486	632	340	11	1	10
4	Burundi	496	645	347	12	1	11
5	Tanzania	535	696	375	13	1	12
6	Ethiopia	605	787	424	15	1	14
7	Malawi	656	853	459	15	1	14
8	Guinea-Bissau	681	885	476	16	1	15
9	Madagascar	706	918	494	18	1	17
10	Uganda	797	1035	558	20	2	18
11	Mali	892	1159	624	20	3	17
12	Gambia	895	1163	626	20	3	17
13	Sudan	991	1289	694	21	5	16
14	Mauritania	1,017	1322	712	21	6	15
15	Kenya	1,031	1340	721	21	6	15
16	São Tomé & Principe	1,226	1594	858	21	8	13
17	Ghana	1,270	1651	889	21	8	13
18	Benin	1,283	1668	898	21	8	13
19	Zimbabwe	1,328	1726	929	21	10	11
20	Côte d'Ivoire	1,352	1758	946	21	10	11
21	Cape Verde	1,777	2309	1244	22	13	9
22	Swaziland	2,630	3419	1841	26	21	5
23	Namibia	3,637	4728	2546	27	22	5
24	Gabon	3,847	5001	2693	27	22	5
25	South Africa	3,978	5172	2785	27	22	5
26	Botswana	4,269	5549	2988	27	22	5
27	Seychelles	6,354	8260	4447	29	23	6
28	Equatorial Guinea	7,973	10365	5581	29	27	2
29	Mauritius	10,652	13848	7457	29	27	2

national accounts on a regular basis. In 1981 Kpedekpo and Arya commented on national accounting practices in Africa:

> Reflecting the practice of the industrial countries, it focuses attention heavily on the main tables, especially the gross domestic product (GDP), and the international agencies reinforce this bias by requesting national statistics offices to provide data for aggregates long before the preparation is defensible, resulting in figures that are little better than random numbers.[17]

More recently a Zambian report on national accounting concluded that:

> to a large extent accuracy and reliability of estimates depend on coverage, data availability and data source. In Zambia, like many other developing countries, there are

17. G. M. C. Kpedekpo and P. L Arya, *Social and Economic Statistics for Africa: Their sources, collection, uses and reliability* (Allen and Unwin, London, 1981).

> generally severe constraints in the area of data availability and collection, completeness of the universe, quality of information, non-response, time-lags and under-reporting. Even resources to enable the collection of requisite data are, quite often, never sufficient.[18]

A second and related problem is that because of the importance of the 'non-monetary', 'subsistence', 'informal', or simply 'unrecorded' economy it is very difficult to compile data for large parts of the economy, and to decide where to draw what is referred to as the 'production boundary' – that is, what type of economic activity should be included in the estimate of total value added.[19] The national statistical office faces delicate choices as to whether to include estimates for sectors of the economy for which there is no basic data, and if so, how to make such an estimate. To illustrate the potential importance of these choices, consider two examples from the national accounting history of Tanzania.

First, van Arkadie reported that the Tanzanian official data of the 1960s did not include measures of the unrecorded economy.[20] In 1967 construction and rents in the 'subsistence' sector were included. These changes increased national income estimates by 25 percent and capital formation by 11 percent. This extension of the definition of national income would invalidate a comparison of economic change in Tanzania over the 1960s; further, it would complicate the comparison with the income level of a neighbouring country like Malawi, for example, where no such addition in national income had been made. The second example derives from a revision of the national income estimates undertaken in the 1990s. The Tanzanian state and the formal economy were in serious decline in the early 1980s. From 1985 structural adjustment programmes under the auspices of the International Monetary Fund were implemented. Statistical methods of income estimation remained unchanged since the 1970s, although large structural changes had taken place. In particular one did not know how large the informal market economy was in the 1990s, according to a report prepared by Central Bureau of Statistics in Tanzania: 'Estimates of the size of this deficiency ranged from 30 percent to as much 200 percent of

18. Republic of Zambia, 'National Accounts Statistical Bulletin No. 8, 1965–2000' (Central Statistical Office, Lusaka 2001), p. 3.
19. In a footnote G. Wood offered a short and accurate comment as to why neither of the terms commonly used for this part of the economy is apt: 'There is no satisfactory name for this sector. The non-monetary sector is used in this paper because that is what it is called in the Kenyan National Accounts. The name is misleading since money is widely used in this sector. Other names which have been used to designate this sector are: the "subsistence" sector, although the standard of living is usually above the subsistence level; and the traditional sector, although social, economic and political institutions and behaviour are probably changing as rapidly in parts of this sector as they are elsewhere in the country'. G. D. Wood (Jr), 'Problems of comparisons in Africa with special regard to Kenya', *Review of Income and Wealth* **19**, 1 (1973), pp. 105–16, p. 106.
20. B. van Arkadie, 'National accounting and development planning: a review of some issues', *Development and Change* **4**, 2 (1972–3), pp. 15–31.

GDP.'[21] In the end the GDP estimate was increased by 62 percent and the change drew the following comment: 'From the perspective of the national accounts staff, this revision was an *ad hoc* adjustment as the methodology from that revision was not fully incorporated into the estimation procedures.'[22]

As mentioned above, after reviewing and assessing estimation methods used to assemble African income data, Derek Blades suggested different plus-minus error ranges as a precaution when considering GDP level estimates in sub-Saharan Africa.[23] In the PWT the country data come with a quality rating, expressed as a margin of error. Of the 43 sub-Saharan African countries, 17 are given a 40 percent error margin, while for 26 the margin is 30 percent.[24] Based on this advice, in the following exercise the income level estimates are not understood as representing an exact cash value like $1,040 *per capita* in Mauritania. Instead they are interpreted as expressing the mid-point in a band estimate of plus-minus 30 percent. Thus the *per capita* income of Mauritania is somewhere between $712 and $1,322. The previous section left the monetary estimates aside, but when considering reliability, the dollar estimate has to be re-introduced. Based on the previous exercise 14 economies were excluded from the examination, leaving 30 countries in the sample. In Maddison the poorest economy in year 2000 was measured at $212 (1995 International Geary-Khamis), while WDI has the poorest country measured at $92 (1995 Constant) and PWT at $359 (1996 International Geary). This compares to $10,652, $6,557 and $15,121 for the richest economies in Maddison, WDI and PWT respectively, which translates into a large difference of relative wealth and poverty at the top and bottom of the income distribution. WDI has the income of the Seychelles recorded as 72 times higher than the DRC, while Maddison and PWT have the Seychelles and Mauritius as 49 and 41 times richer than the DRC. Again, there is no immediate reason to accept one of the datasets above another, and therefore the pragmatic option is to proceed with Maddison cash values since its distance between top and bottom is higher than PWT, while it is lower than WDI.

21. United Republic of Tanzania, 'Report on the Revised National Accounts of Tanzania, 1987–96' (Bureau of Statistics, Dar es Salaam, 1997), p. 1.
22. *Ibid.*
23. It was suggested that the size of the error margin (weighted by the different sectors) was between Nigeria with 35 percent at the top of the scale, while Kenya, with the lowest error range, was considered to have +/- 22 percent. Kenya is widely regarded as having the best statistical services in sub-Saharan Africa, and therefore a margin of 30 percent is used in this section. Blades, 'What do we know', pp. 65–8.
24. As reported in J. Vernon Henderson, Adam Storeygard, and David N. Weil, 'Measuring economic growth from outer space' (NBER Working Paper No. 15199), referencing Alan Heston and Angus Deaton, 'Understanding PPPs and PPP based national accounts' (NBER Working Paper No. 14499).

Thirty countries were included in the previous exercise, as the income estimates of the other fifteen were too volatile to be considered meaningful. In the following, the DRC is also excluded because its income estimate is undoubtedly too low.[25] The average income in the sample according to Maddison is 2,145 dollars: the mean is considerably higher than the median income. Kenya is situated at the middle of the 29-country sample at 1,031 dollars. The distribution of income among African economies has a much longer tail towards the higher-income section, with the income of Sierra Leone a bit less than half of Kenyan GDP *per capita*, while the *per capita* income in Mauritius is more than ten times higher than in Kenya.

Table 4 shows the 29 economies ranked according to the reported GDP *per capita*. The first column shows the GDP *per capita* of each country as reported by Maddison. The second column shows the upper bound of the estimates, assuming that GDP could hypothetically be 30 percent higher than reported. Column three shows the opposite case, assuming that GDP *per capita* is overestimated by 30 percent, and therefore the plausible lower bound of the estimate. Together those two columns show upper bound and lower bound of the reliability band of each economy. Column 4 shows the highest possible rank the economy could potentially have if its GDP *per capita* has been estimated to be 30 percent too low, while all the other economies should have been 30 percent lower. Column 5 displays the opposite case. Column 6 shows the conceivable range in relative ranking if the 30 percent plus-minus band is taken seriously. This interpretation of the error band is assuming the extreme case where one country is underestimated, while all others are overestimated. Further empirical investigation at country level, as shown in the example of Tanzania, might establish the direction and timing of bias; however, at face value this extreme case cannot be ruled out. The variation in ranking and the income estimates of the countries in Table 2 justifies this caution. One further caveat should be noted. It might be argued that it is wrong to assume, as has been done in Table 4, that the error range should be increasing proportionally with income. However, if the reader re-evaluates the large fluctuations from data set to data set in Table 2, it may seem that this 30 percent plus-minus band is not an extreme assumption. Consider the case of Equatorial Guinea and Gabon. Maddison has the income *per capita* of Equatorial Guinea more than 200 percent higher than in Gabon, while WDI ranks Gabon almost 300 percent richer in *per capita* terms than Equatorial Guinea. Similar calculations could be made with any of the other countries, showing the 30 percent to be a conservative estimate. There is also good plausible cause why the

25. If DRC was included it would not make a difference to the analysis. It would just be an outlier, estimated as having less than half the average annual income as compared to the second poorest economy in any of the three datasets.

constant dollar estimates of the higher-income African economies vary to this extent. Most of these countries are heavily reliant on some valuable, but very volatile, mineral resource, meaning that their relative monetary value of production depends on the base year chosen.

Thus Table 4 shows that among the poorer two-thirds almost all economies overlap if the GDP *per capita* value is understood as an estimate with a plus-minus 30 percent reliability band. Particularly striking examples are Madagascar and Uganda, which conceivably could be the poorest or second poorest African economies, but could also still be ranked in the upper half of the income distributions as the eleventh or ninth richest economies respectively. Other low- and middle-income countries show almost as high variability in the rankings, while the range of variation is lower among the richer economies. In the upper third (from Cape Verde to Mauritius) the dollar gap between each country is not only larger in absolute terms, but also larger proportionally. The average difference from one country to another in the ranking is 10 percent across the whole sample from one country to another across the 29, but between economy 21 and 29 there is an average relative percentage difference of 19 percent, while the average difference in the countries listed from Sierra Leone to Côte d'Ivoire is as low as 6 percent.

Based on this cumulative information it makes sense to distinguish between the clearly distinguishable relatively rich economies – Cape Verde, Swaziland, Namibia, Gabon, South Africa, Botswana, Seychelles, Equatorial Guinea, and Mauritius – and the remaining relatively poorer group of 20 economies. Figure 1 shows how this group of the poorest 20 African economies maps out. Each country is indicated by a line or range, rather than a dot, showing the +/- 30 percent reliability margin. The countries whose ranges overlap cannot definitively be distinguished in income *per capita* terms. In Maddison's ranking the median income *per capita* is the average income of Uganda and Mali at 844 dollars in the middle of a band +/- 30 percent, giving it a possible intercept with both the richest country in the group and the third poorest, with a band reaching from 591 to 1097 dollars.[26] Perhaps the most telling example is that of Madagascar and Uganda, shoulder to shoulder at the middle of the distribution. At ninth place in the ranking it cannot be said for certain that Madagascar is not the poorest economy in the sample, while Uganda, ranked as number 10, could equally well be the richest economy in the sample. With the 30 percent reliability band it can be established that the 9 poorest countries are not the richest economies in the group, but all of them might be among the 10 richest. On the other hand, while the top 11 countries can with 30 per-

26. The mean income is very similar to the median income at 854 dollars.

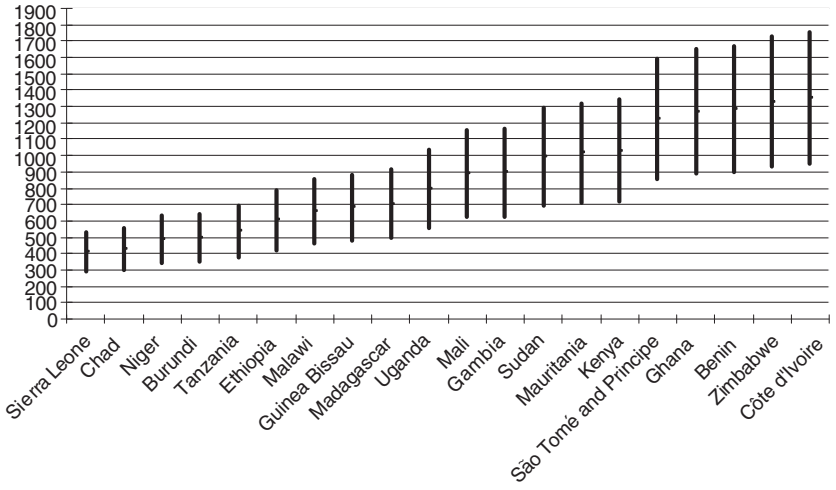

Figure 1. GDP reliability band of poor and middle-income African economies.

centage certainty be said not to be the poorest country in Africa, all of them might be among the poorest 10 countries.

It can be concluded that the low- and middle-income countries should at best be considered a fluid continuous band of 20 countries. It is only among the ten richest countries that one level of income is distinguishably different from another. Specifically, it can only reliably be determined that Cape Verde, Swaziland, Namibia, Gabon, South Africa, Botswana, Seychelles, Equatorial Guinea, and Mauritius are richer than the 'rest'. In the conclusion I return to these countries and their characteristics.

Volatility of the estimates

One well-known characteristic of African income is its volatility. This is due in part to the low absolute income, the dominance of the agricultural sector, which makes income particularly dependent on variation in the weather, dependence on fluctuating world market prices, and, finally, the low quality of statistical services, which may cause abrupt *ad hoc* changes in income estimates. It might seem arbitrary, therefore, to pick a year when the historical legacy is supposed to have manifested itself in a low or a high income. From a pragmatic viewpoint it does make sense to use a point in time that is relatively close to 'today' when examining the income distribution, but an investigation of lasting historical legacies should be supported by some examination of the validity of the conclusion through time. This

does not mean that it is required that the relative ranking of income should be constant through time. However, if the relative ranking of economies is very volatile it does provide a good case for promoting research that investigates trajectories of economic growth and economic change, rather than research that aims to explain an implicitly assumed stable income distribution between countries.

For this exercise the data from WDI will be used because these follow the national account files submitted from the national statistical agencies more closely, and therefore give a better impression of the year-to-year volatility of some of the statistics from Africa, while the other two sources are to a larger extent modified by their publishers. The volatility in GDP *per capita* income in the post-colonial period is examined, and in order to be able to compare like with like, all countries where there is no WDI data for the period between 1960 and 2001 are excluded. By this measure Angola, Cape Verde, Comoros, Equatorial Guinea, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Mali, Mauritius, Mayotte, Mozambique, Namibia, São Tomé, Somalia, Swaziland, Tanzania, and Uganda are excluded and we are left with 29 countries.

Among these 29 there is a high variation in income across time, immediately casting doubt on the idea of persistence in income distribution. The lowest recorded income in WDI of all time was Liberia, where in 1995 GDP *per capita* was measured at 49 dollars. In 1972 it was 960 dollars – almost 20 times higher – and in that year Liberia was the fifth richest economy, surpassed only by South Africa, Gabon, the Seychelles, and Côte d'Ivoire. Following a similar trajectory, the DRC is today the poorest African economy at 85 dollars, but was at its peak in 1974 at 380 dollars *per capita*, which would have placed it above 12 other economies in that year.

The highest *per capita* income recorded in the post-colonial period was Gabon, with 8,502 dollars in 1976, almost double the income measured in 2001, and more than four times the income measured in 1960. As in the previous exercises, there is more stability among the richest economies, and Gabon conforms to this rule, remaining among the three richest economies throughout the period. Botswana is an exception to the rule. In 1960, it was twelfth from the bottom, while in 2001 it was the third richest economy. Some of these growth and decline trajectories raise further questions about the persistence of the income distribution. It should be considered as temporary, at least among the low- and middle-income countries.

In order to eliminate the economies whose ranking is not stable, the economies are ranked relative to each other for each year from 1960 to 2001. Table 5 shows all the economies with continuous data between 1961 and 2000, and each economy's highest and lowest *per capita* income in terms of constant dollars and relative rank. As mentioned, there is more stability among the richer countries. Only Congo-Brazzaville, Côte

Table 5. Volatility in income estimates and income ranking, 1960–2001

	Income		Rank	
	High	Low	High	Low
Benin	424	332	12	19
Botswana	4130	397	3	17
Burkina Faso	250	159	20	28
Burundi	211	138	25	28
Cameroon	1020	475	5	12
Central African Republic	476	313	11	17
Chad	300	173	19	28
Congo, Dem. Rep.	380	85	14	29
Congo-Brazzaville	1128	479	5	10
Côte d'Ivoire	1238	694	4	7
Gabon	8502	2891	1	3
Ghana	485	309	11	20
Kenya	358	225	15	25
Lesotho	570	173	9	27
Liberia	960	49	4	29
Madagascar	408	235	14	22
Malawi	169	120	25	29
Mauritania	523	442	10	18
Niger	458	200	11	25
Nigeria	328	180	18	25
Rwanda	333	154	18	26
Senegal	673	526	5	11
Seychelles	7347	2615	1	3
Sierra Leone	360	150	16	27
South Africa	4868	3696	1	4
Sudan	328	193	16	26
Togo	466	285	13	23
Zambia	752	386	5	14
Zimbabwe	698	481	7	11

d'Ivoire, Gabon, Seychelles, and South Africa remain among the ten richest throughout the period. In the accuracy exercise earlier it was established that only WDI places Congo-Brazzaville and Côte d'Ivoire among the ten richest, so they will be excluded here. There are some interesting cases of countries that were among the ten richest of African economies at one point in time in the period, but not consistently. Botswana and Lesotho were very poor at independence but have grown relatively quickly post-independence. Liberia was rich, but has grown poor. Zambia and Senegal followed a similar, if less dramatic, trajectory. Zimbabwe and Mauritania have both been in the vicinity and sometimes among the top ten rankings between 1960 and 2001, while Cameroon was a middle-income country that grew rich after the late 1970s.

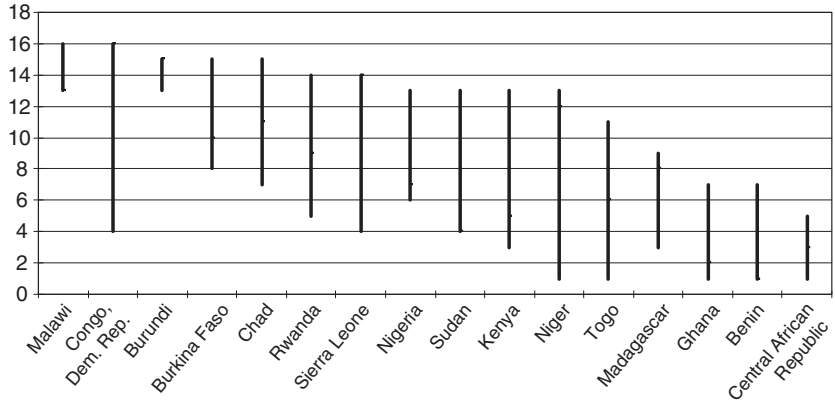

Figure 2. Volatility in income ranking: poor and middle-income African economies.

This leaves 16 economies which at no point since independence have stood out as relatively prosperous. In Figure 2 each of these 16 economies is given a line indicating its highest and lowest relative ranking in one year between 1960 and 2001. With the exception of Malawi and Burundi, which are consistently poor countries, and the Central African Republic, which is consistently relatively rich, it is a homogeneous group of countries. DRC, Burkina Faso and Chad have been ranked as high as fourth, eighth and seventh (in 1963 and 1973–4, 1999, and 1960–3 respectively), while Benin and Ghana were ranked as low as seventh in 1983 (Benin also ranked seventh in 1969, 1971, 1972, and 1975). For these middle 13 countries the relative ranking depends largely on the year chosen.

If volatility through time in the dataset is used as a criterion, it can be concluded that Gabon, Seychelles, and South Africa were consistently richer than the others. Central African Republic, Congo-Brazzaville, Côte d'Ivoire, Senegal and Zimbabwe seem fairly securely placed in a middle-income group. The rest are not robustly different from each other through time, or else a GDP *per capita* time series for the economy is lacking. The 'rest' for which data were available followed a range of different trajectories. Some economies grew consistently during the period, while others were in permanent decline. Many countries did not follow a linear pattern but experienced periods of boom and bust. There is no reason to believe that the income distribution pattern has settled in year 2000, either. According to Maddison's latest data set GDP *per capita* in economies like Angola and Chad grew 52 and 39 percent from year 2004 to 2006 respectively, thus

confirming the high volatility of income estimates as a persistent pattern in Africa, and the impermanence of income distribution.

Conclusion: what is there to explain?

The available African income data sets have been subjected to three tests. The article has examined whether the income distribution among African economies is robust through three different sources, given a certain reasonable error level and through time. The three different tests of accuracy, reliability, and volatility have yielded different yet similar answers. Based on the accuracy test in ranking of African economies according to Maddison, WDI, and PWT, it was found that given the uncertainty it is more accurate to speak of three separate levels of income rather than 45 as in the individual data sets. When each economy was given a plus-minus reliability band it was found that the low-income and middle-income groups are not distinguishable from each other. It might be that the middle-income countries have a positive bias in their estimates, while the poorer economies have a negative bias, and that one is therefore only picking up differences in statistical coverage, not economic performance. It was also concluded that there was one group of distinguishable richer economies.

Given that the explanations of African income diversity give little indication about when the different types of historical roots or legacies should have manifested themselves, volatility becomes crucial. The third test showed that among the relatively rich countries very few have been consistently rich. That test further confirmed what had been found in the earlier two investigations, namely that it is difficult to distinguish the majority of the African economies from each other on the basis of income levels.

The countries that remained after the reliability test were Cape Verde, Swaziland, Namibia, Gabon, South Africa, Botswana, Seychelles, Equatorial Guinea, and Mauritius. Of these, Cape Verde, Swaziland, Seychelles, Namibia, and Mauritius did not have a complete time series for 1960–2001 and were therefore excluded. If we go back to 1985 WDI has data for all these countries save Namibia.[27] In 1985 Cape Verde, Swaziland, Seychelles, and Mauritius were already among the richest ten of 42 countries in the WDI dataset. Equatorial Guinea's relative wealth is a recent phenomenon, and GDP *per capita* increased 174 percent from 1996 to 1999 following expansion in petroleum extraction. Following this investi-

27. Namibia was under the administration of South Africa following the First World War, was annexed by South Africa following the Second World War, and did not gain its independence until 1990.

gation there is a subset of questions to explain in terms of income diversity in Africa.

The rise of Equatorial Guinea and Botswana requires a particular explanation. Are their recent riches better explained by colonial institutions and patterns of slavery extraction, or by their peculiar status as very small populations which have experienced booms in extraction of petroleum and diamonds respectively? Gabon could be considered to belong to this group of countries with the crucial difference that here extraction of petroleum started earlier: in the 1970s. These three countries are different in economic resource endowment, yet physically similar to a second group of relatively rich, small, tropical islands: Cape Verde, the Seychelles, and Mauritius. To explain *their* relative prosperity one needs to reconsider their history, where settlers and slaves figure dominantly. In quite a different historical pattern these islands were settled and re-settled by white colonizers and slaves, and later immigrants, over the past centuries. The success of Mauritius is rooted in some manufacturing in export process zones and entrepôt trade, and the island state is perhaps more similar to Hong Kong and Singapore than most African economies.[28] The relative richness of the Seychelles and Cape Verde has not been subject to much scholarly investigation but it might well be explained by their location, which makes them attractive for trade and tourism. The third segment of relatively rich economies has sometimes not been considered as a homogeneous part of sub-Saharan Africa for political and economic reasons, namely South Africa and the countries deeply integrated in the South African economy – here represented by Swaziland and Namibia, though Lesotho and Botswana might also be added to that list. These five countries were members of the Southern African Customs Union as it was relaunched in 1969, and they benefited from access to the South African market and a relatively stable currency.[29] South Africa, John Iliffe wrote, 'deserves separate treatment' in particular because of its mineral endowments of gold and diamonds and its political system of racial repression which 'gave the south a trajectory different from the rest of the continent'.[30]

If the problems of inaccuracy, reliability, and volatility in income distribution among African economies are taken seriously, there is little left to

28. Shyam Nath and Yeti Nisha Madhoo, 'A shared growth story of economic success: the case of Mauritius' in Benno J. Ndulu, Stephen A. O'Connell, Jean-Paul Azam, Robert H. Bates, Augustin K. Fosu, Jan Willem Gunning, and Dominique Njinkeu (eds), *The Political Economy of Economic Growth in Africa, 1960–2000* (Cambridge University Press, Cambridge, 2008), pp. 369–401.
29. Dani Rodrik, 'Why is trade reform so difficult in Africa?', *Journal of African Economies* **7**, Supplement 1 (1998), pp. 43–69.
30. John Iliffe, *The Africans* (Cambridge University Press, Cambridge, 2008), p. 271.

explain. It is more appropriate to consider the majority of about 30 African economies as quite similar in terms of income. A relative ranking difference is as likely to represent a mistake in reporting, a measurement problem, or a temporary fluctuation as an economically important difference, and since these income estimates tell us nothing about the relative distribution of wealth within the economy, clearly the exclusive use of such variables should be reconsidered. Fewer than ten countries are exceptions to this finding and they can be distinguished as richer economies. One of them is South Africa, while the rest are either very small islands or very resource-rich economies with small populations. It is time, therefore, to reconsider the almost exclusive use of GDP as a measure of relative development and growth.